

# Neat Image

standalone application (Linux)

*To make images look better.*

## User guide

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# 1. Introduction

## 1.1. Overview

Neat Image is a digital filter software designed to reduce visible noise in digital photographic images.

Neat Image detects, analyzes, and reduces image noise. The filtration quality is higher than that of other methods because Neat Image takes into account specific characteristics of particular image acquisition devices, making the filtration more accurate. Using device noise profiles, Neat Image adapts itself to almost any input device – digital camera, scanner, etc. Neat Image incorporates the most advanced noise reduction algorithms in the industry.

Noise is a serious problem that hinders high-quality digital image processing. In digital photography, the consumer- and prosumer-level cameras produce images with an easily noticeable noise component. This component is especially strong in images shot at high ISO rates. The noise reduces the visual quality of digital images and resulting printouts. Some image processing operations, like sharpening, make quality of noisy images even worse.

The rich control set of the filter allows you to easily achieve the desired level of noise reduction. In addition, Neat Image can make images look sharper without any degradation of image quality (which is usually inevitable with noisy images). The combination of the sharpening and noise filter makes such an effect possible.

See online examples of  
Neat Image noise reduction:  
[www.neatimage.com](http://www.neatimage.com)

Neat Image standalone (Linux) is currently produced in three editions:

- Demo is a freeware edition of the software with limited functionality
- Home edition supports 8-bit images, and limited batching (up to 100 images in one batch)
- Pro edition supports 8-bit, 16-bit and 32-bit images and unlimited batching

## 1.2. Features

### Noise Reduction and Image Sharpening

- **Advanced noise filter** to reduce noise and grain in digital images
- **Complete control** over the filter settings to achieve the desired level of noise reduction
- **Smart sharpening filter** to make images look sharper without amplification of noise
- **8-bit, 16-bit and 32-bit image support** to fully utilize capabilities of modern image acquisition devices and support HDR post-processing workflows
- **CUDA and OpenCL** acceleration to speed up processing using computation-capable GPUs

### Device Noise Profiles

- **Auto Profile** to build noise profiles for your camera or scanner on the fly
- Rich set of **pre-built noise profiles** in the online profile library
- **Auto Match** to select the most suitable pre-built noise profiles for input images
- **Batch profiler** to automate profiling with the Calibration Target

### Batch Processing

- **Batch functionality** to process many images automatically
- **Background processing**: multiple images are processed in background as you prepare new images or work in another application

### Preview

- **Embedded preview** for any selected image area
- Preview of filtration results separately for each **channel** and **frequency component**

Some features are only available in certain editions of Neat Image. Detailed feature map (page 50) explains the differences between Neat Image editions in details.

## 1.3. Requirements

### 1.3.1. Hardware requirements

System requirements for practical use of Neat Image depend on size of input images. The more system RAM is available the larger images can be processed. The processing speed is determined primarily by the processor number-crunching power (clock frequency, number of cores/processors, cache size) and memory speed.

Recommended system configuration to process photos produced by modern digital cameras:

- Intel Core 2 Duo or Quad class machine or better, single or multi-processor
- Linux 64-bit or 32-bit
- 1 GB RAM or more
- True color display, resolution 1280x800 or more

Optional CUDA acceleration requires:

- CUDA-capable NVIDIA video card;
- Recent video driver supporting CUDA v4.2 or newer.  
(you can download the latest versions of the video drivers from <http://www.nvidia.com>)

Optional OpenCL acceleration requires:

- Supported video card:
  - ATI Radeon HD 57xx/58xx/59xx;
  - AMD Radeon HD 67xx/68xx/69xx;
  - AMD Radeon HD 77xx/78xx/79xx;
  - AMD Radeon HD 87xx/88xx/89xx;
  - AMD Radeon R7 260X;
  - AMD Radeon R9 270X/280X/290X;
  - Another AMD/ATI GPU based on one of the following chip series:  
Juniper, Cypress, Barts, Cayman, Cape Verde, Pitcairn, Tahiti, Bonaire, Hainan, Hawaii
- Latest version of AMD Catalyst Driver

### 1.3.2. Supported types of images

Neat Image supports the following formats of input images (the same formats are supported to save output images<sup>1</sup>):

- |   |  |
|---|--|
| • TIFF (single image, no layers, no alpha channel, no mask)<br>8/16/32-bit per channel<br>RGB and grayscale | • JPEG<br>8-bit per channel<br>RGB and grayscale |
| • PNG<br>8/16-bit per channel<br>RGB and grayscale  |  |

RAW images can be processed after they are converted to TIFFs (using TIFF is recommended to avoid quality loss due to compression) or to JPEGs (this involves quality loss, because JPEG is a lossy format).

Color input images are supposed to be in an RGB color space (for example, AdobeRGB, sRGB, and the like). If an input image is in some type of RGB color space then Neat Image produces the output image in exactly the same type of RGB color space.

Minimum size of the input images is 40x40 pixels; maximum size is usually limited by the amount of system RAM available.

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<sup>1</sup> There are some limitations in the Demo edition. Please see Detailed feature map, page 50, for more information.

## 2. Key concepts

### 2.1. What it can do – functionality of Neat Image

Neat Image is a digital image filter. Its main function is to *reduce noise* in digital images.

Neat Image can work with images produced by any imaging devices – digital cameras, scanners, etc. Neat Image can be adjusted to a particular device by means of a *device noise profile*, which describes the noise characteristics of the device working in a certain mode.

A device noise profile is built by analyzing featureless image areas that contain no visible (or important) details. Usually the software can find such areas completely automatically. In a difficult case, you can assist it and select featureless areas manually. Finding such areas is very easy for human eyes but may sometimes be a bit difficult for software.

By analyzing found or specified featureless areas, the *Auto Profile* function in Neat Image builds a profile which describes the noise in these areas. Using this profile, Neat Image's noise filter can efficiently reduce noise in the whole image.

When several such profiles for different device modes are available, the *Auto Match* function can automatically select the profile that matches given input image. In this way, you can skip noise analysis and simply re-use one of profiles built earlier.

*Smart Profile* combines the power of *Auto Profile* and *Auto Match* by preparing two candidate profiles and then selecting the better one for actual image processing. This improves automated image processing and helps to achieve great results in more cases.

The noise filter processes images in three spatial frequency ranges. This makes possible reducing noise in one frequency range even if details are present in other ranges. The filter can also selectively process any of the color channels components of the input images.

In addition to the noise filter, there is the smart sharpening filter, which only sharpens important image details without increasing the level of noise. This filter also uses the noise profile to tell noise from details, so applying the noise and sharpening filters together saves time and produces better overall results.

### 2.2. When it works – types of input images

Neat Image is designed to reduce noise in images produced by digital cameras and scanners, and can also be used to process images from other sources. An input image should satisfy the following requirements:

- **Noise must be uniformly distributed throughout the image**, i.e., there should be no strong surges of noise intensity in some areas of the image or significant changes of noise characteristics across the image.

Neat Image works fine, for example, on images with high ISO noise because such noise usually uniformly covers the whole image area. However, 'hot' or 'dead' pixels (produced by single 'broken' elements of image sensor) do not satisfy the uniformity condition and, therefore, are not efficiently removed by Neat Image.

Another frequent source of noise is JPEG compression. The JPEG noise is approximately uniform when high quality setting (low compression rate, larger file size) is used. However, low compression quality makes noise non-uniform. Therefore, we recommend using the highest quality levels whenever possible. Try to avoid visible artifacts ('squares' or 'blocks' introduced by JPEG compression) in input images beginning from the early stages of image processing. If you can, use lossless file formats such as TIFF.

- **Noise should be concentrated in high and medium spatial frequencies.** This condition is usually met by images produced by modern digital cameras. This condition may not be completely satisfied if you use the strong (e.g., x2-x3 and more) digital zoom features of digital cameras.

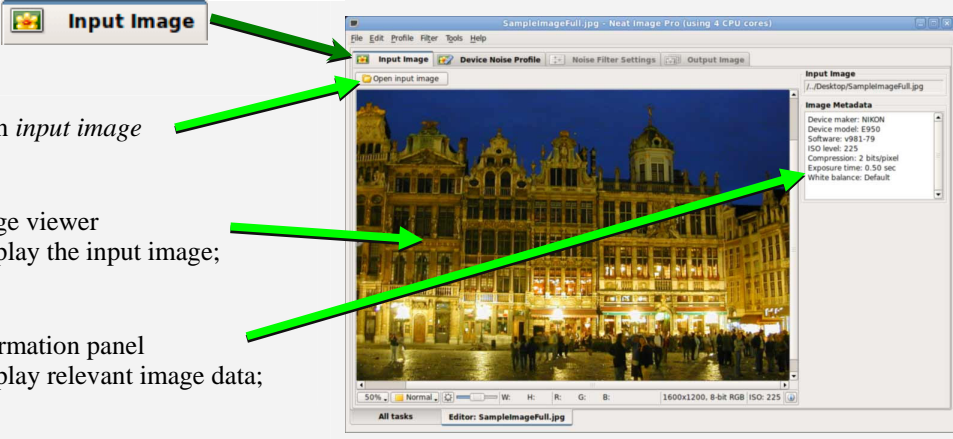
## 3. Filtration process overview

### 3.1. Overview of Neat Image filtration process

When you start Neat Image, the main Neat Image window opens automatically and then you can take the following steps to process one image:

**1. Open an *input image***

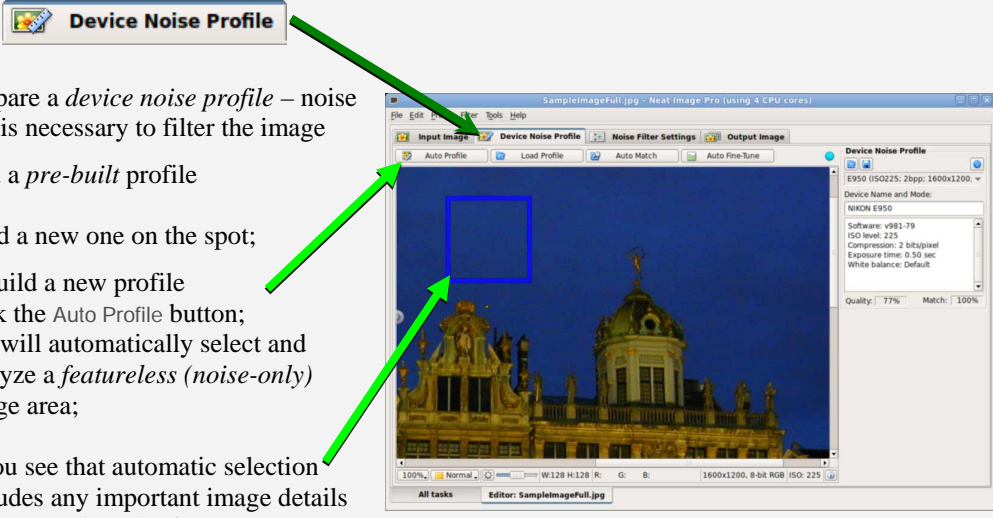
- the image viewer will display the input image;
- the information panel will display relevant image data;



**2. Prepare a *device noise profile* – noise analysis necessary to filter the image**

- load a *pre-built* profile or build a new one on the spot;
- to build a new profile click the Auto Profile button; this will automatically select and analyze a *featureless (noise-only)* image area;

if you see that automatic selection includes any important image details then move the selection to an area without details and click the Auto Profile button again;

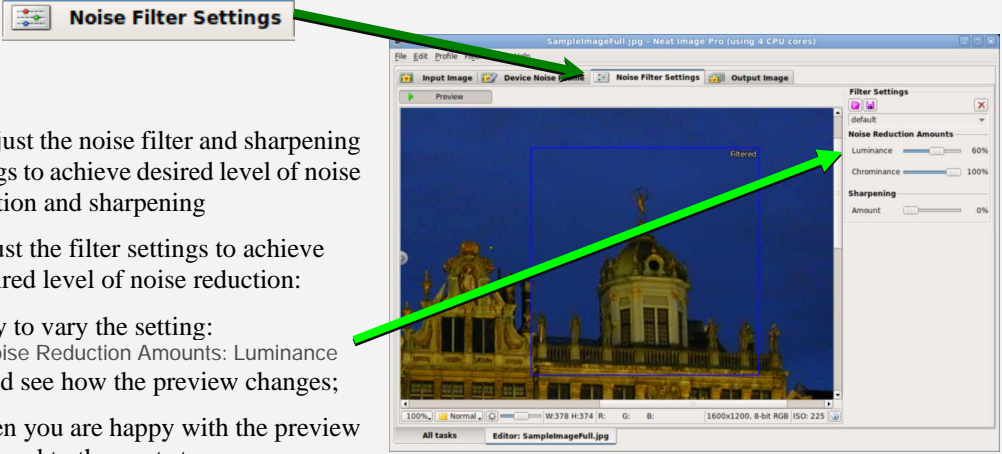


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3. Adjust the noise filter and sharpening settings to achieve desired level of noise reduction and sharpening

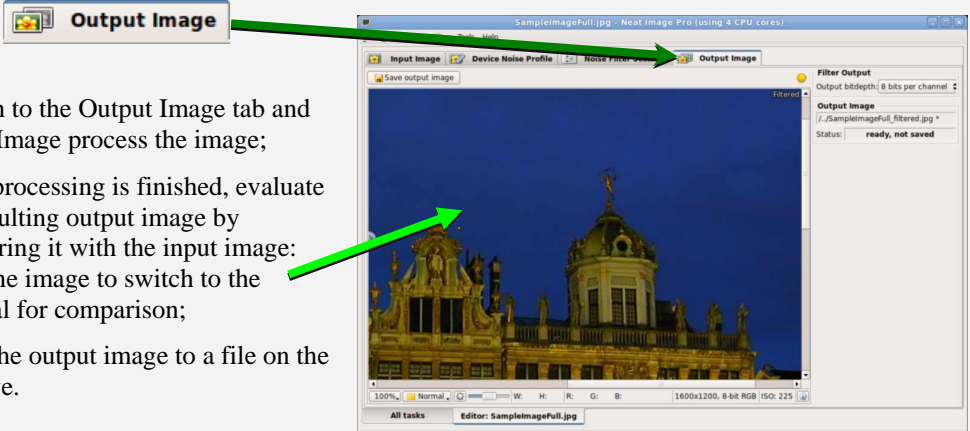
- adjust the filter settings to achieve desired level of noise reduction:
- try to vary the setting:  
Noise Reduction Amounts: Luminance and see how the preview changes;
- when you are happy with the preview proceed to the next stage;



4. Switch to the Output Image tab and let Neat Image process the image;

- when processing is finished, evaluate the resulting output image by comparing it with the input image: click the image to switch to the original for comparison;

5. Save the output image to a file on the hard drive.





## 3.2. Running Neat Image on a sample image

There is a test-kit prepared to help you start using Neat Image. You can download it from the Neat Image web page: <http://www.neatimage.net/files/Testkit5.zip>, 250KB. Having downloaded, please unzip it to a new folder on the hard drive.

The test-kit contains a sample image: the *SampleImage.jpg* file. This image is a part of typical photo taken with a digital camera. The detailed information about the test image is available in the *SampleImageInfo.txt* file.

Please start Neat Image and go through the stages below to see how it can improve the image:

### Stage 1. Open the sample image

1. Click  **Open input image** in the toolbar in the Input Image tab:  **Input Image**
2. In the Open input image file dialog, navigate to the folder where the sample image has been unzipped and double click on the *SampleImage.jpg* file.



Neat Image will open the sample image.

You will see that there is strong noise in the image, especially in the sky area (use zoom and scroll to see it). This is the typical noise produced by the Nikon CoolPix 950 digital camera. The task of Neat Image is to reduce this noise. To do that the software generally needs a noise profile describing the noise





properties of the image. We have prepared such a noise profile in advance. The profile is supplied with the test-kit in the *SampleProfile.dnp* file. Using the noise profile, Neat Image can efficiently reduce the noise in the image.

## Stage 2. Load the sample noise profile

1. Switch to the Device Noise Profile tab:  **Device Noise Profile**
2. Click  **Load Profile** in the toolbar;
3. In the Load Device Noise Profile dialog, navigate to the folder where the sample device noise profile has been unzipped and double click on the *SampleProfile.dnp* file.


Now the sample device noise profile is loaded and Neat Image is almost ready to filter the sample image. Usually, you would adjust the filter settings at this stage. To make things easier for the first run of Neat Image, we have prepared a sample preset file that stores “good” filter settings suitable for the sample image.

## Stage 3. Load the sample filter preset

1. Switch to the Noise Filter Settings tab:  **Noise Filter Settings**
2. Click  (pink folder) in the Filter Preset box on the right panel;
3. In the Load filter preset dialog, navigate to the folder where the sample filter preset has been unzipped and double click on the *SamplePreset.nfp* file.

Now the sample filter preset is loaded and the filter settings are adjusted to process the sample image.

## Stage 4. Apply the filter

1. Switch to the Output Image tab:  **Output Image**
2. Wait until the progress indicator disappears.

Processing may take a few seconds. Then the filtered output image is displayed. You can click the output image to compare it with the input image. Notice that the noise – especially in the sky area – has been significantly reduced while the image details have been preserved.

Please note that the sample noise profile and sample filter preset supplied with the test-kit are suitable only for images taken with that particular digital camera working in the same or similar mode. Neat Image can perform similar noise reduction on images captured or acquired by any other camera or scanner working in any mode. To be able to do that Neat Image needs device noise profiles that describe the noise characteristics of those devices. With Neat Image you can build these profiles yourself. The software can completely automatically build a profile given an input image. Also, you can find pre-built device noise profiles for many digital cameras and scanners in the Profiles section of Neat Image web page: <http://www.neatimage.com/linux/standalone/profiles.html>

The next sections – Filtration process details, page 9, and Device noise profiles, page 19, – contain detailed descriptions of the filtration and profiling processes. There are also several examples of profiling and filtration in the examples section of Neat Image web page: <http://www.neatimage.com/linux/standalone/examples.html>.

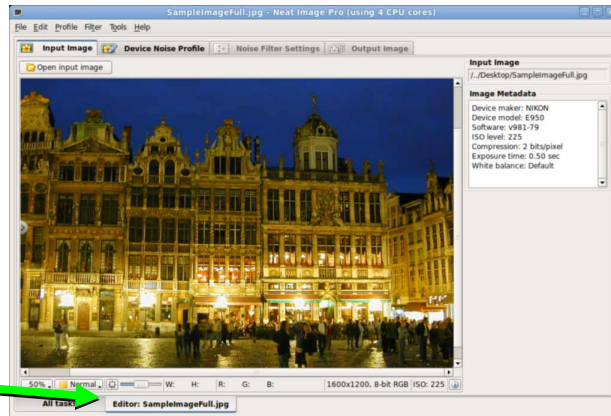


## 4. Filtration process details

Neat Image can be used to filter a single image or to automatically process multiple images. This section describes the single image workflow. Processing multiple images is detailed in the Batch processing section, page 33.

The main window of Neat Image and its Editor tab (see on the right, this will be called Editor in this guide) is usually used to process one image. When you start Neat Image for the very first time, this window opens automatically in the Editor tab:

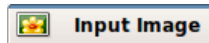
**Editor: SampleImageFull.jpg**



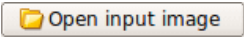
The filtration process is described below as a sequence of stages that need to be done to process one image.

### 4.1. Stage I. Open an input image

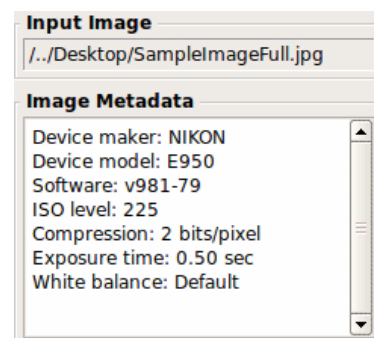
Use the Input Image tab:



#### To open an input image

- Click  (the Open input image button) in the toolbar or use the File > Open Input Image... menu item. Select an image that you want to process.  
The supported file formats are TIFF, PNG and JPEG (see Requirements, page 4, for more information about supported file formats).
- Drag an image file from Finder and drop it to the image viewer in Neat Image.
- Use the Edit > Paste menu item to copy-and-paste an image from another application to Neat Image through the clipboard.<sup>1</sup>

When the input image is ready, the Input Image box (in the right panel) displays the full name of the image. If the image contains the EXIF data then the optional Image Metadata box shows the available details such as camera model, ISO rate, compression and other relevant parameters present in the EXIF fields. Only those parameters are displayed that could be extracted from the input image and that are important for noise reduction.



#### To scroll and pan the image

- drag the image using the middle mouse button;
- press the spacebar and drag the image with the left mouse button.

#### To change the image zoom level

- use the mouse wheel when mouse is over the viewer;
- use the zoom control under the image viewer;
- use the Ctrl+Plus, Ctrl+Minus, Ctrl+0 (zero), Ctrl+Alt+0 (zero) keyboard shortcuts.

<sup>1</sup> Please note that copy and pasting an image does not copy the EXIF information which may be important for Neat Image noise reduction (in particular, for profile matching). In cases when the EXIF information is significant, consider opening an image file manually or drag and drop it instead of copy and pasting.

## 4.2. Stage II. Prepare a device noise profile

To filter the input image, Neat Image needs to know the characteristics of noise produced by the image acquisition device (digital camera, scanner, etc.) that the image comes from. The noise characteristics of a device working in a certain mode are stored in a *device noise profile*.

There are several ways to get a device noise profile that suits the input image:

1. **Auto Profile:** to build a new profile by analyzing the input image (or a specially prepared test image);
2. **Auto Match:** to automatically select the most suitable device noise profile from a pre-built set of profiles (when it is available);
3. **Smart Profile:** to use both Auto Profile and Auto Match (with Auto Fine-Tune) to prepare two candidate profiles and then automatically select the better of two profiles;
4. **Load Profile:** to manually select a suitable profile from a pre-built set of profiles.

The first option is often the easiest one provided the input image includes uniform featureless areas that contain noise but no visible or important details.<sup>1</sup> Auto Profile will try to automatically find such image areas and analyze them to build a noise profile. When the image does contain featureless areas, this automatic way of preparing a noise profile is the most accurate and therefore recommended. If the input image includes no such areas, another image with featureless areas can be used to build a profile.

The other options are available once you have a pre-built reusable set of profiles. You can find some pre-built profile sets for different cameras and scanners in:



- Profiles section of the Neat Image web page:  
<http://www.neatimage.com/linux/standalone/profiles.html>
- Device noise profiles section of the Neat Image community forum:  
<http://www.neatimage.net/forum/viewforum.php?f=5>
- Other digital imaging forums and web pages from users of Neat Image

If you cannot find a pre-built set of profiles for your camera or scanner, you can easily build such profiles yourself. Moreover, please be aware that using profiles built by other people may produce less than optimal results with your images because of possible slight differences in noise properties of cameras (scanners) as well as due to different image processing workflows used. Therefore, we advise to use profiles built by others only as a starting point to learn how to use Neat Image. To achieve better results consider building your own reusable profiles.

You can build a set of profiles for different device modes or just one profile to process one image. You can find more details about profiling in the Device noise profiles section, page 19.

Once you have a set of profiles for different modes of your imaging device, you can (automatically or manually) select a profile that matches the input image. Or if you have just built a single profile specifically for the input image, then you can directly use the profile to process the image in the Stages III-V below.

### Auto Profile: build a new profile using the input image

- ➔ Make sure you have switched to the Device Noise Profile tab:  **Device Noise Profile**
- ➔ Click  **Auto Profile** (the Auto Profile button) in the toolbar, or use the Profile > Auto Profile with Regular Image menu item, or press F2.

Neat Image will find and highlight the image area selected by Auto Profile for main analysis. Neat Image will then automatically analyze the noise in that area as well as in the whole image and will build a new noise profile.


To build a profile, Neat Image is looking for a flat uniform featureless area in the input image. In difficult cases, Neat Image may have trouble finding a uniform featureless area in the input image and then the auto-selected area will contain some important image details. In such a case, move the selection to an area that does not contain any image details (you can make a new selection or resize the old one) and then click the same Auto Profile button again.

<sup>1</sup> You can see some examples of featureless image areas in the Examples section, page 43.

After the profile is built, check the Profile Quality indicator in the Device Noise Profile box. A profile built using a uniform and featureless image area will show a high value in this indicator. If the profile quality is high (for example, higher than 75%) then you can be sure that the noise profile is accurate. In this case, consider the noise profile ready and proceed to Stage III. Adjust filter settings, page 12.

If the quality is not high, try to select another uniform image area and use Auto Profile once again. That may not help still, especially if the input image contains only a few featureless areas. In this case, consider building a noise profile using an alternative image or special test image prepared with the Calibration Target. Please see the Device noise profiles section, page 19, to learn how to use the Calibration Target to build device noise profiles. You can also try to load some pre-built profile using one of the methods described below.

## Auto Match: select matching noise profile from a pre-built profile set

- ➔ Click  (the Auto Match button) or use the Profile > Auto Match menu item.

The Auto Match function uses the EXIF data fields of the input image to automatically select and load the device noise profile that matches the device mode of the image. The most matching profile is selected from profiles stored in a special folder. By default, this folder is in your *Documents*<sup>1</sup>:  
*/home/<username>/Documents/Neat Image Standalone/Profiles/*

Auto Match will look for matching profiles in that folder as well as all its subfolders (where you can place profiles built by you or downloaded from the Internet).

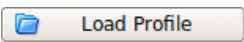
After a profile is loaded by Auto Match, the degree of match between the current input image and loaded noise profile is displayed in the Device Noise Profile box. Higher Match values mean better match, leading to more accurate filtration.

## Smart Profile: prepare two profiles and select the better one


- ➔ Use the Profile > Smart Profile menu item (or press the F5 key).

Smart Profile uses both Auto Profile and Auto Match (with Auto Fine-Tune) to prepare two candidate profiles and then selects the better of two profiles. For Smart Profile to be fully efficient, the input image must contain flat featureless areas with noise for Auto Profile to analyze, and also there must be several pre-built profiles to help Auto Match find the most matching noise profile, as described above. You can adjust settings of Smart Profile function in Preferences.

## To manually select a noise profile from a pre-built profile set

- ➔ Click  (the Load Profile button) or use the Profile > Load Profile... menu item. Then select a profile in the Load Device Noise Profile dialog.

or

- ➔ Click  (the drop-down button) in the Device Noise Profile box to open the popup menu with all available profiles and then select one of the available profiles.

Please note that you have either to build your own profiles or download some pre-built profiles and place them to the Neat Image's Profile folder to make this drop-down button and popup menu truly work. By default the Profile folder is located in the *Documents* folder<sup>2</sup>:  
*/home/<username>/Documents/Neat Image Standalone/Profiles/*

If you build or download some pre-built profiles, place (unzip the profile set if necessary) those to the above folder and Neat Image will recognize and display those profiles in the popup menu to help you quickly load any of them when needed.

When manually selecting a profile for input image, use the profile file names and sub-folder

<sup>1</sup> You can check and adjust the location of that folder using the menu Tools > Preferences > Matching.

<sup>2</sup> You can check and adjust the location of the Profile folder using the menu Tools > Preferences > Folders.

structure to guide your search. See [Preparing profile set for different device modes: Stage III. Structuring profile set](#), page 27, for more information on profile set structuring.

## To additionally fine-tune the loaded or matched profile

You may want to additionally fine-tune the profile after it has been loaded either automatically (using [Auto Match](#)) or manually (using [Load Profile](#)). Fine-tuning the profile to the current image usually makes the profile more accurate and better reflecting the image's noise properties. Please note that you do not need to fine-tune a profile if you have built it using [Auto Profile](#). [Auto Profile](#) automatically applies fine-tuning so you do not need to repeat it.

- ➔ Click  **Auto Fine-Tune** (the [Auto Fine-Tune](#) button) or use the [Profile > Auto Fine-Tune](#) menu item to fine-tune the profile to the current input image.

There is no need to select any area in the input image because [Auto Fine-Tune](#) automatically analyzes the whole image.

Once you have loaded the profile that matches the input image or you have just built a new profile specifically for the current input image, proceed to process the image in the [Stages III-V](#) below.


## 4.3. Stage III. Adjust filter settings

As soon as the noise profile is ready you can use the noise and sharpening filters. These filters have several adjustable settings. The default settings usually produce good results. You may want to additionally vary the filter settings to achieve the filtration results that look best to your eyes.

- ➔ Switch to the [Noise Filter Settings](#) tab:  **Noise Filter Settings**

### 4.3.1. Use preview when adjusting filter settings

The image viewer in the [Noise Filter Settings](#) tab shows a part of the image processed by the noise and sharpening filters. If you change any filter settings then the preview is automatically updated (provided

 **Preview** (the [Preview](#) button) in the toolbar is depressed). You can zoom in and out, drag, scroll and pan the image to see how the filtration affects different parts of the image. If you manually select an area in the image then only the selected area will be processed for preview.

When the preview is ready (the preview area shows “[Filtered](#)”), you can click inside the preview image area to temporarily switch back to the original for comparison.

### 4.3.2. Standard and Advanced modes

Neat Image has two sets of filter controls; they are available in the [Standard mode](#) and [Advanced mode](#) (you can select the mode using the [Tools > Standard mode](#) and [Advanced Mode](#) menu items). The [Standard mode](#) provides a simple control set, recommended for beginners who just start using Neat Image. The [Advanced mode](#) provides the most complete control set with maximum manual control over noise profiling and filtration processes. The [Advanced mode](#) is recommended for power users. Adjusting filter settings is described below separately for the [Standard](#) and [Advanced mode](#). We recommend starting with the part about the [Standard mode](#) and then proceeding to the part about the [Advanced mode](#) if you are going to use the complete control set.

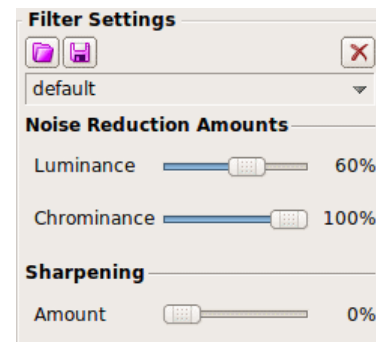
### 4.3.3. Adjust filter settings in Standard mode

There are two main filters in Neat Image: noise reduction filter and sharpening filter. These two filters can be used together and each of them can be used independently. You can enable, disable and adjust these filters using the guidelines in the subsections below.

#### Adjusting noise filter settings in Standard mode

If you work with a color image then two major image components can be distinguished: the luminance and chrominance component. This distinction is very useful from the standpoint of noise reduction because it allows processing luminance and chrominance information separately.

Some color images are represented in color spaces that enable direct separation of the luminance and chrominance components (for example, Lab, YCrCb, etc.). Other images (including RGB images that Neat Image takes as input) have to be converted to another representation to enable separation of the luminance and chrominance components. Neat Image applies an internal color space conversion to achieve that. Once luminance and chrominance components of the input image are separated, Neat Image can treat them individually. Neat Image provides separate luminance and chrominance settings in the noise filter (see the figure on the right).



In the Standard mode, the noise reduction applied to each image component (either luminance or chrominance component) is controlled by the corresponding *noise reduction amount* setting.

A noise reduction amount tells the filter how much of the detected noise should be reduced. For example, if the noise reduction amount is set to 50% then all image elements that are considered (by the filter) to be noise are reduced (made weaker or less visible) in half. The noise reduction amount value of 100% tells the filter to remove the detected noise completely.

The default noise reduction amounts usually produce good filtration results provided the noise profile is accurate<sup>1</sup>. By default, the noise filter removes 60% of detected noise in the luminance component of the input image and 100% of noise in the chrominance component. Our experience shows that the default noise reduction amounts usually provide a good balance between noise removal and preserving natural (not over-processed) appearance of filtered images.

Decreasing the noise reduction amounts may have a positive effect if the input image contains some natural noise. For example, when you filter images of asphalt, sand, or anything else that contains fine natural noise-like features, it may be helpful to reduce amounts down to 30-50%.

## Adjust noise reduction amounts<sup>2</sup>

- ➔ Use the Noise Reduction Amounts: Luminance and Chrominance sliders.

You can vary the noise reduction amount for both luminance and chrominance component of the input image. The higher a certain noise reduction amount, the more of the detected noise is removed in the corresponding image component. Be careful, setting the noise reduction amounts too high, especially in the luminance component, may lead to loss of fine details and unnaturally looking (over-smooth, plastic-like) results. Too low amounts may be not enough to sufficiently reduce the objectionable part of the noise. You have to balance the noise reduction amounts (most importantly, the amount of noise reduction in the luminance component) to get the result that looks best to your eyes.

As human vision is not very sensitive to variations of colors, strong filtration in the chrominance component does not noticeably distort image, but efficiently removes color noise.

## Use preview

As you make changes in the noise filter parameters, check preview on different parts of the image to get a better feeling for the prospective results of noise reduction.

If the noise filtration looks too strong try to decrease the noise reduction amounts. If the noise filtration is not sufficient then increase the amounts.

## Adjusting sharpening settings in Standard mode (optional)

The sharpening filter in Neat Image increases image sharpness without increasing the noise strength.

The sharpening filter is disabled (sharpening amount is set to 0%) by default. Increase the sharpening

<sup>1</sup> Use the Quality and Match indicators in the Device Noise Profile box to estimate the accuracy of the profile. The Quality indicator shows how accurate and complete is the noise analysis itself. The Match indicator shows how closely this profile corresponds to the current input image. Both indicators have to show high values for the noise reduction to be accurate.

<sup>2</sup> We recommend disabling the sharpening filter when adjusting the noise filter. To disable the sharpening filter, set the Sharpening: Amount to 0%.



amount to sharpen the image. Like with any sharpening method, you have to balance the sharpening amount to avoid over-sharpening.

Use the preview when adjusting the sharpening settings.

### Adjust sharpening amount

- ➔ Use the Sharpening: Amount slider.

Specify how much sharpening should be applied to the input image.

### Use preview

As you make changes to the sharpening setting, check preview on different parts of the image to get a better feeling for the results of sharpening.

As soon as you are happy with the preview results regarding both noise reduction and sharpening, proceed to save the filter settings into a preset (page 17), or directly to the Stage IV. Apply filter to the input image (page 17).

## 4.3.4. Adjust filter settings in Advanced mode

As said above, Neat Image has two sets of filter controls, that are available in the Standard mode and Advanced mode (you can select the mode using the Tools > Standard mode and Advanced Mode menu items). The Standard mode described above provides a simple control set, recommended for beginners who just start using Neat Image. The Advanced mode provides the most complete control set with maximum manual control over noise profiling and filtration processes. The Advanced mode is recommended for power users. If you want to use the Advanced mode then please read this sub-section, otherwise skip it and proceed to page 17 for the next stage.

As compared with the Standard mode, the Advanced mode offers a more extensive set of filter controls. There are also two filters – noise reduction filter and sharpening filter – but these have more settings now. Please follow the guidelines below to adjust both filters.

### Adjusting noise filter settings in Advanced mode

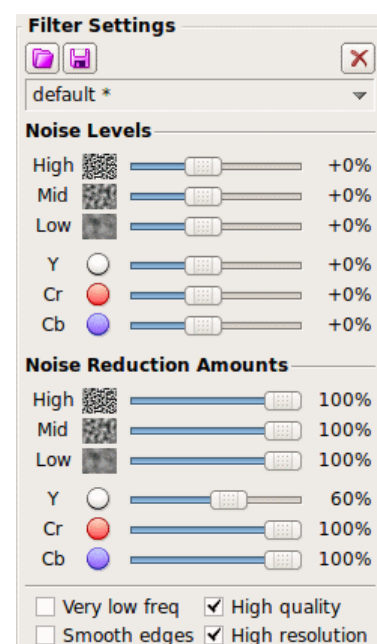
In Advanced mode, the noise filter has separate settings for all frequency and channel components of the input image. There are also pairs of *noise level* - *noise reduction amount* controls for each of these image components. The meaning of each *noise level* - *noise reduction amount* pair is the following:

- a noise level control adjusts the threshold that determines which image elements are considered noise in the corresponding image component and which elements are considered not noise;
- a noise reduction amount control determines how much reduction is applied to the image elements identified as noise in the same image component.

In Advanced mode, you can adjust the noise levels as well as noise reduction amounts for each image component. The noise levels are adjusted relative to the noise levels of the current noise profile that have been measured during profiling.

For example, the noise level of the Y (luminance) channel could be measured in the noise profile at 8.55 units.<sup>1</sup> This number tells the noise filter which image elements should be considered noise and which – image details: the image elements that are weaker than 8.55 units are considered noise and reduced by the noise filter; the image elements that are stronger than 8.55 units are considered details and not reduced.

If you do not change the default noise filter settings (Noise Levels:



<sup>1</sup> All measured noise levels are shown in the Profile Viewer (use the menu Profile > Profile Viewer to open it).

Y: +0%) then noise reduction in the Y channel is completely determined by the measured number from the noise profile (8.55 units). However, if you do adjust the filter setting for the Y noise level then this adjustment is also taken into account. For example, if you set the Noise Levels: Y control to +15% then what is considered by the noise filter as the actual noise level is:

$$8.55 * (100\% + 15\%) \Rightarrow 9.83 \text{ units}$$

With this adjustment, the image elements in the Y channel that are weaker than 9.83 units are considered noise and reduced, and elements that are stronger than 9.83 units are preserved.

Thus, with a *noise level - noise reduction amount* pair of settings you can adjust what should be considered noise in a component of the input image and how much of this noise should be reduced. You have access to six such pairs – three for channel components (Y, Cr, Cb) and three for spatial frequency components (High, Mid, Low) of the input image.

Because the noise level controls are relative to the device noise profile, the default filter settings usually produce good results when the noise profile is accurate<sup>1</sup>. The noise level defaults are 0%, which means the noise levels are completely determined by the noise profile. When you adjust the level controls, the noise level estimations are raised or lowered accordingly. A noise level control can be in the range from -100%, which means no image elements are considered noise, and therefore, no noise reduction is applied in the corresponding image component; to +150%, which means noise reduction is applied to the image elements that are weaker than 250% of the noise profile's noise level.

Noise reduction amounts can be in the range from 0% (none of the detected noise is removed) to 100% (all the detected noise is removed). By default, the noise filter removes 100% of detected noise in all but the luminance (Y) channel where only 60% of detected noise is removed.




Decreasing the noise reduction amounts can have a positive effect if the input image contains some natural noise. For example, when you filter images of asphalt, sand, or anything else that contains fine natural noise-like features, it may be helpful to reduce amounts down to 30-50%. Our experience shows that these values generally provide a good balance between preserving image details and noise removal.

## Adjust noise reduction amounts<sup>2</sup>

- ➔ Use the Noise Reduction Amounts: High, Mid, Low; Y, Cr, Cb sliders.

You can vary the noise reduction amount for each frequency and channel component of the input image. The higher a certain noise reduction amount, the more of the detected noise is removed in the corresponding image component. Be careful, setting the noise reduction amounts too high can lead to unnaturally looking (over-smooth, plastic-like) results. Too low amounts may be not enough to sufficiently remove the objectionable part of the noise. You have to balance the noise reduction amounts (most importantly, the amount of noise reduction in the Y channel) to get the result that looks best to your eyes.

Noise samples of different frequency/size are shown in the Noise Filter Settings box. These are examples of grainy structures typically regarded as noise.

High   
Mid   
Low 

As human vision is not very sensitive to variations of colors, strong filtration in the Cr and Cb channels does not noticeably distort an image, but efficiently removes color noise.

If the input image has only fine (high frequency) noise then you can utilize only the high frequency filter and switch off the filters for other frequencies by setting their amounts to 0%.

## Adjust additional filter settings (optional)

- ➔ If the input image contains strong low frequency noise (for example, a very coarse-grained color splotches) then you may want to switch on the very low frequency filter (check the Very low freq checkbox in the Filter Settings box).
- ➔ Check the Smooth edges checkbox to make edges and lines look smoother.

<sup>1</sup> Use the Quality and Match indicators in the Device Noise Profile box to estimate the accuracy of the profile. The Quality indicator shows how accurate and complete is the noise profile itself. The Match indicator shows how closely this profile corresponds to the input image. Both indicators have to show high values for the noise reduction to be accurate.

<sup>2</sup> We recommend disabling the sharpening filter when adjusting the noise filter. To disable the sharpening filter, uncheck all channels in the Sharpening Settings box.



- ➔ Check the **High quality** checkbox to enable the higher-quality noise reduction filter. This will slightly slow down processing but will deliver the most accurate results in return.
- ➔ Check the **High resolution** checkbox to enable the higher-resolution noise filter. This may be useful when processing images with very fine details that should be better preserved by the filter.

### Use preview

As you make changes to the noise filter parameters, check preview on different parts of the image to get a better feeling for the results of noise reduction.

If the noise filtration looks too aggressive try to decrease the noise reduction amounts for appropriate channels or frequency components. If the noise filtration is not sufficient then increase the amounts.

### Adjust noise levels (only when necessary)

Usually it is not necessary to change the noise levels if the noise profile is accurate. You only have to adjust the noise levels if you see that some noise elements are not reduced even if you set the noise reduction amounts to 100%. Such residual noise elements are usually caused by inaccurate noise profile (providing inaccurate estimations of actual noise levels). This may be compensated by adjusting (increasing) the noise levels in the filter settings.

- ➔ Use the Noise Levels: High, Mid, Low; Y, Cr, Cb sliders.

The noise filter has access to three frequency components and three channel components of the input image. The corresponding sliders adjust the estimated noise levels of these components.

The higher a certain noise level, the more image elements in the corresponding image component are considered noise. Be careful, setting a noise level setting too high can lead to removal of important image details. Setting a noise level setting too low can lead to incomplete filtration: residual noise and compression artifacts can stay in the output image.

As a rule, if the device noise profile has been built properly, it is not necessary to increase the noise levels by more than 50%. If the input image contains strong surges of noise in the high frequency range, it is recommended to increase the high frequency noise level up to +20 to 40%.

If the input image contains strong color noise, it is recommended to increase the Cr and Cb noise levels to +30%. In some cases, it may be useful to increase these noise levels up to +100%.

If adjusting noise levels still does not help and some noise elements remain visible in the preview and output image, probably the device noise profile is not good at all. Return to Stage II, page 10, and additionally fine-tune the device noise profile or simply rebuild the profile from scratch.

## Adjusting sharpening settings in Advanced mode (optional)

The sharpening filter is designed to increase image sharpness without increasing the noise strength.

The default values of the sharpening settings should produce satisfactory results (when sharpening is enabled for any of the channel components) but you are encouraged to vary the settings to find values that produce the desired level of sharpness. Zero sharpening amounts will not sharpen the image at all. The non-zero sharpening amounts will apply sharpening of the specified strength. Use sharpening controls for different frequency components to sharpen fine, medium or large image details. As with any other sharpening method, you have to balance the amounts to avoid over-sharpening.

Use the preview when adjusting the sharpening settings.

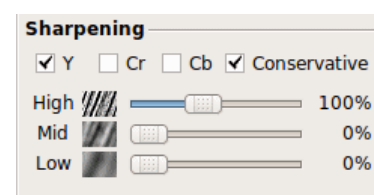
### Select color channels where sharpening should be applied

- ➔ Use checkboxes in the Sharpening section.

Usually you only want to sharpen the luminance channel – Y.

### Select sharpening mode

- ➔ Check the **Conservative** checkbox to enable more accurate sharpening, which produces much less halo effect around sharpened image details.



## Adjust sharpening amounts

- ➔ Use the High, Mid and Low sliders in the Sharpening section.


Specify how much sharpening should be applied to each frequency component of the image.

The standard sharpening settings used by many graphic editors are 100% for high frequency and 0% for medium and low frequencies (used by default).

As soon as you are happy with the preview results regarding both noise reduction and sharpening, proceed to save the filter settings into a preset (see the subsection below), or directly to the Stage IV. Apply filter to the input image, page 17.

### 4.3.5. Save filter settings into a preset (optional)

#### To save the current filter settings into a preset


- ➔ Click  (the Save filter settings as preset... button, pink disk) in the Filter Settings box or use the Filter > Save Filter Preset... menu item.

In the Save Filter Preset As dialog box, specify the name of the file to save the preset. The filter presets are stored as \*.nfp files.

Saved filter preset includes the noise filter and sharpening settings. By re-opening a preset, you can reproduce exactly the same filter settings later on. Also, you can exchange filter presets with other users of Neat Image. Together, a device noise profile and a filter preset can be used to precisely reproduce the filtration results.

#### To load a previously saved filter preset

- ➔ Click  (the Load filter preset... button, pink folder) in the Filter Preset box or use the Filter > Load Filter Preset... menu item. In the Load Filter Preset dialog box, specify the name of the filter preset to be loaded.
- or

- ➔ Click  (the drop-down button) in the Filter Settings box to open the popup menu with all available presets and then select one of them.

There are several pre-written filter presets in the following sub-folder<sup>1</sup> in your **Documents** folder:  
*/home/<username>/Documents/Neat Image Standalone/Presets/*

Please explore these presets to see what combinations of the noise and sharpening filter's settings can be used to solve typical tasks (names of the presets explain these tasks).

## 4.4. Stage IV. Apply filter to the input image

- ➔ Switch to the Output Image tab:  **Output Image**

This will automatically start the filtration process and Neat Image will process the whole input image.

Processing may take some time (from seconds to minutes, depending on the speed of your computer's processor and size of the image).

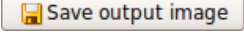
When the filtration is completed, you can compare the output and input images. Click the output image to temporarily switch between the output and input images for comparison.

If the filtration result is not satisfactory, please return to Stage III, page 12, to change some of the filter settings, or to Stage II, page 10, to build a new or improve the current noise profile to make it better match the noise of the input image.

<sup>1</sup> You can check and adjust the location of that folder using the menu Tools > Preferences > Folders > Preset folder.

- ➡ In Pro version, you can optionally select a different bitdepth of the output image using the **Filter Output** box. The output bitdepth can be made different from that of the input image. In such a case, the input image will be internally converted to the output bitdepth during processing.

## 4.5. Stage V. Save the output image

- ➡ Click  **Save output image** (the **Save output image** button) in the toolbar or use the **File > Save Output Image As...** menu item.

The available output file formats are: TIFF, PNG and JPEG (see the Requirements subsection, page 4, for more details).

When saving in the PNG format, you can select the compression level: 0 is for the lowest compression / large file size and 9 is for the highest compression / smallest file size.

When saving in the JPEG format, you can select the compression quality. The last used compression quality value is always used as the current default.

Neat Image uses 4:1:1 subsampling with the JPEG quality smaller than 85. If the JPEG quality is set to 85 or higher then subsampling is not used.

or

- ➡ You can also use the clipboard to export the filtration results to another application. Use the **Edit > Copy** menu item for that purpose. An image put on the clipboard will be in 24-bit RGB format.

## 5. Device noise profiles

A *device noise profile* (or *noise profile*, or simply *profile*) describes the properties of noise produced by an imaging device (e.g., digital camera, scanner, etc.) working in a certain mode. Several noise profiles corresponding to different modes of a device constitute a *profile set*. Neat Image can use profiles from such a set to process images produced in any of the modes covered by the set.

You can find some pre-built noise profiles or build your own profiles for your camera or scanner. Learn how to find, build and use device noise profiles in Neat Image in the subsections 5.1-5.4 below.

### 5.1. Getting ready-made noise profiles

You can find some pre-built profile sets for different cameras and scanners in:

- Profiles section of the Neat Image web page:  
<http://www.neatimage.com/linux/standalone/profiles.html>
- Device noise profiles section of the Neat Image community forum:  
<http://www.neatimage.net/forum/viewforum.php?f=5>
- Other digital imaging forums and web pages from users of Neat Image.

To use a profile set from one of these sources, download the archive with profiles and unzip all profiles to the following folder<sup>1</sup> and/or its sub-folder(s) in your *Documents* folder:

*/home/<username>/Documents/Neat Image Standalone/Profiles/*

After that you can use individual profiles from this set in Neat Image to process images produced in device modes covered by this profile set.

Please be aware that using ready-made profiles built by other people may produce less than optimal results with your images because of possible slight differences in noise properties of cameras (scanners) as well as due to different imaging processing workflows used. Therefore, we advise to use ready-made noise profiles built by others only as a starting point to learn how to use Neat Image. To achieve the best results consider building your own profiles as explained in the subsections below.

### 5.2. Building a profile for a device mode (standard profiling procedure)

In this subsection, you will find out how to build a single noise profile for an image produced in a certain shooting or scanning mode (such a profile can also be called “a profile for a certain mode of the device”).

Building a new noise profile generally consists of three stages:

- Stage I. Building a profile;
- Stage II. Documenting the profile;
- Stage III. Saving the profile.

The Stage I, building a profile, can be done with the use of a *regular image* (for example, the image that you want to denoise or any other regular image) or with the use of the *Calibration Target*. These two cases are described as two alternative versions of the Stage I:

- Stage I. Case of building a profile using a regular image
- Stage I. Case of building a profile using the Calibration Target

You may want to follow the case of building a noise profile using a regular image if you only need a single-use profile to process selected input image. In this case, the input image (or an alternative regular image from the same series; it should be produced by the same device working in the same mode) should contain enough uniform featureless areas for noise analysis.

A uniform area (with minor variation in all channels of the image) may be overcast sky, clear sky (without clouds and birds), or any other part of the image, where there are no visually perceptible details (except the noise). Neat Image needs uniform featureless areas of around 128x128 pixels (the minimum

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<sup>1</sup> You can check and adjust the location of the Profile folder using the menu Tools > Preferences > Folders.

is 32x32 pixels). You can see some examples of such areas in the Examples section, page 43.

If the input image does not contain such areas and you have no suitable alternative regular image that contains such areas, you can prepare a special test image and follow the case of building a noise profile using the Calibration Target. That is also recommended if you want to prepare a reusable noise profile for a certain mode of your camera or scanner.

### 5.2.1. Stage I. Case of building a profile using a regular image

To build a noise profile using a regular image you have to take 2 steps:

- Step 1. Preparing a regular image for noise analysis;
- Step 2. Analyzing the image noise.

#### Step 1. Preparing a regular image for noise analysis

To analyze noise in a regular image, you can use the input image or an alternative regular image that was produced by the same camera (or scanner) in the same or similar shooting (scanning) mode. Using the input image usually produces most accurate noise profile that perfectly matches the noise properties of this input image. However, if there are not enough flat featureless areas in the input image then you have to use an alternative regular image.

##### Case of using the input image

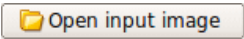
In this case, simply stay with the input image that is already opened in the Editor tab. The input image is displayed in both the Input Image and Device Noise Profile tabs.

To build a profile, switch to the Device Noise Profile tab and proceed to the step 2 below.

##### Case of using an alternative image

If there is no large enough uniform featureless areas in the input image, use an alternative image. The alternative image is supposed to be produced by the same device working in the same or similar mode. This can be just another image from the same series; the image should contain at least one large enough uniform featureless area suitable for analysis.

To open the alternative image:

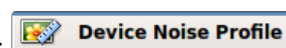
- ➔ Click  (the Open input image button) in the toolbar or use the File > Open Input Image... menu item. Select an image to be used for profiling.
- ➔ Drag an image file from Konqueror and drop it to the image viewer in Neat Image.
- ➔ Use the Edit > Paste menu item to copy-and-paste an image from another application to Neat Image through the clipboard.

Use the loaded alternative image to build a noise profile in the step 2 below. Then load the original input image back to process it using the newly built profile.

#### Step 2. Analyzing image noise (profiling)


Analyzing noise is the main part of building a noise profile for an imaging device working in a certain mode. The current version of Neat Image plug-in for Photoshop offers three ways of conducting the noise analysis (profiling): automatic, semi-automatic and manual one. Using automatic profiling is easier and therefore recommended for beginners. In difficult cases (for example if Neat Image cannot automatically find a uniform featureless area in analyzed image), automatic profiling may not work well or may produce less than perfect results. You can always override automatics and use semi-automatic or manual profiling.

- ➔ Make sure you use the Device Noise Profile tab:



## Case of automatic profiling

To analyze noise properties, Neat Image uses uniform image areas that contain noise but no visible or important details. With automatic profiling, Neat Image tries to find one such area automatically and then uses this area to analyze image noise.

- ➔ Click  **Auto Profile** (the Auto Profile button) in the toolbar, or use the Profile > Auto Profile with Regular Image menu item, or press F2.

Neat Image will try to automatically find image areas suitable for analysis and will analyze them, first the primary selected area and then the rest of the image. If the primary selected area shown in viewer indeed contains no visible details then the resulting noise profile will be accurate.

To be sure, check the profile Quality indicator in the bottom of the Device Noise Profile box. A profile built using a uniform and featureless image area will show a high value in this indicator.

If the profile quality is high (for example, higher than 75%) then you can be sure that the noise profile is accurate. Please proceed to Stage II. Documenting noise profile, page 24.

If the automatically-selected image area does contain visible details or the profile quality is not very high then try to use the semi-automatic profiling instead (see below).

## Case of semi-automatic profiling

### 1) Find a uniform featureless image area


- ➔ Manually find and select an image area that contains no visible details.<sup>1</sup>

The area should be at least 32x32 pixels large. That is the minimum size; the recommended size is 128x128 pixels or more (you can resize the selection frame).

Scroll, pan, zoom the image to find a uniform image area and then select this area for analysis.

If you cannot find a large enough uniform area in the input image, consider using an alternative regular image or use the Calibration Target as explained in the next section (Stage I. Case of building a profile using the Calibration Target, page 22).

### 2) Analyze selected image area

- ➔ Click  **Auto Profile** (the Auto Profile button).

Neat Image will automatically analyze the selected image area and the rest of the image.

The profile is now ready. Please proceed to Stage II. Documenting noise profile, page 24.


## Case of manual profiling (Advanced Mode only<sup>2</sup>)

### 1) Find a uniform featureless area

- ➔ Manually find and select an area that contains no visible details.

The area should be at least 32x32 pixels large. This is the minimum size; the recommended size is 128x128 pixels or more (you can resize the selection frame).

### 2) Analyze selected area

- ➔ Click  **Auto Profile** (the Auto Profile button).

Neat Image will automatically analyze the selected area and build a noise profile.

<sup>1</sup> You can find some examples of uniform featureless image areas in the Examples section, page 43.

<sup>2</sup> You can enable Advanced mode using the Tools > Advanced Mode menu item.

### 3) Additionally manually fine-tune the profile


Fine-tuning uses additional flat featureless frame areas to make the noise profile more accurate. You must manually select and analyze several such areas one after another.

#### 1) Find and select a uniform featureless area

- Scroll, pan, zoom the frame in the viewer in the Device Noise Profile tab to find a new uniform area.

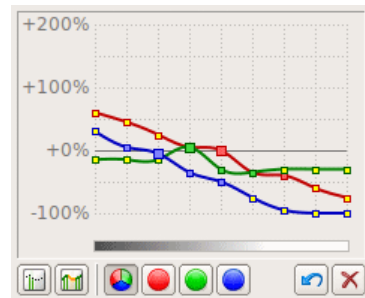
The size of an area may be from 16x16 to 256x256 pixels. Using larger areas makes fine-tuning more accurate. The selection edges will change their thickness according to the selection size.

#### 2) Analyze selected area with Manual Fine-Tune

- Click  (the Manual Fine-Tune button) or use the Profile > Fine-Tune Using Selected Area menu item.

The analysis results will be shown in the noise profile equalizer: the graphs of the equalizer will change some of the values (see the picture on the right). You can switch from one channel to another in the equalizer to better see a specific channel's graph, or select to show them all together.


The goal of manual fine-tuning is to fill the equalizer with measured values (shown as graph-color knots) in all points of the graphs. The previous steps (specifically, the Auto Profile function) may have already filled some of the values. Manual fine-tuning can further improve the analysis by filling out the still missing or interpolated values (shown as yellow knots) and/or making some of already measured values more precise.



#### 3) Repeat 1-2 above with other uniform areas of different brightness

To make the device noise profile more accurate, fine-tune it using several uniform image areas. Select areas of different brightness for best results. Try to choose and analyze uniform areas to cover all or most elements of the equalizer in all its color channels. The more elements of profile are analyzed, the higher is the quality of the profile.

#### 4) Complete fine-tuning using Auto Complete

- Click  (the Auto Complete button) or use the Profile > Auto Complete menu item to automatically complete the fine-tuning by adjusting the unmeasured values using interpolation based on the measured data.

At this point the profile is ready. Proceed to Stage II. Documenting noise profile, page 24.

## 5.2.2. Stage I. Case of building a profile using the Calibration Target

The Calibration Target is specially designed to enable easy profiling of various imaging devices. It can be used to build a single profile for a certain device mode or a set of profiles for different modes.

Follow the steps below to prepare a single profile using the Calibration Target.

### Step 1. Preparing the Calibration Target

To use the Calibration Target, either go to menu Tools > Calibration Target and then click

 (the Display target... button), or download the image of the Target from the Neat Image web page: <http://www.neatimage.com/linux/standalone/testtarget.html>

There are two ways of using the Calibration Target: you can open it on the screen and take a shot (with a digital or film camera, depending on your workflow) or you can print it out and shoot the hardcopy.

Shooting the Calibration Target off the screen is faster, especially with a digital camera. However, be careful when shooting it off the screen of a CRT monitor because you may occasionally capture scan



bands. These bands may spoil a part of the shot. If you cannot avoid these bands, prepare a printed version of the Calibration Target or shot it off an LCD monitor, which does not produce this effect. Also, try to avoid glares when using a monitor with a glass or glossy screen.

### Case of shooting the Calibration Target off the screen

- ➡ Open the Calibration Target image on the screen (menu Tools > Calibration Target and then click the Display target... button). Then use the displayed Calibration Target in the Step 2 below.

### Case of shooting the printed Calibration Target

- ➡ Open the Calibration Target image in an image editor and print out the image on a sheet of white matte paper; make the image fill the whole page. Then use the printed target in the Step 2 below.

## Step 2. Preparing a shot or scan of the Calibration Target

### Case of digital camera

Use the displayed or printed Calibration Target to prepare a test shot for building a device noise profile for your camera:

1. Set the camera to a certain shooting mode (ISO level, etc.) you want to build a profile for;
2. **Important:** set the focusing system on infinity or in macro mode to get a slightly-out-of-focus image of the target;
3. Make sure the Calibration Target fills the whole frame and make a shot;
4. Open the resulting shot in Neat Image (the step 3 below).

### Case of flatbed scanner

Use the printed Calibration Target to prepare a test scan for building a device noise profile for your flatbed scanner:

1. Set the scanner to a certain scanning mode (resolution, light level, etc.) you want to build a profile for;
2. If possible set the scanner slightly out of focus (an out of focus scan is preferred for profiling); a possible way to achieve this is to raise the page over the scanner glass a bit;
3. Scan the printed Calibration Target;
4. Open the resulting scan in Neat Image (the step 3 below).

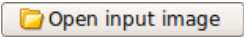
### Case of slide scanner

Use the displayed or printed Calibration Target to prepare a test scan for building a device noise profile for your film scanner:

1. Set the camera to a certain shooting mode (film type, exposure, etc.) you want to build a profile for;
2. **Important:** set the focusing system on infinity or in macro mode to get a slightly-out-of-focus image of the target;
3. Make sure the Calibration Target fills the whole frame and make a shot;
4. Develop the slide and put it into the scanner;
5. Set the scanner to a certain scanning mode (resolution, light level, etc.) that you want to build a profile for and scan the slide;
6. Open the resulting scan in Neat Image (the step 3 below).

### Step 3. Analyzing image noise

Open the shot or scan of the Calibration Target in Neat Image and use it to build a noise profile:

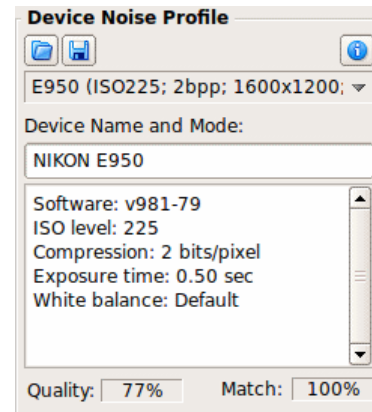
- ➔ Click  (the Open input image button) in the toolbar or use the File > Open Input Image... menu item. Select the shot or scan that you have just prepared.
- ➔ Use the Profile > Auto Profile with Calibration Target menu item.

After the analysis is completed, proceed to the Stage II below.

#### 5.2.3. Stage II. Documenting noise profile

At this point of building the noise profile for your camera or scanner, the noise analysis is done and all important noise characteristics are gathered in the profile. You may still want to manually document the profile if Neat Image has not done this automatically. With most images from digital cameras, Neat Image is able to automatically extract the crucial information about the camera mode from the EXIF data fields of the analyzed image and put this information to the noise profile (you can see that in the Device Name and Mode fields in the Device Noise Profile box).

If Neat Image has not automatically placed any information to the Device Name and Mode fields after noise analysis, you can fill out these fields manually.



- ➔ Use the Device Name and Mode fields in the Device Noise Profile box. Here, you can specify the model of the image acquisition device and describe the device mode, which can be something like the data in the picture on the right.

##### About the Device name and mode notes


It is highly recommended to specify these details to keep record of devices, device modes, and corresponding device noise profiles that you use.

The noise characteristics of any two devices can be extremely different. Even a single device in different modes can produce significantly different noise. Therefore, it is always better to use separate noise profiles for different devices and device modes to avoid inaccurate filtration and artifacts. Commenting on the device name and device mode parameters helps you keep track of them when you do manual profile matching, i.e., when you manually select a suitable profile to process an image.

Automatic profile matching available in Neat Image uses the EXIF information from the image files and profiles, not the Device Name and Mode fields, so filling out these fields may not be necessary for automatic profile matching. However, filling out these fields is highly advisable both for the clarity purposes and for the cases of EXIF-less input images (in such cases, you have to manually select a suitable profile based on the Device Name and Mode fields).

See the Preparing profile set for different device modes section below to learn more about camera and scanner parameters that may need to be documented in the Device Name and Mode fields.

#### 5.2.4. Stage III. Saving the noise profile

- ➔ Use  (the Save Device Noise Profile As... button, blue disk) in the Device Noise Profile box or use the Profile > Save As... menu item.

In the Save Device Noise Profile As... dialog box, select the desired file name for this profile. The default name is based on the device name and device mode when these are available from the EXIF data fields of the analyzed image. If the EXIF data are not available then the default profile name is based on the name of analyzed image file. Use the suggested default or change the name of the file to store the device noise profile. Device noise profiles are saved as \*.dnp files.

**File naming considerations**

If you are going to re-use a device noise profile later on, select a good file name explaining the device name and mode so that you could easily recognize this profile by its file name. Alternatively, you can use special folder structuring to keep many device noise profiles arranged according to their device modes.

See Preparing profile set for different device modes: Stage III. Structuring profile set, page 27, for additional information.

A saved noise profile includes the complete noise analysis. Therefore, by re-opening the noise profile, you can reproduce exactly the same conditions for image processing later on.

## 5.3. Preparing profile set for different device modes

Usually an imaging device can work in several different modes. Therefore, there should be several device noise profiles covering different modes to enable accurate processing of arbitrary images produced by this device. If a set of profiles covers all modes of the device then any image from this device can be processed by using one of the profiles from the set.

This subsection explains how you can prepare a reusable set of profiles for a range of modes of an imaging device.

As an owner of a certain imaging device you are in perfect position to prepare a profile set because you have direct access to the device hardware, you can adjust its shooting mode and take test shots. Moreover, using your own set of profiles makes noise reduction more accurate because such profiles better reflect the specifics of the camera or scanner as well as the workflow you use.

When building a set of profiles, please follow the guidelines below that will help you structure the profile set in such a way as to make consequent reuse of the set easy for you<sup>1</sup>.

### 5.3.1. Stage I. Selecting device parameters for profile set

To build a set of profiles for particular camera or scanner, you must identify the device parameters that affect the noise characteristics and that you will take into account during profiling. There may be many device parameters but not all of them influence image noise and those that do differ by the strength of their influence. Naturally, you are only interested in those parameters that appreciably affect noise. Different noise profiles should be prepared for different values of important parameters, so you have to identify these parameters in the first place.

The tables below describe the parameters that appreciably affect noise characteristics (from the most to the less important ones) of digital cameras and scanners:

<b>Digital camera parameters in the order of decreasing importance</b>		
<b>ISO rate</b>	50, 100, 200, 400, etc.; depends on a camera	Higher ISO rate produces more noise.
<b>Camera noise reduction</b>	High, Normal, Low, etc.; depends on a camera	In-camera noise reduction can reduce levels of noise in photos (usually at expense of some details).
<b>Sharpness adjustment</b>	Low, Normal, High, etc.; depends on a camera	Internal sharpness adjustment of a camera makes noise more intensive. Using no internal sharpness adjustment produces least noise.
<b>Compression</b>	1:1 (or Uncompressed), 1:5 (or Fine), 1:10 (or Normal), 1:20 (or Basic), etc. or 2 bits/pixel, 4 bits/pixel, etc. depends on a camera	Strong JPEG compression typically produces more JPEG artifacts and destroys image elements including noise; weaker compression preserves more image elements including noise created by the image sensor. It is preferable to use the lowest amount of compression for the best results.

<sup>1</sup> ...and other people if you decide to share your results. Please do share because in this way you will help people with the same camera or scanner model. You can submit a set of profiles to the Neat Image team to publish the set in the profile library in [www.neatimage.com](http://www.neatimage.com) (see Contacts, page 50) or just share them with other people directly.

<b>Resolution</b>	1:1 (original resolution, like 4288x2848), 1:2 (downsized in camera, e.g., 2144x1424), 2:1 (digital zoom, 2x), etc.	Camera's internal interpolation (both downsizing and upsizing, e.g., that of <i>digital zoom</i> ) changes many characteristics of noise.
<b>White balance</b>	Sun, Cloudy, Incandescent, Fluorescent, etc.; depends on a camera	White balancing changes characteristics of noise (mainly of color noise) slightly.
<b>Exposure</b>	1/16s, 1.0s, 16s;	Longer exposures produce more hot-pixel noise; also, some cameras switch on the automatic noise reduction when exposure is longer than a certain threshold – this may affect the noise levels.

Scanner / camera parameters in the order of decreasing importance		
<b>Film type</b>	For example, Kodak Tmax 400, Kodak Tri-X Professional 320, Fuji Superia 200, etc.	Every film type produces specific grain pattern, which depend on film materials. Strength of the grain depends on ASA/ISO rate of the film.
<b>Scanning resolution</b>	For example, 300 dpi, 3200 dpi, 4000 dpi, etc.	Higher scanner resolution emphasized film grain and makes it more evident in the scanner image.
<b>Number of scan passes</b>	Single pass, 2x pass, 4x pass, etc.	Multi-pass scanning can potentially produce less grainy images.

If two images were captured in the same or similar conditions (most of the above device mode parameters are the same) then the noise of these two images should be very similar. If you have built a device noise profile using one of these images, you can use this profile to filter both images with good results. If the shooting or scanning conditions were different then the noise in two images could be significantly different. In this case, cross-use of one noise profile is not recommended. Instead, two different profiles should be built and used to filter these two images.

Based on these considerations and tables above, identify the device mode parameters of your camera or scanner that (1) are important from the noise standpoint and (2) are changed in your imaging tasks. For example, if you never change the sharpness adjustment of your digital camera then there is no need to build profiles for different values of the sharpness adjustment parameter. On the other hand, if you do shoot with different ISO rates then you have to build profiles for every ISO rate you use. Some parameters are less important (for example, the White Balance or Exposure) and you may simply choose to ignore the difference in noise characteristics caused by such device mode parameters.

Identify and make a list of the device mode parameters that are important for your needs. For example, you could include the ISO rate: ISO 100, 200, 400; and JPEG compression level: HQ, SHQ. Then it is straightforward to write down all combinations of the selected parameters:

JPEG HQ, ISO 100  
 JPEG HQ, ISO 200  
 JPEG HQ, ISO 400  
 JPEG SHQ, ISO 100  
 JPEG SHQ, ISO 200  
 JPEG SHQ, ISO 400

Now you must prepare an individual profile for each combination from this list. Please proceed to the Stage II to build profiles for all combinations.

### 5.3.2. Stage II. Building individual profiles

To build individual profiles for the profile set, you can either use the standard profiling procedure described earlier, or employ a special Neat Image tool – the Batch Profiler.

## Using standard profiling procedure

To build individual profiles using the standard profiling procedure, follow the guidelines of the Building a profile for a device mode section, page 19. Using those guidelines, build a new profile for every combination of the device mode parameters included in your list as described in the Stage I above. The resulting set of noise profiles (several *\*.dnp* files on the disk) can be further structured as explained in the Stage III below.

## Using Batch Profiler

The Batch Profiler is a dedicated tool that can automatically build several noise profiles using shots or scans of the Calibration Target (please note that the Batch Profiler is **not** for regular images). To use this tool, you must prepare several shots (scans) and then analyze them all at once using the Batch Profiler.

### 1. Preparing set of images of the Calibration Target

To prepare shot or scan of the Calibration Target for every combination of device mode parameters, please follow the two initial steps of Stage I. Case of building a profile using the Calibration Target:

Step 1. Preparing the Calibration Target, see page 22.

Step 2. Preparing a shot or scan of the Calibration Target, see page 23.

Do the Step 2 for every combination of device parameters in your list. Then place all resulting image files (*\*.jpg*, *\*.tiff*, *\*.png*) to a new folder (and its subfolders if necessary) on the hard drive, for example: */home/<username>/Target Images/*

### 2. Preparing profiles

To prepare profiles using the images of the Calibration Target:



1. Select the Tools > Batch Profiler... menu item to open the Batch Profiler window.
2. In the Batch Profiler window, specify the folder with images of the Calibration Target and the folder where the Batch Profiler should save prepared device noise profiles.
3. Click the Start button to initiate profiling process.  
When profiling is finished, new noise profiles are saved in the selected target folder.
4. Use the Close button to close the Batch Profiler window.

As the result, you have a set of noise profiles (several *\*.dnp* files on the hard drive) that have to be structured as described in the Stage III below.


## 5.3.3. Stage III. Structuring profile set

In the Stage II, you have prepared a set of profiles, they are now saved on the disk. You have assigned names to these profiles that reflect the device modes they correspond to.

For example, profiles for Olympus C5050Z could be named like the following:

 <b>Olympus C5050Z</b> C5050Z (ISO100; JPEG HQ; SharpNormal; 2560x1696).dnp C5050Z (ISO100; JPEG HQ; SharpNormal; 2560x1920).dnp C5050Z (ISO100; JPEG SHQ; SharpNormal; 2560x1696).dnp C5050Z (ISO100; JPEG SHQ; SharpNormal; 2560x1920).dnp C5050Z (ISO200; JPEG HQ; SharpNormal; 2560x1696).dnp C5050Z (ISO200; JPEG HQ; SharpNormal; 2560x1920).dnp C5050Z (ISO200; JPEG SHQ; SharpNormal; 2560x1696).dnp C5050Z (ISO200; JPEG SHQ; SharpNormal; 2560x1920).dnp C5050Z (ISO400; JPEG HQ; SharpNormal; 2560x1696).dnp C5050Z (ISO400; JPEG HQ; SharpNormal; 2560x1920).dnp C5050Z (ISO400; JPEG SHQ; SharpNormal; 2560x1696).dnp C5050Z (ISO400; JPEG SHQ; SharpNormal; 2560x1920).dnp C5050Z (ISO100; TIFF; SharpNormal; 2288x1712).dnp C5050Z (ISO100; TIFF; SharpNormal; 2560x1696).dnp	 – disk folder  <b>C5050Z</b> – camera name  <b>ISO ###</b> – ISO rate of camera mode  <b>JPEG SHQ / JPEG HQ / TIFF</b> – file format and compression level  <b>Sharp#####</b> – sharpness adjustment  <b>#### x ####</b>
---	--

C5050Z (ISO100; TIFF; SharpNormal; 2560x1920).dnp C5050Z (ISO200; TIFF; SharpNormal; 2288x1712).dnp C5050Z (ISO200; TIFF; SharpNormal; 2560x1696).dnp C5050Z (ISO200; TIFF; SharpNormal; 2560x1920).dnp C5050Z (ISO400; TIFF; SharpNormal; 2288x1712).dnp C5050Z (ISO400; TIFF; SharpNormal; 2560x1696).dnp C5050Z (ISO400; TIFF; SharpNormal; 2560x1920).dnp	– image size
---	--------------

When the profiles are named like this, manual selection of a suitable profile is simple. You can check the device mode of the input image (using the Image Metadata information in the Input Image tab or using  button in the bottom of image viewer) and then select a profile for this mode from the popup menu.

There is another way to select profile for an image, based on structuring the profile set using the disk folders. For example, the above Olympus C5050Z profile set could be structured like this:

<ul style="list-style-type: none"> <li>📁 <b>Olympus C5050Z</b> <ul style="list-style-type: none"> <li>📁 <b>TIFF (Uncompressed)</b> <ul style="list-style-type: none"> <li>📁 <b>2048x1536</b> <ul style="list-style-type: none"> <li>ISO 100.dnp</li> <li>ISO 200.dnp</li> <li>ISO 400.dnp</li> </ul> </li> <li>📁 <b>2288x1712</b> <ul style="list-style-type: none"> <li>ISO 100.dnp</li> <li>ISO 200.dnp</li> <li>ISO 400.dnp</li> </ul> </li> <li>📁 <b>2560x1696</b> <ul style="list-style-type: none"> <li>ISO 100.dnp</li> <li>ISO 200.dnp</li> <li>ISO 400.dnp</li> </ul> </li> <li>📁 <b>2560x1920</b> <ul style="list-style-type: none"> <li>ISO 100.dnp</li> <li>ISO 200.dnp</li> <li>ISO 400.dnp</li> </ul> </li> </ul> </li> <li>📁 <b>JPEG</b> <ul style="list-style-type: none"> <li>📁 <b>HQ (2bpp)</b> <ul style="list-style-type: none"> <li>📁 <b>2560x1696</b> <ul style="list-style-type: none"> <li>ISO 100.dnp</li> <li>ISO 200.dnp</li> <li>ISO 400.dnp</li> </ul> </li> <li>📁 <b>2560x1920</b> <ul style="list-style-type: none"> <li>ISO 100.dnp</li> <li>ISO 200.dnp</li> <li>ISO 400.dnp</li> </ul> </li> </ul> </li> <li>📁 <b>SHQ (5bpp)</b> <ul style="list-style-type: none"> <li>📁 <b>2560x1696</b> <ul style="list-style-type: none"> <li>ISO 100.dnp</li> <li>ISO 200.dnp</li> <li>ISO 400.dnp</li> </ul> </li> <li>📁 <b>2560x1920</b> <ul style="list-style-type: none"> <li>ISO 100.dnp</li> <li>ISO 200.dnp</li> <li>ISO 400.dnp</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li></ul>	<ul style="list-style-type: none"> <li>📁 – disk folder</li> </ul> <p><b>Olympus C5050Z, JPEG / TIFF, #### x ####</b> - the names of disk subfolders containing device noise profiles for corresponding device modes;</p> <p>ISO ###.dnp - device noise profiles;</p> <p>Note that constant parameter (Sharpness adjustment) is not reflected in the folder structure. However, if there were profiles with different values of these parameters then additional subfolder should be added.</p> <p>Parameters that can be disregarded, such as exposure time, are not reflected in the folder structure too.</p>
--	---

In this case, the folder tree stores device noise profiles in a structured way, which helps to select one profile from the set given the device mode of the input image.

Note that the automatic profile matching provided by Neat Image does work well in both cases: you can keep the whole set of profiles as a flat list of files in one folder, or you can structure the files into subfolders. This choice only affects the convenience of manual selection of profiles, while automatic profile matching can handle both cases equally well.



If the automatic profile matching is not available (for example, if the images or profiles contain no EXIF information or the available EXIF details are incomplete) then you have to select profiles manually. Therefore, we recommend to structure profiles according to one of the methods above to make your manual work easier.

### 5.3.4. Stage IV. Documenting profile set

Along with the text comments inside the device noise profiles and their file names, we recommend to document the whole profile set with a plain text file explaining the following points:

- Author of the profile set and profiling date
- Device name, firmware version
- Device modes that have been profiled in this set
  - Device mode parameters that change within the profile set
  - Device mode parameters that are constant for all profiles in the set
- Post-processing applied (after receiving image from imaging device and before Neat Image)

An example of such a description is below:

```
Olympus C5050Z noise profiles
by John Smith, September 26, 2014

A set of profiles for Olympus C5050Z TIFF and JPEG files. The profiles were built using shots of the Calibration Target for
the following file formats and image sizes:
    TIFF: 2048x1536 / 2288x1712 / 2560x1696 / 2560x1920
    JPEG HQ / SHQ: 2560x1696 / 2560x1920

For each file format and image size above, shots with different ISO rates (100, 200 and 400) were made and used to build
profiles.
Default camera settings were used for Sharpness, Contrast, and Saturation. In-camera noise reduction was switched off. The
white balance was set to daylight.
No post processing was applied; the calibration target shots directly from the camera were opened in Neat Image to build
profiles.
```

Such kind of summary would help you figure out any set of profiles you prepared as well as let other people understand your results if you decided to share your profiles.

## 5.4. Using noise profiles

When you have a set of profiles for your camera or scanner, you can directly use these profiles to process images in Neat Image. Usually there is only one profile that is most suitable to process a given input image. Therefore it is very important to select the right profile, which would provide the best match between profile and image. Profiles in a set usually correspond to different modes of the imaging device. To make a perfect match between a profile and image, the device mode of a profile should be the same or very close to the device mode used to capture the image.

There are two ways to select a device noise profile that matches the input image:

- To automatically select the most suitable profile from a pre-built set of profiles using Auto Match (see page 11 to learn how to use Auto Match);
- To manually select the most suitable profile from a pre-built profile set based on mode comments (see page 11 for details).

When you select and load a profile in either way, Neat Image shows the degree of match between the profile and input image. This degree is shown by the Match indicator in the Device Noise Profile box. The match degree is calculated on the basis of the image and profile's metadata (the EXIF data fields). If the profile's device mode is exactly the same as device mode used to capture the image then the match is 100%. There is always 100% match between an image and profile built using this very image (Neat Image displays that using the note "(AP)" in the Match indicator). If the device modes of a profile and image are very close then the match degree is close to 100%. The more different the device modes of profile and image, the lower the match degree. Use the match degree as an indication of match accuracy. If the match degree is low then it is likely that building a new profile (using the current input image or



the Calibration Target shot in current device mode) would produce better noise reduction results.

Obviously it is preferable to build a new noise profile for each new input image (unless the image does not allow building a quality profile because it contains no large uniform areas for analysis), because such a profile would perfectly match the noise of that image. Nevertheless, any noise profile can, with some degree of accuracy, be used to process other images captured by the same device working in the same or similar mode. This is less accurate than building a profile for each image but saves time because building a new quality profile can take more time than re-using a pre-built one. This is especially important if one profile is re-used many times, for example to process a series of images produced in one device mode. Also, it may not always be possible to build an accurate profile using input image when it contains no flat featureless areas.

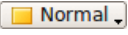
When using pre-built profiles, you may also want to pay attention to the *Quality* indicator in the *Device Noise Profile* box. A properly-built and fine-tuned profile will show a high value in this indicator. If the profile quality is high (for example, higher than 75%) then you can be sure that the profile is accurate.

Both *Quality* and *Match* indicators should usually show high values for the noise reduction of the current input image using the current noise profile to be accurate.

## 6. Additional tools

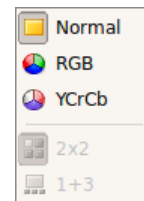
### 6.1. Alternative modes of image viewer

The image viewer in Neat Image can show the currently processed image in several alternative modes to enable detailed examination of both channel and frequency components. Examining the components helps to find flat featureless image areas for noise analysis. Also, that allows to visually compare the original and filtered version of each component and to find optimum filter settings for the corresponding component easier and faster.


- ➔ Use  (Viewer mode button) in the viewer toolbar to select the desired viewer mode.

The viewer mode will change accordingly and will display the image components separately or as one composite image.

Examine individual channel and frequency components of the image, check the presence of noise in individual components. Working in the Noise Filter Settings tab, you can use the separately displayed components to identify those components that do not get enough (or get too much) noise reduction and adjust the corresponding filter settings.




You can also adjust the brightness of the viewer to easier see the image details and noise in very dark or very bright areas of the image:

- ➔ Use  (the viewer brightness controls) in the viewer toolbar to adjust and/or reset the viewer brightness to better see the noise and details in very dark or very bright areas of the image.

Please note that this adjustment does not change the underlying image data in any way. The adjustment only affects the image viewer, i.e., the way the images are displayed in it.


### 6.2. Navigator

The image viewer has an additional Navigator panel, which offers an easy way to locate and navigate to an area of interest in a large image that does not entirely fit into the viewer, for example when you zoom into the image to see its fine details. When using Navigator you don't need to zoom out and then again zoom in (though such an approach to locating an area of interest can be used as well).

- ➔ Use  (the Navigator button in top-left corner of the viewer), the Tools > Navigator menu item or press F8 to open or close the Navigator panel.
- ➔ Use the mouse pointer to drag the visible area frame to the desired image position within the Navigator panel. This will make the main viewer navigate to the same position in the image.

### 6.3. Profile Viewer

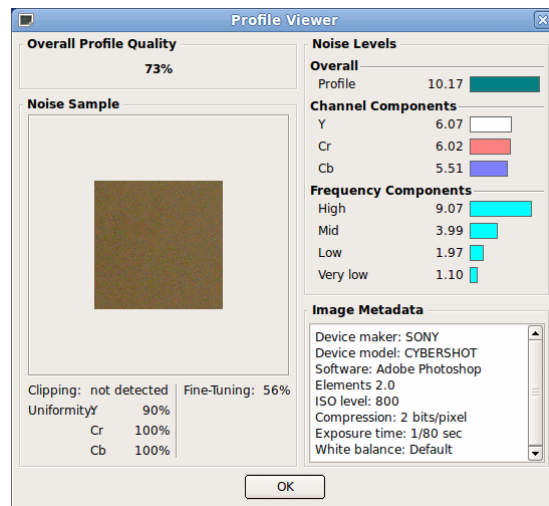
The Profile Viewer provides detailed information about the currently used noise profile.

- ➔ Use  (the Profile viewer button) in the Device Noise Profile box in the Device Noise Profile tab to open the Profile Viewer window.

The Profile Viewer provides the following details:

- Overall Profile Quality – this is an estimation of the overall quality of the noise analysis contained in this profile. The higher this value the better this profile seems to be. A quality profile is necessary for quality noise reduction.

- **Noise Sample** – this is an optional noise sample (a crop from the image used to build this profile). The noise sample helps you visually evaluate the noise described by this profile. Also, you can easily see whether any details are present in this area, which makes the profile less accurate (only flat featureless areas without any details should be used for profiling, so the sample should contain no visible details).
- **Clipping** – this indicator tells whether there is any clipping in the analyzed image area. Clipping occurs when the sample contains pixels that are very close to or in fact are entirely white (or entirely black). Clipping reduces the overall profile quality.
- **Uniformity** – these values show how uniform the noise sample is in all color channels. The uniformity is low when any details are present in the area. Low uniformity reduces the overall profile quality.
- **Fine-Tuning** – this indicator tells how well this profile is fine-tuned. Fine-tuning is a part of profiling process (both automatic and manual) and the more complete and accurate the fine-tuning the higher the overall profiling quality. If you work with Neat Image in Advanced mode then you can see that the more equalizer values are filled in with measured data the higher the overall profile quality is. You can improve the profile quality by additional fine-tuning.
- **Noise Levels** – these figures show the actual noise levels measured by the noise analyzers during profiling. There are the overall noise level and noise levels in channel and frequency components. These figures are a good indication of how noisy an image source is.
- **Image Metadata** – this box contains the EXIF information associated with the image used to build this profile. This information is used by Neat Image to find a profile that matches an input image.



## 7. Batch processing

Neat Image standalone can automatically process multiple images. To do that, you can create several *image filtration tasks* (one task is one input image to be processed) and let Neat Image process the tasks one after another.

You can create several tasks one by one, and you create many tasks at once.

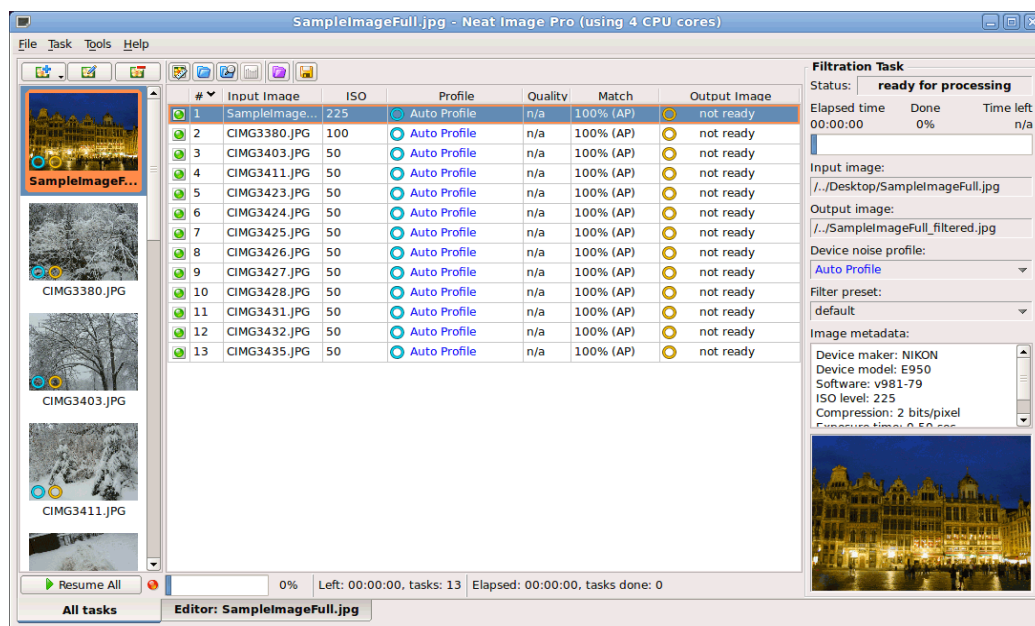
You can use the same filtration parameters for all tasks or customize groups of tasks or individual tasks with different filtration settings. You can modify parameters of any task at any time.

In this section, we explain in details how you can use all these capabilities of Neat Image.

### 7.1. All Tasks tab

When you normally start Neat Image, it usually opens with the Editor tab open. To process many images switch to the All tasks tab: **All tasks** (if there is no All tasks tab, press the Esc button).

Then you can process many images using the tools available there. This is how it looks like:




The All tasks tab contains the list of image filtration tasks (in the central part of the window), a set of tools to create, edit, configure, remove, start and stop tasks, and the panel on the right with detailed information about the currently selected image filtration task(s).

### 7.2. Creating new image filtration tasks


Each filtration task in Neat Image includes one input image and one customized set of filtration settings. To process many images you must create many image filtration tasks using the available methods:

#### To create one image filtration task

- Click  (the Add new task(s) button) in the toolbar and then select Add Image(s)... in the popup menu; or use the Task > Add Image(s)... item in the main menu.

Neat Image will then open the Select input image(s) dialog to let you select the input image to be processed. Select an image on the disk and click the Open button.


A new filtration task with the selected image will be created and added to the list of tasks. The left panel of the Neat Image window will also show the thumbnail of the added input image.

At this point you can proceed to work with this new task in a single-task manner (using the workflow described in the Filtration process details section, page 9; to do that just click  in the toolbar or click the Edit this task icon inside the thumbnail of the task in the left panel).

Instead of going to Editor to work with new task, you may also want to create more filtration tasks using the same procedure described above and later configure all created tasks all at once and let Neat Image process them all together. Or you can also create several more new filtration tasks in a more automated ways as described below.

## To create several image filtration tasks


### Method 1: select several images

- ➔ Click  (the Add new task(s) button) in the toolbar and then select Add Image(s)... in the popup menu; or use the Task > Add Image(s)... item in the main menu.

In the Select input image(s) dialog, select **several** images instead of one (you can hold the Shift or Ctrl key pressed to select multiple images) and then click the Open button.

A new filtration task will be created for every selected image. All newly created tasks will be added to the list in the All tasks tab. The left panel of the Neat Image window will also show thumbnails of the added input images. The settings of new tasks will be based on the Defaults specified in the Preferences.


### Method 2: select a folder with images

- ➔ Click  (the Add new task(s) button) in the toolbar and then select Add Folder... in the popup menu; or use the Task > Add Folder... item in the main menu.

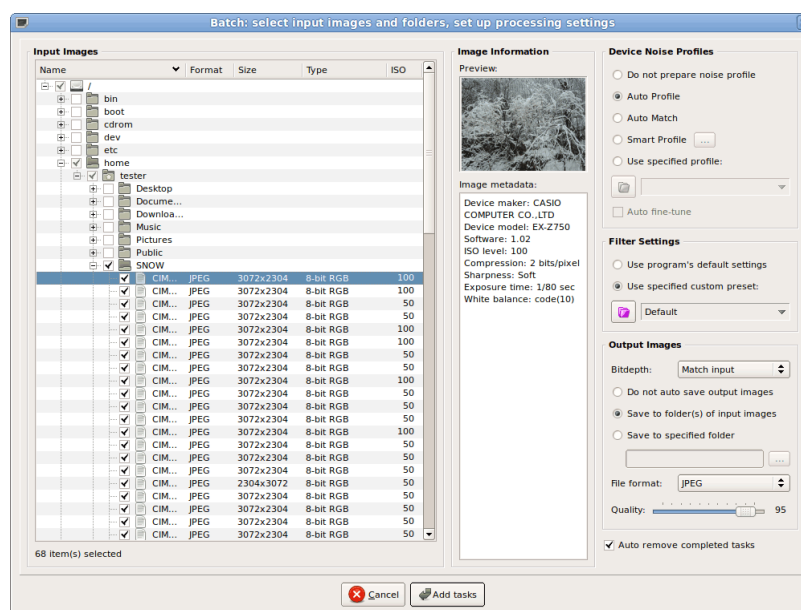
In the Browse For Folder dialog, specify the folder with images that you want to process and then click the OK button.

A new filtration task will be created for every image found in the specified folder and all its sub-folders. The new tasks will be added to the list in the All tasks tab. The left panel will also show thumbnails of the added input images. The settings of new tasks will be based on the Defaults specified in the Preferences.

### Method 3: select any combination of images and folders and customize task settings

- ➔ Click  (the Add new task(s) button) in the toolbar and then select Batch... in the popup menu; or use the Task > Batch... item in the main menu.

Neat Image will then open the Batch dialog to let you specify the input images, device noise profiles to be used, filter settings, output settings, etc.





- ➔ Locate the images to be processed using the browser in the Input Images box (left side of the dialog). Check boxes against individual image files to be processed and/or against folders with images (then

all images in checked folders and sub-folders will be selected for processing as well).

To check the boxes use the mouse or press the Space button on the keyboard.



When selecting individual images you can see their thumbnails and metadata in the Image Information box in the central part of the dialog window. Use that preview to select right images for processing.

- ➔ In the Device Noise Profiles box, specify how noise profiles should be prepared for the images selected in the Input Images box:
  - Do not prepare noise profile - to not automatically prepare any profile(s); do that later manually
  - Auto Profile - to automatically build a profile for each image
  - Auto Match - to find the best matching profile for every image
  - Smart Profile - to try both Auto Profile and Auto Match and select the best profile
  - Use specified profile - to use a specified profile for all images

When Use specified profile is selected, click  (blue folder) or the popup menu (click ) to specify the noise profile to be used.

When available, check the Auto fine-tune option to automatically fine-tune selected profile(s) during processing. When Auto profile image is selected auto fine-tuning is applied automatically.

- ➔ In the Filter Settings box, select the filter preset to process the images selected in the Input Images box:
  - Use program's default settings - to use the filter settings pre-programmed by default;
  - Use specified custom preset - to use a custom preset loaded from the disk.

When Use specified custom preset is selected, click  (pink folder) or the popup menu (click ) to select a filter preset to be used to process the selected images.

- ➔ In the Output Images box, specify the Bitdepth using the drop-down list. Select 8 bits per channel, 16 bits per channel, 32 bits per channel, or Match input. In the latter case, the output images will have the same bitdepth as the corresponding input images.

- ➔ Select the way the output image should be saved when filtration is finished:
  - Do not auto save output images - to not automatically save output images (save manually)
  - Save to folder(s) of input images - to automatically save the output images next to the input images
  - Save to specified folder - to automatically save the output images into one specified folder

When Save to specified folder is selected, select the folder using  (the Browse button).

- ➔ Select the output File format: JPEG, PNG or TIFF.  
When JPEG is selected, you can also adjust the JPEG Quality level (50-100; 100 is the highest for the best quality, 50 is the lowest for the smallest file size). With PNG, you can select the Compression level (0 is for the lowest compression and 9 is for the highest compression / smallest file size).
- ➔ Below the Output Images box, check Auto remove completed tasks if you want to automatically remove completed tasks from the list of the filtration tasks. This is only possible if Neat Image is instructed to automatically save the output images (otherwise the output images would be lost). Once the output images are saved, the tasks can be removed from the list.

- ➔ Click  to add new image filtration tasks to the task list in the All tasks tab.

Several new image filtration tasks will be created in the list.

Neat Image may then automatically start processing these new tasks, provided:

- (1) the tasks are ready for processing (contain valid input images and noise profiles) and
- (2) processing is not generally suspended.

Please see the Processing image filtration tasks section, page 37, for further workflow details.

#### Method 4: use drag and drop

- ➔ Drag one or several image files from another application (for example, from Konqueror) and drop

them in Neat Image window. Neat Image will automatically create new filtration tasks for each dropped file. The settings of new tasks will be based on the Defaults specified in the Preferences.

#### Method 5: use Open With command in Konqueror





- ➔ Select one or several image files in Konqueror, right click on them and use Open With > Neat Image. Neat Image will automatically create a new image filtration task for each selected image file. The settings of new tasks will be based on the Defaults specified in the Preferences.

## 7.3. Configuring image filtration tasks

You can change the parameters (such as noise profile, filter preset, etc.) of any filtration task available in the list of tasks. Usually, you will change some parameters during or after adding new tasks. For example, after adding some new tasks you may want to instruct Neat Image to use Auto Profile to prepare noise profiles for all these tasks. Or you may specify a fixed noise profile available on the disk. Or assign a specific custom filter preset to process all selected tasks. All that can be done directly in the All tasks tab using the controls available around the task list. Below you will find a description of all these controls. To use any of them to adjust parameters of one or several tasks, select some tasks in the list of tasks and then use the tools as described below.


### To assign a noise profile to selected task(s)

Select one or several tasks in the list of tasks and:

- ➔ Click  (the Auto Profile button) in the toolbar or use the Task > Auto Profile menu item to instruct Neat Image to use Auto Profile to automatically build a new noise profile for every selected task.
- ➔ Click  (blue folder) in the toolbar or use the Device noise profile popup menu in the Filtration Task box (or use the Task > Set Profile... menu item) to specify a noise profile to be used in all selected tasks.
- ➔ Click  (the Profile Matcher button) in the toolbar or use the Task > Match Profile menu item to automatically find and assign matching profiles to selected tasks.
- ➔ Click  (the Auto Fine-Tune button) in the toolbar or use the Task > Auto Fine-Tune menu item to make Neat Image automatically fine-tune the assigned noise profile to the input image for every selected task.


### To assign a filter preset to selected task(s)

Select one or several tasks in the list of tasks and:

- ➔ Click  (pink folder) in the toolbar or use the Filter preset popup menu in the Filtration Task box (or use the Task > Set Preset... menu item) to assign a filter preset to all selected tasks.

### To edit a selected task in Editor

Please note that you can do only most general changes to the tasks using the tools available in the All tasks tab. For example, you can assign a specific noise profile to a group of tasks. However, to do any more subtle modifications like manual profiling with some manual tuning of filter settings requires using the Editor. To do that simply select any task and open it in the Editor tab for detailed examination:

- ➔ Select a task in the list and click  (the Edit selected filtration task button) or use the Task > Edit... menu item.

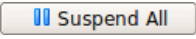
Neat Image will open the selected task in the Editor tab to let modify all details of the test: input image, device noise profile and filter settings. You can then use the tools and workflow described earlier (the Filtration process details section, page 9).

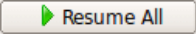
At any moment, you can switch back to the All tasks tab, select another task, apply any other changes, etc.



## 7.4. Processing image filtration tasks

As soon as you have created one or more filtration tasks, Neat Image will try to automatically process them, unless processing is manually suspended. You can control that using the buttons in the left bottom corner of the Neat Image window, right above the *All tasks* tab:

➔ Click the  (the Suspend All button) to suspend processing all tasks in the list.

➔ Click the  (the Resume All button) to resume processing all tasks in the list.

Not every task can be automatically processed though. To be processed automatically, a task must be configured, which means it should have an input image and noise profile specified. While an input image is almost always available, a noise profile may be in some cases not available. A newly created task may get a noise profile from the *Defaults* section of Neat Image Preferences (menu *Tools > Preferences > Defaults*), or you may specify it manually when creating or configuring the task.

If some of the tasks do not yet have any assigned noise profile (they show the status “profile not ready” in the *Profile* column in the list of tasks) you can assign a profile using one of the options described in the previous section (Configuring image filtration tasks, page 36).


As soon as a task is provided with a profile, it can be automatically processed and Neat Image will immediately try to do that. You will then see running progress indicators, changing statuses of profile, its quality, match level, output image, etc.

You can stop processing at any moment using the above *Suspend All* button and resume it later.

## 7.5. Saving output images

When an image filtration task is completed, Neat Image will try to automatically save the output image (if you instructed it to do so or if the *Output* settings in *Preferences* instruct it to save output images automatically). You can also save the output image manually, either from the *Editor* tab or directly from the *All tasks* tab. In the *All tasks* tab, you can save several output images at once.

### To automatically or manually save output image(s) of filtration task(s)

➔ Select one or several tasks (they do not need to be fully processed yet) and click  (the *Save output image as* button) in the toolbar or use the *Task > Save Output...* menu item.

Neat Image will open a dialog to let you specify how you want to save the output images of all selected tasks (when these output images will be ready, if they are not prepared yet).

Neat Image may ask about particular image saving properties, e.g., the JPEG compression level, about the folder where you want to save the output images.


In some cases, you can additionally select the option called *Auto remove completed tasks*. When that option is enabled, Neat Image will remove (meaning close) the tasks from the list of tasks after saving the output images to the disk. If it is not selected, you can later remove the completed tasks manually.

You can instruct Neat Image to always automatically save output images (use the menu *Tools > Preferences > Output > Auto save output images*). In this case, you will not have to manually save output images; Neat Image will do that for you automatically whenever possible.

## 7.6. Removing image filtration tasks

### To remove image filtration task(s) from the list

When you finished working with an image filtration task and saved the filtered output image to the disk, you may not need this task anymore and may want to remove it from the list of tasks.

➔ Select one or more filtration tasks in the list that you want to remove and click  (the *Remove selected filtration task* button) or use the *Task > Remove* menu item or just press the *Delete* button on the keyboard.

## 8. Preferences

There are several preferences that adjust the behavior of Neat Image standalone.

Use the Tools > Preferences... menu item to open the Preferences dialog box.

### 8.1. General preferences

#### Auto zoom to fit on image open

Check this option to make the image viewer automatically adjust zoom level to fit the image into the window.

#### Show hints over interface controls

This option switches on/off the hints. The hints are displayed when the mouse pointer is placed over any control in the Neat Image interface.

#### Show splash screen at startup

This controls whether the splash screen (the Neat Image logo) is displayed at the application startup.

### 8.2. Defaults

#### Default Device Noise Profile

There are several possible ways to assign a noise profile to a newly created image filtration task:

- Do not prepare noise profile automatically  
If this variant is selected then no device noise profile is loaded when a new task is created. You will have to manually assign or build a noise profile for the input image.
- Auto Profile  
If this variant is selected then a new profile is automatically built by analyzing the input image; This provides the most accurate noise analysis but takes a bit more time and may not always work (if the input image does not contain enough flat featureless areas for analysis).
- Auto Match  
If this variant is selected then the Auto Match function tries to select the most matching profile (matching the input image) from a pre-built set of profiles; This provides shorter overall processing times when pre-built noise profiles are available and can be matched against the input image (matching requires both profiles and images to contain EXIF metadata).
- Smart Profile (Auto Profile and Auto Match)  
If this variant is selected then Neat Image uses both Auto Profile and Auto Match to prepare two noise profiles and then selects the better of two resulting profiles. This provides higher overall quality at expense of slightly longer processing time. To be fully efficient, this option also needs a pre-built set of noise profiles (for Auto Match to work). You can configure the behavior of the Smart Profile function in the Smart Profile section of the Profiling tab.
- Use specified default profile  
If this variant is selected and a valid profile is specified then it is automatically loaded when a new image filtration task is created. Useful when all input images were produced by the same device working in the same or similar device modes.
- Auto fine-tune  
If this option is checked then Neat Image additionally fine-tunes the assigned noise profile by analyzing the input image.

This provides higher accuracy of resulting noise reduction when the input image contains flat featureless areas suitable for fine-tuning noise analysis.

## Default Filter Preset

There are two ways to assign a filter preset to a newly created image filtration task:

- Use program's default settings  
If this variant is selected then no custom preset is loaded from the hard drive when a new filtration task is created, instead Neat Image uses its pre-programmed default filter settings. You will still be able to manually assign a filter preset for the input image.
- Use specified custom preset  
If this variant is selected and a valid filter preset is specified then it is automatically loaded when a new task is created.  
This setting is useful when you want to apply filtration using the same custom filter settings to all input images.

## 8.3. Profiling preferences

### Save noise samples in profiles

Enable this option to make Neat Image save a noise sample from the analyzed image area into device noise profile (\*.dnp file). This will increase the size of the \*.dnp file but will also improve the compatibility with the future versions of the software (Neat Image will be able to re-build the profile using the saved noise sample).

### Show warnings about selected image area

Enable this option to let Neat Image display warnings about selected image area during profiling. For example, Neat Image may warn you about clipping or non-uniformity detected in the selected area, thus helping you select a better area for profiling.

## Smart Profile

Smart Profile is one of the possible ways to prepare a noise profile for an image filtration task. Smart Profile uses both Auto Profile and Auto Match (with Auto Fine-Tune) to prepare two candidate profiles and then selects the better of two profiles.

Use the settings in the Smart Profile box to configure the behavior of the Smart Profile function.

### Automatically select the best profile

Use this option to let Neat Image automatically decide which noise profile to use.

### Prefer profile prepared by Auto Profile

Let Neat Image preferably select the profile prepared by Auto Profile when it can find a good area for analysis in the input image. When the area is not very good then Neat Image will use the profile prepared by Auto Match with Auto Fine-Tune.

### Prefer profile prepared by Auto Match and Auto Fine-Tune

Let Neat Image preferably select the profile prepared by Auto Match when it can find a matching profile among the pre-built noise profiles, even when Auto Profile provides a good profile as well.

## 8.4. Matching preferences

### 8.4.1. Profile Matching

Use profile matching preferences to adjust the way Neat Image matches noise profiles to input images.

#### Look for noise profiles in the following folder:

If you select this option then Neat Image will look for matching noise profiles in the specified folder. If you have several sub-folders with profiles, select the topmost folder of all those subfolders to let Neat Image search in all of them.

By default, the folder used to store profiles (see the **Folders > Profile folder** setting in the same Preferences window) is used for matching. You can use any other (sub-)folder for profile matching as well.

#### Look for noise profiles in folders of input images

If this option is selected then Neat Image will look for matching profiles in the folders of the input images. If you put desired noise profile to a folder with input images and select this option then Neat Image will select this profile for every image from that folder. If there are several profiles in such a folder then the best matching will be selected for every input image.

#### Matching parameters priorities

To automatically match profiles for the input image, Neat Image compares the device parameters of the input image and candidate profiles selected from the folder specified by the above options. Different parameters usually have to be matched with different priorities. Using **Matching parameters priorities** controls, you can select the priorities of such parameters as Input device, ISO rate, Compression, Resolution, Sharpness, Exposure:

- Match – the parameter should match exactly;
- High – it is highly important that the parameter is very close or matches exactly;
- Low – it is preferable that the parameter is close or matches exactly;
- Ignore – the parameter is not important at all.

## 8.5. Filtration preferences

### Main window

**Auto restore on finish** is to restore the application window (if it was minimized during processing) when all filtration tasks are done.

### Processing priority

Use this option to adjust the priority to the Neat Image filtration process running in a multitasking environment:

- Idle – lowest priority; filtration gives way to other applications when necessary;
- Below – priority below normal; provides the smoothest performance for all applications; this may slow down Neat Image a bit, but will allow you to work normally with other applications, especially if the computer is slow;
- Normal – normal priority; filtration may somewhat slow down other applications.

## 8.6. Performance preferences

The first group of settings in this tab selects the computing devices to be used for image processing. This group of settings is optional, it is shown only if at least one supported GPU (graphic processing unit) is available along with the regular CPU (central processing unit, or processor). This group includes the following items:

## Use CPU only

This option makes Neat Image perform all image processing using only CPU.

## Use GPU only

This option makes Neat Image perform all image processing using only GPU.

## Use CPU and GPU

If you select this option then Neat Image will process images using both CPU and GPU.

Depending on individual performance of each computing device (CPU and GPU), each of the above options may be the most efficient. You can try different settings and measure the resulting speed using the Benchmark tool below.

## CPU

### Number of used cores

This option adjusts the number of CPU cores used by Neat Image for processing. The number of used cores can go up to the total number of cores in all CPUs in your computer (like 2 cores in Core Duo, 4 cores in Core Quad, 8 cores in a desktop version of i7 with enabled hyperthreading, etc.). If the computer includes two physical CPUs then the number of cores is correspondingly higher. Ideally, using all cores should provide the best overall performance. In some cases however, processing speed may be even higher if fewer cores are used (especially on CPUs with hyperthreading). For example, using fewer than all 8 virtual cores in i7 is in some cases faster, so you may want to test different values of this setting.

## GPU

In this box, you can specify which of the available computation-capable GPU devices (CUDA-capable NVIDIA cards and/or supported OpenCL-capable AMD/ATI cards) should be used for image processing (in addition to CPU or instead of CPU). When you have one or more GPUs, you can allow Neat Image to use it and specify how much GPU memory may be used for Neat Image's image processing. When you also have other software using the GPU, you may want to reserve only a part of the GPU memory for Neat Image and leave the rest free for other purposes. In any case, you can try different values and see which setting gives the best results.

## Benchmark

Use the **Benchmark** button to measure the image processing speed with the current settings specified in the CPU and GPU boxes.

## Optimize

Use the **Optimize...** button to open a specialized dialog designed to measure image processing speeds achieved with different combinations of the CPU and GPU settings. It allows to automatically benchmark all possible combinations of settings and to identify the best combination. This is the easiest way to optimize the performance of Neat Image for specific CPU and GPU hardware.

## 8.7. Folders preferences

### Profile folder

Select the folder where Neat Image must look for device noise profiles. This should be the topmost folder of all the (sub)folders with device noise profiles. Neat Image will display all profiles (stored in all subfolders of the specified folder) in the popup menu in the **Device noise profile** panel of the application window and in other parts of Neat Image.

By default, the Profile folder is located in your **Documents** folder:  
*/home/<username>/Documents/Neat Image Standalone/Profiles/*

You can select another location to store and use your Neat Image profiles if you prefer.

## Preset folder

Select the folder where Neat Image must look for filter presets. This should be the topmost folder of all the (sub)folders with filter presets. Neat Image will display all presets (stored in all subfolders of the specified folder) in the popup menu in the *Filter Settings* panel of the application window and in other parts of Neat Image.

By default, the *Preset folder* is located in your *Documents* folder:  
*/home/<username>/Documents/Neat Image Standalone/Presets/*

You can select another location to store and use your Neat Image presets if you prefer.

## Temporary folder

Select the folder that Neat Image must use to store its temporary files.

# 8.8. Output preferences

## 8.8.1. Save Settings

### Allow overwriting existing image files

Enable this option to allow Neat Image overwrite existing image files when output images are auto saved by the application (for example, when Neat Image automatically processes multiple images).

### Preserve image metadata in output image files (when possible)

Enable this option to make Neat Image preserve the EXIF, IPTC and other metadata by copying these from the input to output images. Note that copying the metadata to the output image is not always possible. This depends on both input and output file types used and on type of metadata as well. The EXIF data are copied with the following combinations of input and output file types: JPEG->JPEG, JPEG->TIFF, TIFF->TIFF, and TIFF->JPEG. The IPTC data are copied with the following combinations: JPEG->JPEG and TIFF->TIFF.

### Preserve original timestamp in output image files

Enable this option to make Neat Image preserve the original image's file timestamp (the date and time when the image file was created and/or modified) by copying it from the input to the output image file. This will keep the output images in the same relative order as the input images when sorted by date and time.

## Output bitdepth

This option controls the bitdepth of the images processed by the filter. For example, if the input image has 8 bits per channel and the output bitdepth is selected to be 16 bits per channel, then the input image will be converted to 16-bit representation, processed with the filter, and the output image will be 16-bit. If 'Match input' is selected then the output bitdepth will match the input bitdepth.

## Output file name suffix

Select the suffix added to the output image file name by default (to differentiate processed images from originals). Note that the suffix can be empty only if the *Allow overwriting existing image files* option is enabled (see above).



## Auto save output images

Enable this setting to let Neat Image automatically save output images when they are ready.

## Save filtered images to

### Folder(s) of input images

Enable this option to save each output image beside the corresponding input image.

### Specified folder

Enable this option and specify a folder to make Neat Image save all output images to that folder.

## Output file format

### Format

Select the output file format to be used by default when the output image is saved by Neat Image.

### Quality / Compression

Select the JPEG quality level (or PNG compression level) to be used by default when the output image is saved by Neat Image in the JPEG (or PNG) format.

### Auto remove completed tasks

Enable this option to automatically remove from the list of tasks (or close) image filtration tasks that have been fully processed and saved.

### Use settings above to save output images (do not ask every time)

Enable this option to make Neat Image automatically save output images using the settings from this tab. Neat Image will then silently save output images without opening the Save Settings dialog for every image. In this way you can set the desired output settings once here and not be asked to adjust them each time you save an output image.

## 9. Command line version of Neat Image

Besides the GUI (graphical user interface) version of Neat Image, there is also a separate command line (CL) version. It can also build noise profiles and filter one or more images.

To see how to use the command line version of Neat Image, open Terminal and execute the following command:

***NeatImageCL***

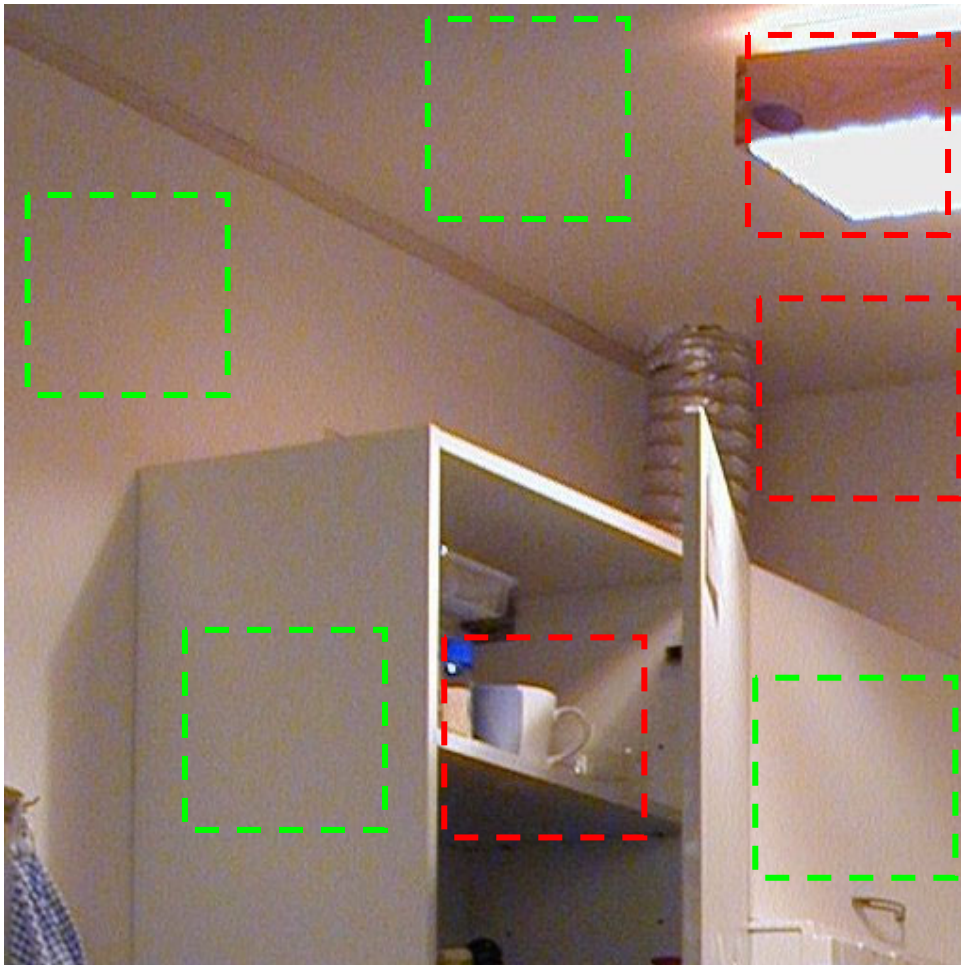
This will display the description of command line format of the CL version. Use the description to formulate new commands for the CL version.

Please note that the CL version of Neat Image uses the settings specified in the Preferences of the GUI version. Therefore, if you want to adjust any of those settings please start the GUI version, adjust the settings and apply, close the GUI version, and then use the CL version.

## 10.Examples

### 10.1.Images to build a noise profile

The image below contains examples of areas that are “good” and “bad” from the standpoint of profiling. Here, “good” image areas are highlighted in green, these should be at least 32x32 pixels large, preferably more than 128x128 pixels; “bad” ones are highlighted in red. If the input image you have does contain similar ‘good’ flat featureless noise-only areas as shown in the example then you can be sure that automatic profiling will produce an accurate noise profile. However if there are no such flat featureless areas in the input image, then automatic profiling will not work well with the image because building a profile using an area with details produces an inaccurate profile that will then lead to very inaccurate filtration. In such a case, you have to use either an alternative image with flat featureless areas or to use the Calibration Target to produce test images with flat featureless areas.

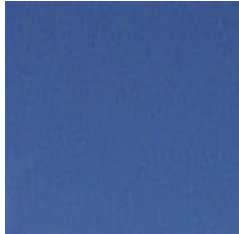


Additional comments regarding the “good” and “bad” areas in this example are available on the next page.

These image areas are good to build device noise profiles, as they contain no visible details:



– **GOOD**, because this area contains no important details



– **GOOD**, no important details (this area is from another image)

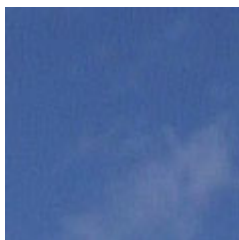
Examples of “bad” areas that contain visible details:



– **NOT RECOMMENDED**, because this area contains a detail: corner – junction of wall and ceiling



– **UNACCEPTABLE**, because this area contains many details



– **NOT RECOMMENDED**, because this area contains some details: clouds (this area is from another image)

See more examples of building noise profiles on the Neat Image web page:

<http://www.neatimage.com/linux/standalone/profiling.html>

## 10.2. Filtration results

Here are some examples of Neat Image performance.



This is a small portion of a digital photo taken with a compact digital camera. The original image contains easily visible noise. In this case, the source of noise is the camera's image sensor (CCD) working in high ISO mode.



This image was also taken with a digital camera. Along with the strong high ISO noise, there is an image degradation caused by the JPEG compression. Even though Neat Image tries to do its best to clean up such images, please avoid using strong JPEG compression.

See more filtration examples in the Neat Image web page:  
<http://www.neatimage.com/linux/standalone/examples.html>

# 11. Questions and answers

## 11.1. General questions

**Q What is the difference between Demo, Home and Pro editions of Neat Image?**

**A** The Demo edition of Neat Image has some of the functionality disabled. In particular, it does not save images in TIFF and PNG formats and does not copy output image to the clipboard (the Demo edition only saves images in JPEG with fixed quality). Non-Demo editions do not have those limitations. Please see the Detailed feature map, page 50, for more details.

**Q Should I uninstall Demo prior to installing Home / Pro edition?**

**A** That is not necessary. The Home / Pro edition can be installed over the Demo edition.

**Q Should I uninstall the older version of Neat Image prior to installing a newer one?**

**A** Usually that is not necessary. A newer version can be installed over the older one; it will replace the old version.

**Q I think I have found a bug. How can I submit a bug report?**

**A** Please use the online bug report form ( <http://www.neatimage.com/linux/standalone/brf.html> ) to let us know all the details necessary to reproduce the problem.

See more information about bugs in the Issues and bugs subsection, page 49, and about bug fixes in the **WhatsNew.txt** file supplied with the software – use the Help > What's New menu item to open that file (also see the history section on the Neat Image web page for the most up to date information: <http://www.neatimage.com/linux/standalone/history.html> ).

**Q What about batch processing?**

**A** Neat Image supports batch processing. Please see the Batch processing section, page 33.

## 11.2. Filtration-related questions

**Q Why do I receive some crystal-like artifacts in the filtered image?**

**A** Presence of many residual noise elements is usually a consequence of using a poorly built noise profile or a profile built for another device and/or device mode.  
The crystal-like artifacts (usually these are the residual JPEG compression artifacts) look like thin lines in the filtered image. They can be easily eliminated by increasing the high frequency noise level in the filter settings.

**Q Filtered image looks 'plastic'. Why?**

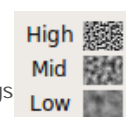
**A** The reason is that too much filtration was applied. Let Neat Image keep some noise to produce natural-looking results. Adjust the noise reduction amounts; for example, reduce the noise reduction amount in the luminance (Y) channel to 50-70%. Also, make sure the device noise profile does match the input image. Using an incorrectly chosen or poorly built profile can either produce plastic-looking results or leave residual artifacts (see the previous question).

**Q What is frequency?**

**A** The term (spatial) *frequency* is used in Neat Image to denote image elements (both important details and noise) of certain size.

*High frequency* corresponds to image elements of smallest size. *Medium (mid) frequency* corresponds to elements of medium size. *Low frequency* corresponds to image elements of (relatively) large size.

For reference, see the noise samples of different frequencies in the Noise Filter Settings tab of the Filtration Task Editor.



**Q The filtration process is not very fast, is this normal?**

- A** This is normal, because the filtration algorithm is quite complex. We work on further optimization to provide better performance.

**Q Is the input image automatically changed according to the profile that is being opened?**

- A** The input image is NEVER changed. Neat Image always creates a new output image, which contains the filtration results. The output image can be saved to any file.

**Q How to filter only the color noise (not the brightness noise)?**

- A** Set the value of the luminance (Y) channel noise reduction amount to 0%. This will disable filtration in the luminance (brightness) channel.

**Q What is YCrCb?**

- A** YCrCb is the name of a family of color spaces widely used in digital imaging, television, image compression (e.g., the JPEG compression transform RGB images into the YCrCb space to efficiently compress image data), etc. In 'YCrCb', 'Y' corresponds to the luminance channel, 'Cr' - to the Cr chrominance channel covering the red to blue-green color range, 'Cb' - to the Cb chrominance channel covering the blue to yellow color range. Because this space enables easy separation of the luminance and chrominance information, it is very suitable to conduct noise reduction.

**Q Is processing via Neat Image best done before or after any other processing (i.e. tonal/color correction)?**

- A** Such operations as tonal/color correction are quite conservative from the standpoint of noise, i.e., they do not significantly change the noise characteristics of the image. Therefore, filtering before or after is about the same as long as the noise profile is built and applied at the same stage of image processing. For example, do not use a device noise profile built with an unprocessed (with the color correction not yet applied) image to filter a processed image.

Some digital cameras apply some color correction internally. Other cameras allow access to unprocessed RAW data. Neat Image is a generic filter, which can be applied in both cases. The only requirement is to build and use a noise profile in the same point of the post-processing workflow.

On the other hand, image sharpening applied to a noisy image makes it much noisier. It is best to apply Neat Image filtration before sharpening. However, the sharpening and noise filters of Neat Image itself can be used together because Neat Image's sharpening is applied AFTER its noise filtration.

If you are not sure, try to use Neat Image as close to the source of the input image as possible.



## 12. Tips and tricks

### 12.1. Preventing banding

In some cases, the banding effect may appear when applying the noise filter to images with faint brightness gradients. This effect is quite rare for normal images, especially when viewed on a true color display.

To avoid banding, try to reduce the noise reduction amount for the high frequency component to 50%.

Another option is to process the image in higher bitdepth.

### 12.2. Filtration of shadow areas

In some situations, it is preferable to filter only the shadow areas of images leaving bright areas intact. You can do this with the standalone Neat Image by using the noise profile equalizer to limit or stop filtration of bright image areas.

The graph nodes in the noise profile equalizer correspond to particular ranges of brightness (individually for each color channel) of the RGB color space. The position of each node reflects the noise level in the corresponding range of brightness. So, the lower a node, the less filtration will eventually be applied to image elements that belong to the corresponding range of brightness.

Therefore, to filter only shadows you can manually move all the 'bright' nodes down (refer to the gradients in the bottom of the noise profile equalizer to see which brightness level they correspond to). For example, move down all but the three 'darkest' nodes in each RGB channel.

Using this method, you can effectively prevent filtration of the bright image areas.

### 12.3. Partial filtration

Some images contain both noisy and clean areas and it may be preferable to filter only noisy areas. This can be manually done by combining two images – original and filtered one – in an image editor. For example, the following steps can be used:

1. Filter the input image in Neat Image (so that noisy areas are cleaned) and save the output image to a new file;
2. Open this new file in your image editor;
3. Place the filtered image in a new layer on top of the original image;
4. Adjust the transparency of the top layer so that noisy areas look fine;
5. Select and delete the areas of the top layer where filtration is not necessary or excessive (you may want to use the eraser tool with adjustable transparency and shape).

## 13. Information

### 13.1. Issues and bugs

We try to keep Neat Image as free of bugs as possible. Please report any bugs or issues (even those already reported before) you encounter while working with Neat Image. Use the online bug report form on the Neat Image web page: <http://www.neatimage.com/linux/standalone/brf.html>. Your feedback will greatly help us to improve the software and provide you with even better versions of Neat Image.

### 13.2. Plans

The current version of Neat Image is the result of our ongoing research on noise filtration. We continue to work on the core noise reduction algorithms to improve the quality and speed of noise reduction.

Please let us know if you have ideas that can make Neat Image better. Participate in the discussion on the Neat Image community forum, express your opinion, make suggestions, and ask questions. The more people that ask for a feature the more likely it is that it will be implemented.

## 13.3. Detailed feature map

Features			Edition		
			Demo	Home	Pro
Image processing	8 bits/channel (24-bit RGB, 8-bit Grayscale)		+		
	16 bits/channel (48-bit RGB, 16-bit Grayscale)		–		+
	32 bits/channel (96-bit RGB, 32-bit Grayscale)		–		+
Workflow	Standalone version of the filter		+		
	Maximum batch size		10	100	unlimited
	Command line support in GUI version		–	+	
	Command line version		+	+	
	JPEG	8 bits/channel	+/+ <sup>1</sup>	+/+	
	TIFF: single image, no layers, no alpha channel, no mask	8 bits/channel	+/- <sup>2</sup>	+/+	
		16 / 32 bits/channel	+/-	+/-	+/+
	PNG	8 bits/channel	+/-	+/+	
		16 bits/channel	+/-	+/-	+/+
	Clipboard	8 bits/channel	+/-	+/+	
	Drag and drop		–	+	
	Preserving image EXIF data in processed files <sup>3</sup>		–	+	
Device noise profiles	Automatic profiling of cameras and scanners		+		
	Manual profiling of any imaging devices		+		
	Automatic matching profiles to input images		+		
Noise reduction	Channel-wise (Y, Cr, Cb)		+		
	Frequency-wise (High, Mid, Low, Very low)		+		
Smart sharpening	Channel-wise (Y, Cr, Cb)		+		
	Frequency-wise (High, Mid, Low)		+		
Filter presets (reusable filter settings)			+		

## 13.4. Contacts

We really appreciate your opinion of Neat Image. Please let us know what you think about our software. Feel free to ask questions regarding Neat Image. To share your opinion or to receive support regarding Neat Image, use any of the following means:

### E-mails

- [info@neatimage.com](mailto:info@neatimage.com) — for general inquiries
- [standalone-lin@neatimage.com](mailto:standalone-lin@neatimage.com) — for any inquiries regarding use of Neat Image standalone
- [sales@neatimage.com](mailto:sales@neatimage.com) — for any inquiries regarding purchase of Neat Image software

### Community Forum

Register in Neat Image community forum ( <http://www.neatimage.net/forum/> ), and participate in discussions on the use and development of Neat Image. Such topics are covered in the forum as:

- announcements of new and updated versions of the software;
- questions about use of Neat Image;
- examples of Neat Image performance with comments and suggestions;
- feedback from the users: suggestions of new features and improvements;
- polls: what OS, processor, camera types are used with Neat Image;
- contacts and general comments.

### Web page

<http://www.neatimage.com/linux/standalone/>

<sup>1</sup> The JPEG compression level is set to a fixed high quality value in Demo edition.

<sup>2</sup> Here, +/- means input is supported and output is not.

<sup>3</sup> Whenever possible. Please see "Preserve image metadata in output image files" in page 42 for more details.

## 13.5. Legal information

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### Distribution

Neat Image Demo edition may be distributed unmodified provided any charge is to cover distribution costs only.

Neat Image Demo edition may be placed on magazine CDs as long as the Neat Image team is informed.

## 13.6. Registration

To become a registered user and to get a fully functional edition of Neat Image standalone (Home or Pro edition) you have to purchase a Neat Image license (a single- or multi-user license). You can purchase a license online. Please find the detailed information in the purchase section of the Neat Image web page: <http://www.neatimage.com/linux/standalone/purchase.html>

After you have purchased a Neat Image license, you receive an e-mail from the Neat Image team with detailed download and registration instructions. These instructions will help you download and become

a registered user of the Neat Image software.

By becoming a registered user of Neat Image you will:

- Encourage the authors to further develop and improve Neat Image;
- Get access to all functions of Neat Image that are disabled in the Demo edition (see the Detailed feature map, page 50);
- Be able to use Neat Image for commercial and other purposes;
- Get free updates of the software (minor modifications with the same major version number, for example, updates from the current version to any v7.x);
- Enjoy reduced upgrade prices for new major future modifications of Neat Image or will get a free upgrade;
- Receive the priority support from Neat Image support group;
- Receive the priority attention of Neat Image development group (tell us what you want to see in the next version).

#### Message from the Neat Image team

By becoming a registered user you are helping us to further develop and improve the software.

**Become a registered user and we will make Neat Image better for you!**

## 13.7.Acknowledgments

Neat Image utilizes the IJG JPEG library developed by the Independent JPEG Group.

Neat Image utilizes the openTIFF library developed by George Sotak.

Neat Image utilizes the zlib library developed by Jean-loup Gailly and Mark Adler.

Neat Image utilizes the libpng library developed by Glenn Randers-Pehrson.

Thank you to all the users who contribute by proposing improvements and new features.

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Image wouldn't be Neat without all of you!

*Neat Image team, ABSOft*

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