# EyeDentity v1.3.4

**Technical Sheet**

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# **Table of Contents**

# 1  Product description

The software EyeDentity is a desktop application, which serves for automatic searching of digital image data for the purpose of localization, identification and verification of persons. The application processes images and videos in various formats, resolution and quality, it detects faces in them and applies advanced recognition functions.

This software enables above all:

- localize the faces in video files and photographs

- estimate age and gender of detected person

- identify faces from the input data with the faces in the internal person database

- search for the faces from the internal person database in the input data

The part of the software is a SQL database containing the images and identification data of the persons of interest. The software contains the user interface for data administration of the database. The user can add and remove the persons, edit identification data and notes, add and remove the attached pictures.

The analytical core of the system is based on the advanced recognition algorithms, which are created using the statistical methods of the automatic learning on large training sets. It is necessary to assess the quality of the detection and recognition features on the basis of the statistical evaluation of the larger number of samples.

# 2 Hardware requirements

## 2.1 Minimal requirements

- Processor: Intel® Core™ i5, 2 cores (4 logical processors)
- RAM: 16 GB
- Hard disk: 256 GB (optional SSD)
- Operating system: Microsoft Windows 10, 64b

## 2.2 Recommended requirements

- Processor: Intel® Core™ i7, 4 cores (8 logical processors)
- RAM: 16 GB
- Hard disk: 512 GB, SSD
- GPU (optional): NVIDIA® GeForce® GTX 1050 Ti, 4GB GDDR5
- Operating system: Microsoft Windows 10, 64b

## 2.3 Advanced requirements

- Processor: Intel® Core™ i7, 6 cores (12 logical processors)
- RAM: 32 GB
- Hard disk: 1 TB, SSD
- GPU: NVIDIA GeForce GTX 1060, 6GB GGDR5
  Optional: NVIDIA® GeForce® GTX 1080 Ti, 11GB GDDR5X
- Operating system: Microsoft Windows 10, 64b

# 3  Input files

EyeDentity's input includes pictures or videos in various data formats.

## 3.1  Images

Supported image formats are:

- JPG, JPEG, JPE, JP2
- PNG
- BMP
- TIFF, TIF
- GIF

Images can be processed and evaluated individually or by folders.

The size of the image being processed is not limited by the program; for large photos, processing takes a longer time. We recommend analyzing images up to resolution of about 20 Mpx.

## 3.2  Videos

The program supports following video formats:

- AVI
- MPG
- MP4
- MOV

A prerequisite is the use of ffmpeg video codecs.

Input video resolution and length are not limited but have an impact on processing time. We recommend analyzing videos not exceeding about 10 minutes in length.

## 3.3  Input file processing

The processing time depends on the length and resolution of the input video, or the number and size of the input photographs, the total number of the faces contained, and the performance of the computer. The most time-consuming operation, which runs during processing, is the face descriptor calculation. For one face, calculation on an ordinary PC takes several hundred milliseconds on CPU or units to tens of milliseconds on GPU (processing time depends on available computation power).

The result of the input data processing is the so-called tracks containing the person's face with the corresponding descriptor. For tracks that contain frontal faces, the application performs an estimate of the detected person's gender and age. To get the highest possible recognition accuracy, several rules described in the following paragraphs must be respected during the face input image data collection.

### 3.3.1  Face in the scene

The face position in the photograph or video should be as frontal as possible (lateral rotation

should not exceed 15° in yaw axis) and should not be even partially covered by other people or objects. For optimal results, it is recommended to place the camera at the face height of the subject or a little higher (at a height of 2 - 2.5 meters). The scene should be illuminated by frontal diffused light.
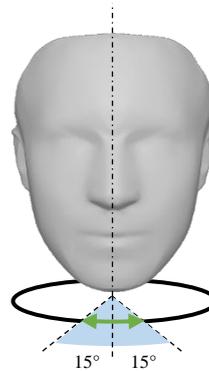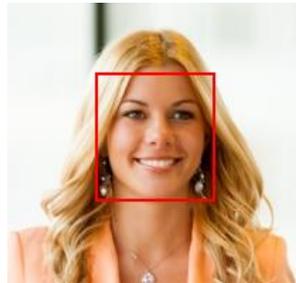


### 3.3.2 Blurred image

The face in the input image must not be blurred by motion or by wrong camera settings. All details on the face must be clearly visible for successful recognition.



**WRONG:**
Wrong camera settings and fast motion causes that the face is blurred.

**CORRECT:**
Image of the face is very sharp, and all parts of the face are clearly visible.

### 3.3.3 Image/video compression

The most common way to save the bandwidth and storage space during the image data transferring and storage is to use the lossy compression, the disadvantage is that the image artifacts occur. The face recognition engine requires the images of the faces to be sharp and without the compression artifacts as much as possible. The higher the compression is the more artifacts occur and the accuracy of the system is lower.
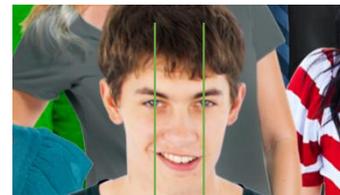
**WRONG:**
The lossy compression of this image is too high, with a significant number of clearly visible artifacts on the face.

**CORRECT:**
Image is sharp, and colors are clear. Image of the face does not contain any compression artifacts.

### 3.3.4 Resolution

The image resolution and recommended face size should be such that the distance of the center of the subject's eyes is at least 60 pixels. The application can analyze faces with an interocular distance of 15 pixels, but success rate is limited in this case.



60 pixels at least

### 3.3.5 Pixel aspect ratio

Pixel aspect ratio of the input image is required to be 1:1. Other aspect ratios are not supported.



**WRONG:**
Pixel aspect ratio is not 1:1, the face in the image is deformed.

**CORRECT:**
Pixel aspect ratio is 1:1.

# 4  Person database

The application can be connected to PostgreSQL or Microsoft SQL Server database.

The following data are recorded in the person database: One or more images, Name, Surname, UID, Age, Gender, Birth date, Birth place, Personal No., ID card number, Nationality, Address, Wanted, Height, Body, Hair color, Hair shape, Eye color, Note.

The application contains a user-friendly graphical user interface for browsing the database of persons including filtering, adding and removing records and editing them. In addition, it also allows bulk import and export of persons into a file.

The application can handle a database containing up to several thousand persons.

# 5  Matching with the database

The result of matching a detected track with a person database record is a score, a decimal number between 0 and 1, where 1 represents absolute match. By default, the application performs matching of all tracks with all database records. However, it is possible to select just a certain subset of specific tracks and/or database persons of interest to be compared. Appropriate narrowing of the selection affects the comparison speed accordingly.

The matching results for the selected face are sorted by the achieved score. Optionally, the threshold for the minimum score for which results are displayed can be changed.

The results can be saved to a file. The application also allows to assign a track to a person from the database.

# 6 Performance

## 6.1 Input file processing

The following table summarizes the average processing time of the input file depending on the selected test suite and processing unit:

1) CPU – processor Intel® Core™ i5-7500 @ 3.40 GHz, 16 GB RAM

2) GPU – graphical card NVIDIA® GeForce® GTX 1050 Ti, 4GB GDDR5

| Input file | | Input file processing time | |
|---|---|---|---|
| Parameters | Tracks | CPU [s] | GPU [s] |
| Video 20 s, 1280 x 720 px, 30 FPS | 13 | 63,1 | 21,5 |
| Video 20 s, 1920 x 1080 px, 30 FPS | 13 | 78,9 | 42,4 |
| Video 622 s, 1280 x 720 px, 30 FPS | 653 | 1369,3 | 436,6 |
| Folder, 303 images 2 Mpx (1920 x 1080 px) | 441 | 90,4 | 84,0 |
| Image 17 Mpx (5184 x 3426 px) | 2 | 2,3 | 2,1 |
| Image 17 Mpx (5184 x 3456 px) | 24 | 8,1 | 7,0 |
| Image 17 Mpx (5144 x 3426 px) | 267 | 72,5 | 61,7 |

Note: FPS = frames per second

## 6.2 Matching with database

The following table summarizes the average time of comparing the detected tracks in the input file with the person database depending on their number. CPU mentioned in the previous chapter was used.

| Source type | Tracks | Persons in database | Pairs matched | Matching time [s] |
|---|---|---|---|---|
| Image | 267 | 1600 | 427200 | 3,4 |
| Image | 441 | 1000 | 441000 | 3,4 |
| Image | 441 | 1600 | 705600 | 4,3 |
| Video | 13 | 1600 | 1169600 | 2,3 |
| Video | 570 | 200 | 2801600 | 3,6 |
| Video | 570 | 1000 | 14008000 | 5,8 |
| Video | 570 | 1600 | 23164800 | 8,1 |

Note: In the case of a video, one person's track usually consists of multiple consecutive shots. In fact, all these individual images are compared with the database records.

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