

# FaceDisplay QuickGuide

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## Brief overview

FaceDisplay is a part of software implementation accompanying my thesis: Artificial neural networks and their application for 3D-data processing. It is focused on processing of 3D face scans. Two artificially created accompanying models are available. FaceDisplay allows you to train the implemented neural networks on face models. It also provides possibility to classify the face with pre-trained convolutional neural networks (using the accompanying external tools).

## Requirements

This program requires a computer with Microsoft Windows XP/Vista/7 installed. The other software requirements are:

- .NET Framework 4
- OpenGL
- Pythonxy 2.7.2.1 (<http://code.google.com/p/pythonxy/>)
  - you may use Pip 1.0.2 to install additional packages (like Theano)
  - Python 2.7.2
  - Numpy 1.6.1
  - Scipy 0.9.0.1
  - Mingw 4.5.2.1 – set up the *PATH* variable to point to directory with *g++.exe*
  - Theano package, version 0.5.0 (<http://deeplearning.net/software/theano/>)

## Installation

To install the program, simply unzip it into location, where you have writing permissions.

## Usage

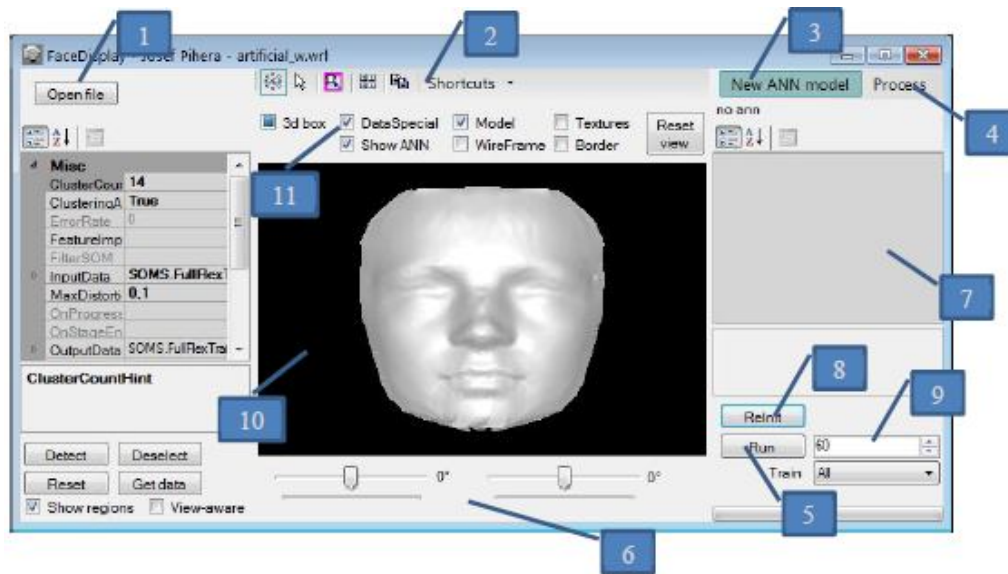
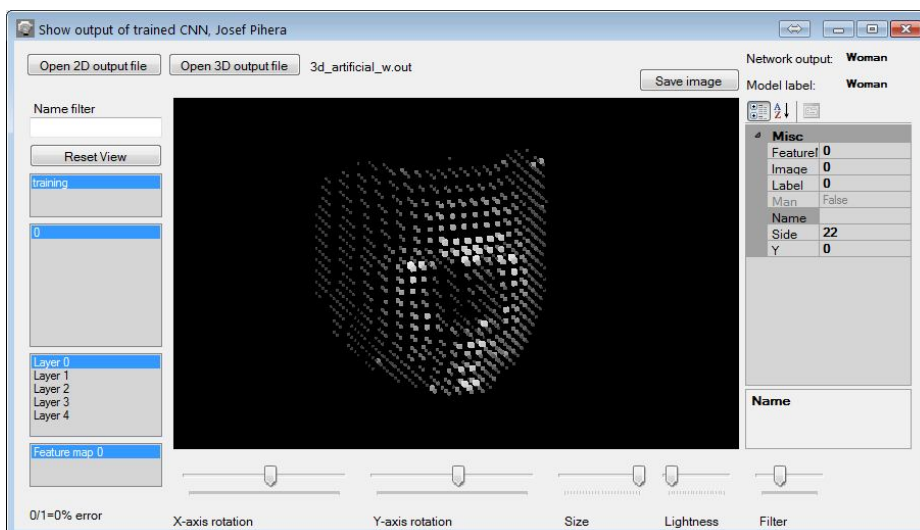


Fig. I FaceDisplay application window

There are few basic controls and many more extending controls at your disposal. You can see the basic ones numbered in Fig. I. We will now refer to those controls by the corresponding numbers.

The fastest way to use the tool needs no more than controls (1) and (2). (1) is an 'Open file' button to load the face model. However, if the face model 'artificial\_w' is present in the 'data' subdirectory, the model is loaded by default. (2) is a menu with shortcuts for user convenience. If you just want to try the functionality (and the Python environment is installed and configured), use the items whose name ends with 'demo'. You will be asked to select a network model, but it is best to just click 'Run' and use the pre-defined selection. After a while, you should be presented with output.

If you chose a 2D experiment, your web browser should open up with results for the CNN model. For a 3D experiment, the ShowLenetOutput tool will show you the results, as in Fig. I. Use the track-bars at the bottom of the window to alter the view at selected feature map. Especially useful is the 'Filter', which enables you to remove grey boxes which represent low output values. To switch to another feature map, use the list-boxes on the left side. You can see the actual output (woman/man) of the network and also the label of the model in the upper right corner.



1. Fig. I Output for the 3D test, ShowLenetOutput tool

We will now address the rest of controls in the window of FaceDisplay application, as you can see them in Fig. I.

To rotate the view, you can use track-bars at the bottom (6). You can also use mouse in the view area (10) to manipulate the view, try holding left/right mouse button and moving the mouse.

If you want to train some (self-organizing) neural network model on the displayed face, use the menu (3). When the model is created, some items appear in the pane (7). You can train your model by clicking button 'Run' (5). 'Run' does not start with clear model, it continues from the current state and performs limited number of steps – to change the number, use (9). To clear the model state and start from the beginning, use the control (8).

If you want to classify the result in 2D, adjust the settings first – use the corresponding shortcut '2D image settings' in menu (2). Then use the 'Run 2D test' menu item in 'Process' menu (4).

To run a 3D test, you must generate grey boxes – use '3D boxes directly' from the 'Process' menu (4), or train a network, as was described above, and make sure that 'DataSpecial' is checked (11). You should see the grey boxes displayed in (10). Then run the 3D test from the 'Process' menu (4).

It should be noted that two artificially created models in 'data' directory were not used for training. Therefore, they constitute completely new input samples for the CNN and ND-CNN models.