NEUROtechnology

Face identification for PC or Web solutions

VeriLook SDK

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Face identification for PC or Web solutions

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VeriLook facial identification technology is intended for biometric systems developers and integrators. The technology assures system performance and reliability with live face detection, simultaneous multiple face recognition and fast face matching in 1-to-1 and 1-to-many modes.

VeriLook is available as a software development kit that allows development of PC- and Web-based solutions on Microsoft Windows, Linux and Mac OS X platforms.

- More than a million algorithm deployments worldwide.
- Live face detection prevents cheating with a photo in front of a camera.
- Simultaneous multiple face processing in live video and still images.
- Webcams or other low cost cameras are suitable for obtaining face images.
- Available as multiplatform SDK that supports multiple programming languages.
- Surveillance SDK is available for integrating face identification into surveillance systems.
- Reasonable prices, flexible licensing and free customer support.

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VeriLook algorithm features and capabilities

All performance tests were made on a PC with Intel Core2 processor running at 2.66 GHz

Neurotechnology has developed a **PC-based face recognition algorithm VeriLook 5.0** designed for biometric system integrators. The VeriLook algorithm implements advanced face localization, enrollment and matching using robust digital image processing algorithms:

- **Simultaneous multiple face processing.** VeriLook 5.0 performs fast and accurate detection of multiple faces in live video streams and still images. All faces on the current frame are detected in **0.01 - 0.19 seconds** and then each face is processed in **0.04 - 0.19 seconds** depending on defined template size. See technical specifications for more details.
- **Live face detection.** A conventional face identification system can be easily cheated by placing a photo of another person in front of a camera. VeriLook is able to prevent this kind of security breach by determining whether a face in a video stream belongs to a real human or is a photo.
- **Face image quality determination.** A quality threshold can be used during face enrollment to ensure that only the best quality face template will be stored into database.
- **Tolerance to face posture.** VeriLook allows 360 degrees head roll. Head pitch and yaw can be up to 15 degrees in each direction. See technical specifications for more details.
- **Multiple samples of the same face.** Biometric template record can contain multiple face samples belonging to the same person. These samples can be enrolled with different face postures and expressions, from different sources and in different time thus allowing to improve matching quality. For example a person could be enrolled with and without eyeglasses or with different eyeglasses, with and without beard or moustache, with different face expressions like smiling and non-smiling etc.
- **Identification capability.** VeriLook functions can be used in 1-to-1 matching (verification), as well as 1-to-many mode (identification).
- **Fast face matching.** The VeriLook 5.0 face template matching algorithm can compare up to **440,000 faces per second**. See technical specifications for more details.
- **Small face features template.** A face features template can be only **4 Kilobytes**, thus VeriLook-based applications can handle **large face databases**. Larger templates can be used to increase matching reliability. See technical specifications for more details.
- **Features generalization mode.** This mode generates the collection of the generalized face features from several images of the same subject. Then, each face image is processed, features are extracted, and the collections of features are analyzed and combined into a single generalized features collection, which is written to the database. This way, the enrolled feature template is more reliable and the face recognition quality increases considerably.

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Contents of VeriLook Standard SDK and Extended SDK

VeriLook SDK is based on VeriLook PC-based face recognition technology and is intended for biometric systems developers and integrators. The SDK allows rapid development of biometric applications using functions from the VeriLook algorithm that ensure fast and reliable face identification. VeriLook can be easily integrated into the customer's security system. The integrator has complete control over SDK data input and output.

VeriLook SDK includes Camera Manager library for Microsoft Windows and Linux that allows to perform **simultaneous capture from multiple cameras**.

VeriLook is available as the following SDKs:

- **VeriLook 5.0 Standard SDK** is intended for PC-based biometric application development. It includes Face Matcher and Extractor component licenses, programming samples and tutorials, camera manager library and software documentation. The SDK allows the development of biometric applications for Microsoft Windows, Linux or Mac OS X operating systems.
- **VeriLook 5.0 Extended SDK** is intended for biometric **Web-based** and network application development. It includes all features and components of the Standard SDK. Additionally, the SDK contains Face Client component licenses, sample client applications, tutorials and a **ready-to-use matching server** component.

The table below compares VeriLook 5.0 Standard SDK and VeriLook 5.0 Extended SDK.

	VeriLook Standard SDK	VeriLook Extended SDK
Component licenses that are included with a specific SDK		
• Face Extractor	1 license	1 license
• Face Client		3 licenses and 1 concurrent license
• Face Matcher	1 license	1 license
• Matching Server		+
Additional component licenses that can be purchased by specific SDK customers		
• Face Extractor	+	+
• Face BSS		+
• Face Client		+
• Face Matcher	+	+

VeriLook 5.0 SDK includes programming samples and tutorials that show how to use the components of the SDK to perform face template extraction or matching against other templates. The samples and tutorials are available for these programming languages and platforms:

	Micorsoft Windows 32 & 64 bit	Linux 32 & 64 bit	Mac OS X
Programming samples			
• C/C++	+	+	+
• C#	+		
• Sun Java 2	+		
• Visual Basic .NET	+		
• Delphi	+		
Programming tutorials			
• C	+	+	+
• C#	+		
• Visual Basic .NET	+		
• Delphi	+		

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Biometric Components Description

Face Extractor

Face Extractor creates face templates from face images. Image quality control can be applied to accept only good quality face images.

The Extractor can generalize a face template from several images that include the same face to improve the template's quality.

Live face detection can be used for determining whether a face in a video stream belongs to a real human or is a photo.

Camera management software allows to perform simultaneous capture from multiple cameras.

See "technical specifications" section for the template extraction speed, the size of face template and the requirements for image size and camera resolution.

One Face Extractor license is included with VeriLook 5.0 Standard SDK and VeriLook 5.0 Extended SDK. More licenses for this component can be purchased any time by VeriLook 5.0 SDK customers.

Face Client

The Face Client component is a combination of the Face Extractor and Face BSS components. It is intended for the systems that need to support all functionality of the mentioned components on the same PC. Using these licenses allows to optimize component license costs as well as reduce license management.

Three non-concurrent licenses and one concurrent license for the Face Client component are included with VeriLook 5.0 Extended SDK. More non-concurrent and concurrent licenses for this component can be purchased any time by VeriLook 5.0 Extended SDK customers

Face Matcher

The Face Matcher performs facial template matching in 1-to-1 (verification) and 1-to-many (identification) modes. Also the Face Matcher component includes **fused** matching algorithm that allows to increase template matching reliability by matching templates that contain fingerprint, face and/or iris records (note that matching fingerprint and irises requires to purchase Fingerprint Matcher and Iris Matcher components correspondingly - these components are available in *VeriFinger 6.3 SDK* and *VeriEye 2.3 SDK* respectively; see these products brochures for more information).

"Technical specifications" and "reliability and performance tests" sections contain information abour the template matching speeds and recognition quality in different scenarios.

One Face Matcher license is included with VeriLook 5.0 Standard SDK and VeriLook 5.0 Extended SDK. More licenses for this component can be purchased any time by VeriLook 5.0 SDK customers.

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Face BSS (Biometric Standards Support)

The Face BSS (Biometric Standards Support) component allows to integrate support for facial image format standards and additional image formats with new or existing biometric systems based on VeriLook SDK.

These biometric standards are supported:

- **BioAPI 2.0 (ISO/IEC 19784-1:2006)** (Framework and Biometric Service Provider for Face Identification Engine)
- **ISO/IEC 19794-5:2005** (Face Image Data)
- **ANSI/INCITS 385-2004** (Face Recognition Format for Data Interchange)

Face BSS component also allows to integrate **JPEG 2000** with Lossy and Lossless Face Profiles support into applications based on VeriLook SDK.

Neurotechnology Token Face Image (NTFI) module is included in the component.

The NTFI module is intended to provide token* face images compatible with the Face Image Format as in ISO/IEC 19794 standard. This face image format enables range of applications on variety of devices, including devices that have limited resources required for data storage, and improves recognition accuracy by specifying data format, scene constraints (lighting, pose), photographic properties (positioning, camera focus) and digital image attributes (image resolution, image size).

The NTFI module has the following features:

- Token face image creation from an image containing human face using eye coordinates which may be either hand marked or detected automatically using Neurotechnology face detection algorithm.
- Face is detected and eye coordinates are acquired using state-of-the-art Neurotechnology face detection and recognition algorithm.
- Geometrical normalization of face image according to proportions and photographic properties in ISO/IEC 19794 standard.
- Intelligent image padding algorithm for cut of parts of token face image as in ISO/IEC 19794 standard.
- Test the created token face image for following quality criteria suggested in ISO/IEC 19794 standard:
  - Background uniformity – the background in the token face image should be uniform, not cluttered.
  - Sharpness – the token face image should not be blurred.
  - Too light or too dark images – the token face image should not be too dark or too light.
  - Exposure range of an image – the token face image should have a reasonable exposure range to represent as much details of the subject in the image as possible.
- Evaluate token face image quality based on suggestions of ISO/IEC 19794 standard (Using the quality criteria above).

Licenses for the Face BSS component can be purchased anytime by VeriLook 5.0 Extended SDK customers.

**Token in this context is used as "symbolic image, good enough image for machine recognition". Token Image as in ISO/IEC19794-5: "A Face Image Type that specifies frontal images with a specific geometric size and eye positioning based on the width and height of the image. This image type is suitable for minimizing the storage requirements for computer face recognition tasks such as verification while still offering vendor independence and human verification (versus human examination which requires more detail) capabilities."*

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Matching Server

The Matching Server is ready-to-use software intended for building moderate size web-based and other network-based systems like local single- or multi-biometric identification system. The Server software runs on a server PC and allows to perform the biometric template matching on server side using Face Matcher component.

Fused multi-biometric matching can be enabled by running components for fingerprint, face and iris mathing on the same machine.

Client communication module that allows sending a task to the Matching Server, querying status of the task, getting the results and removing the task from server, is included with MegaMatcher 4.0 SDK, VeriFinger 6.3 SDK, VeriLook 5.0 SDK and VeriEye 2.3 SDK. This module hides all low level communications and provides high-level API for the developer.

Source code of **sample web server software** is included with the Matching Server. The web server software accepts biometric templates from a web client application, sends them to Matching Server for matching and returns matching results to the client application. The web server is stand-alone and does not require any third-party web server software (like Apache or Microsoft IIS).

The components and database support modules with source codes included for Matching Server component are listed in the table below. Custom modules for working with other databases can also be developed by integrator and used with the Matching Server software.

The table below shows what components are available with Matching Server software.

Components	Microsoft Windows 32 & 64 bit	Linux 32 & 64 bit	Mac OS X
• Matching server software	+	+	+
• Server administration tool API	+	+	
• Source code of sample web server software	+		
Database support modules			
• Microsoft SQL Server	+		
• PostgreSQL	+	+	
• MySQL	+	+	
• Oracle	+	+	
• SQLite	+	+	+
Programming samples			
• C# client	+		
• Sun Java 2 web client	+		
Programming tutorials			
• C/C++	+	+	
• C#	+		

The Matching Server component requires a special one-time license that allows to run the component on all machines that run the fingerprint, face, iris or palm print matching components obtained by an integrator. The Matching Server software is included with VeriLook 5.0 Extended SDK.

Also the Matching Server component is included with these Neurotechnology SDKs (see their brochures for more info):

- MegaMatcher 4.0 Standard or MegaMatcher 4.0 Extended SDK;
- VeriFinger 6.3 Extended SDK;
- VeriEye 2.3 Extended SDK.

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System requirements

- **PC** with **x86 (32bit)** or **x86-64 (64bit)** compatible processors or **Mac** with **x86** or **PowerPC** compatible processors. 2GHz or better processor is recommended.
- At least **128 MB of free RAM** should be available for the application. Additional RAM is required for applications that perform 1-to-many identification, as all biometric templates need to be stored in RAM for matching. For example, **10,000 templates** (each containing 1 face record) require about **24 MB of additional RAM**.
- **Free space on hard disk drive (HDD):**
  - at least 1 GB required for the development.
  - 100 MB required for VeriLook components deployment.
  - Additional space would be required in these cases:
    - VeriLook does not require the original face image to be stored for the matching; only the templates need to be stored. However, storing face images on hard drive for the potential future usage is recommended.
    - Usually a database engine runs on a separate computer (back-end server). However, DB engine can be installed on the same computer for standalone applications. In this case HDD space for templates storage must be available. For example, 10,000 templates (each containing 1 face record) stored using a relational database would require about 30 MB of free HDD space. Also, the database engine itself requires HDD space for running. Please refer to HDD space requirements from the database engine providers.
- **Camera or webcam.** These cameras are supported by VeriLook:
  - Any **webcam** or camera that is accessible using:
    - **DirectShow** interface for Microsoft Windows platform
    - **Video4Linux** interface for Linux platform.
    - **QuickTime** interface for Mac platform.
  - Also these specific models of high-resolution cameras are supported:
    - Axis M1114 camera (Microsoft Windows only)
    - Cisco 4500 IP camera (Microsoft Windows and Linux)
    - IrisGuard IG-AD100 face & iris camera (Microsoft Windows only)
    - Mobotix DualNight M12 IP camera (Microsoft Windows and Linux)
    - PiXORD N606 camera (Microsoft Windows and Linux)
    - Prosilica GigE Vision camera (Microsoft Windows and Linux)
    - VistaFA2 / VistaFA2E face & iris cameras (Microsoft Windows only)
    - VistaMT Multimodal Biometric Device (Microsoft Windows only)
- **Database engine** or connection with it. VeriLook templates can be saved into any DB (including files) supporting binary data saving. VeriLook Extended SDK contains the following support modules for Matching Server:
  - Microsoft SQL Server (only for Microsoft Windows platform);
  - PostgreSQL (for Microsoft Windows and Linux platform);
  - MySQL (for Microsoft Windows and Linux platforms);
  - Oracle (for Microsoft Windows and Linux platforms);
  - SQLite (for all platforms).

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- **Network/LAN connection (TCP/IP)** for client/server applications. Also, network connection is required for using Matching server component (included in VeriLook Extended SDK). Communication with Matching server is not encrypted therefore, if communication must be secured, a dedicated network (not accessible outside the system) or a secured network (such as VPN; VPN must be configured using operating system or third party tools) is recommended.

- **Microsoft Windows specific requirements:**
  - Microsoft Windows 2000/XP/2003/2008/Vista/7, 32-bit or 64-bit.
  - Microsoft .NET framework 2.0 or newer (for .NET components usage).
  - Microsoft DirectX 9.0 or later (for camera/webcam usage).
  - One of following development environments for application development:
    - Microsoft Visual Studio 2005 SP1 or newer (for development under C/C++, C#, Visual Basic .Net);
    - Sun Java 1.5 SDK or later;
    - Microsoft Visual Basic 6;
    - Delphi 7.

- **Linux specific requirements:**
  - Linux 2.6 or newer kernel, 32-bit or 64-bit.
  - glibc 2.3.6 or newer.
  - Video4linux (for camera/webcam usage).
  - GTK+ 2.10.x or newer libs and dev packages (to run SDK samples and applications based on them).
  - GCC-4.0.x or newer (for application development).
  - GNU Make 3.81 or newer (for application development).
  - Sun Java 1.5 SDK or later (for application development with Java).
  - pkg-config-0.21 or newer (optional; only for Matching Server database support modules compilation).

- **Mac OS X specific requirements:**
  - Mac OS X (version 10.4 or newer).
  - QuickTime (for camera/webcam usage).
  - XCode 2.4 or newer (for application development).

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Technical Specifications

All specifications are given for Intel Core2 processor with 4 cores running at 2.66 GHz.

640 x 480 pixels is the recommended minimal image size for VeriLook algorithm.

75 pixels is the recommended **minimal distance between eyes** for a face on image or video stream to perform face template extraction.

VeriLook has certain tolerance to face posture that assures face enrollment convenience:

- head **roll** (tilt) – ±180 degrees (configurable);
  ±15 degrees recommended as the fastest setting which is usually sufficient for most near-frontal face images.
- head **pitch** (nod) – ±15 degrees from frontal position.
- head **yaw** (bobble) – ±15 degrees from frontal position.

All face templates should be loaded into RAM before identification, thus the maximum face template database size is limited by the amount of available RAM.

VeriLook face template matching algorithm can use more than one processor core on **multi-core processors** allowing to increase template matching speed. The template matching speeds in the table below are given as a range, where the smaller number means matching speed using **1 processor core**, while the larger number means matching speed using all **4 processor cores**.

VeriLook 5.0 algorithm technical specifications (for 640 x 480 pixel images)			
	Maximized template size	**Medium template size**	**Minimized template size**
Detection time for all faces in a frame (±15° head roll tolerance)	15 milliseconds		
Detection time for all faces in a frame (±180° head roll tolerance)	185 milliseconds		
Single face template extraction time (1) (milliseconds)	185	90	36
Matching speed (2) (face records per second)	13,000 - 52,000	24,000 - 96,000	110,000 - 440,000
Template size in database (3) (bytes)	35,994	20,010	4,026

(1) Face template extraction is performed after all faces are detected in a frame. The template extraction time does not depend on image size, but only on defined template size.

(2) The probe template is defined to contain 1 **"large"** face record(s). The gallery templates can contain 1 "small", "medium" or "large" face record.

(3) When 1 face record stored in a template. Template size increases proportionally when multiple face records are stored in the same template.

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Reliability and Performance Tests

All tests were performed on Intel Core2 processor with 4 cores running at 2.66 GHz.

We present the testing results to show how VeriLook 5.0 technical specifications correspond the practical algorithm's performance and reliability evaluations. Face images from **FRGC** database were used for testing, thus the testing results can be compared with testing results of other algorithms.

Experiment 1 and *Experiment 2* were performed according to FRGC protocol:

- **Experiment 1** measures performance on the recognition from frontal facial images taken under controlled illumination. The biometric samples in the target and query sets consist of a **single controlled still image** in high resolution.
- **Experiment 2** is designed to examine the effect of multiple still images on performance. The biometric samples in the target and query sets are composed of the **4 controlled images** of each person from a subject.

See *Overview of the Face Recognition Grand Challenge* (*http://face.nist.gov/frgc/FRGC_CVPR05_Overview.pdf*) for more details on FRGC experiments protocol.

Each experiment was performed 2 times to test different scenarios:

- **Test 1** maximized **matching accuracy**. VeriLook 5.0 algorithm reliability in this test is shown on the ROC charts as **red** curves for Experiment 1 and **magenta** curves for Experiment 2.
- **Test 2** minimized **template size**. VeriLook 5.0 algorithm reliability in this test is shown on the ROC charts as **green** curves for Experiment 1 and **blue** curves for Experiment 2.

These sets of ROC curves were calculated using sertain subsets of FRGC database for each experiment and test according to FRGC protocol:

- **ROC I** – gallery and probe photos were taken within half of the year.
- **ROC II** – gallery and probe photos were taken within one year.
- **ROC III** – gallery and probe photos were taken with time lapse of at least half of the year but within 1.5 year.

Notes:

- Template matching was performed using **all 4 cores** of the processor.
- Part of images in the FRGC database is 1600 x 1200 pixels, and the other part is 2272 x 1704 pixels, as the images for this database were obtained with digital photo camera. The technical specifications above are given for 640 x 480 pixels images that are common for webcams.
- Head roll, pitch and yaw were set to ±15° during all experiments and tests.
- No score normalization techniques were applied while calculating these ROC curves, although FRGC protocol allowed to use score normalization.

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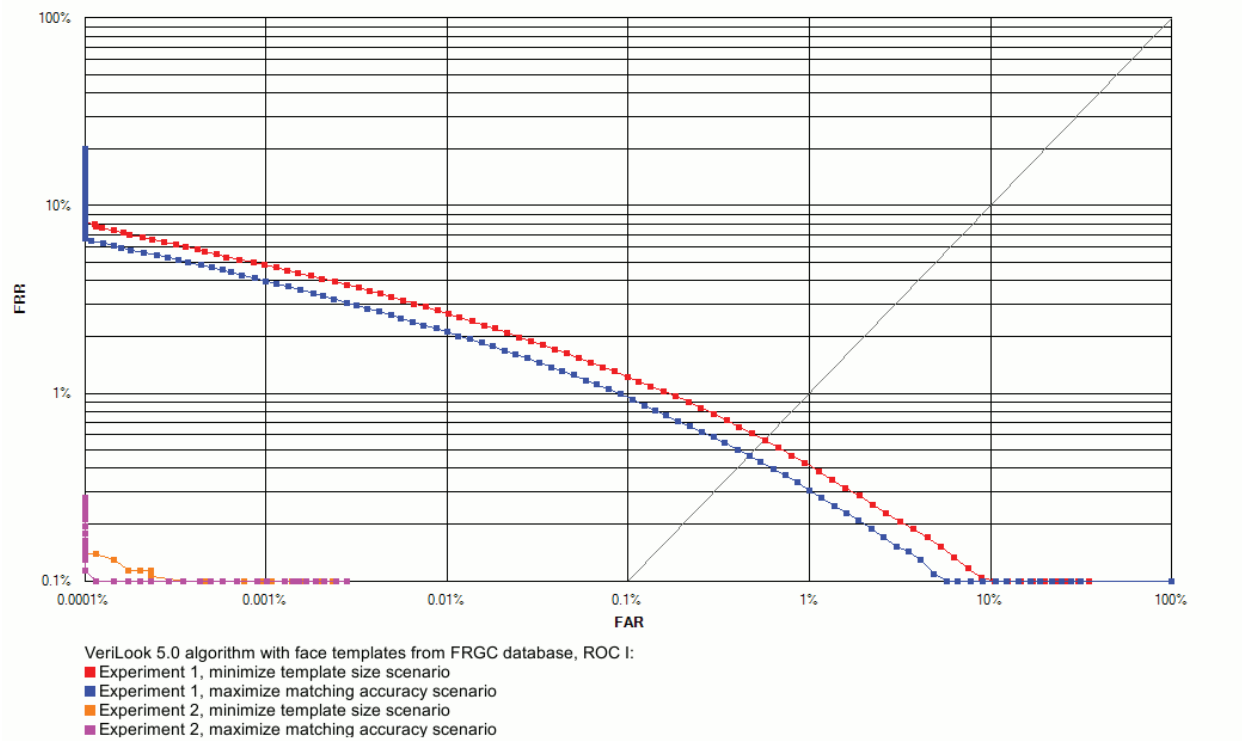
VeriLook 5.0 algorithm testing results with FRGC database					
		Experiment 1		Experiment 2	
		Test 1	Test 2	Test 1	Test 2
Average template extraction speed during enrollment (milliseconds)		309	174	696	696
Template size during enrollment (bytes)		35994	4026	16104 (1)	4026 (2)
Average template extraction speed during identification (3) (milliseconds)		309	309	1236	1236
Template size during identification (3) (bytes)		35994	35994	143976	143976
Template matching speed (3) (templates per second)		13563	118646	7753	29778
FRR at 0.1 % FAR	ROC I	0.956 %	1.225 %	0.000 %	0.000 %
	ROC II	1.768 %	2.189 %	0.043 %	0.026 %
	ROC III	2.638 %	3.201 %	0.074 %	0.055 %

(1) Each gallery template contains **4 "small**" face records.

(2) Each gallery template contains **1 "small"** face record that was created by **generalizing** 4 different face records.

(3) The probe template is defined to contain **"large"** face record(s). The gallery templates can contain "small", "medium" or "large" face record(s).



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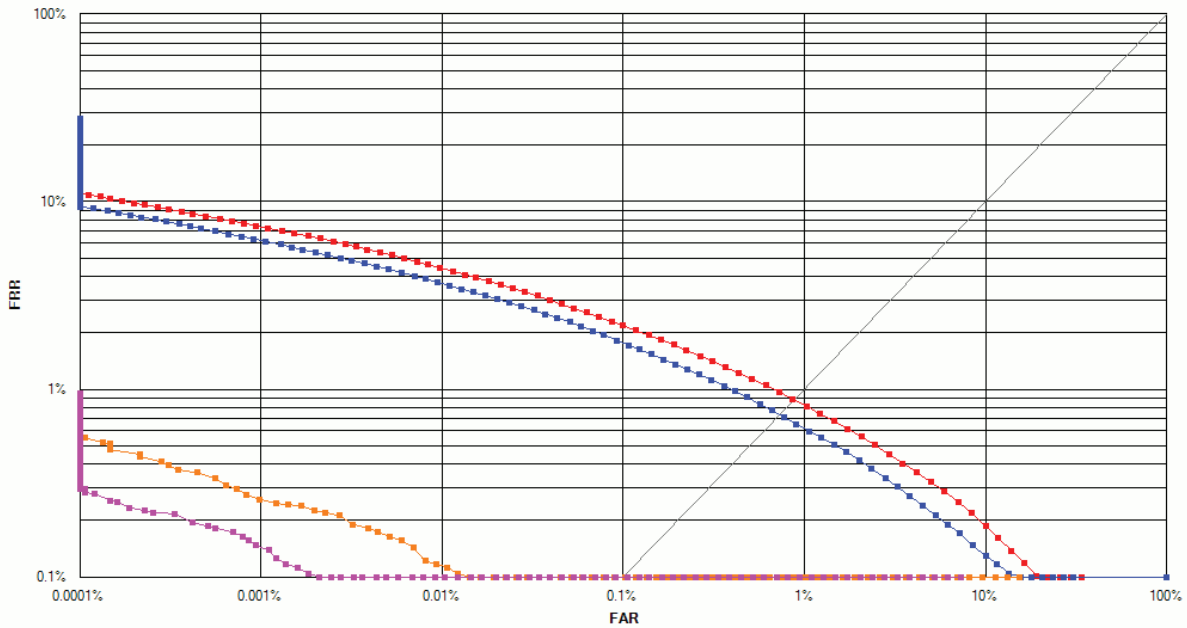
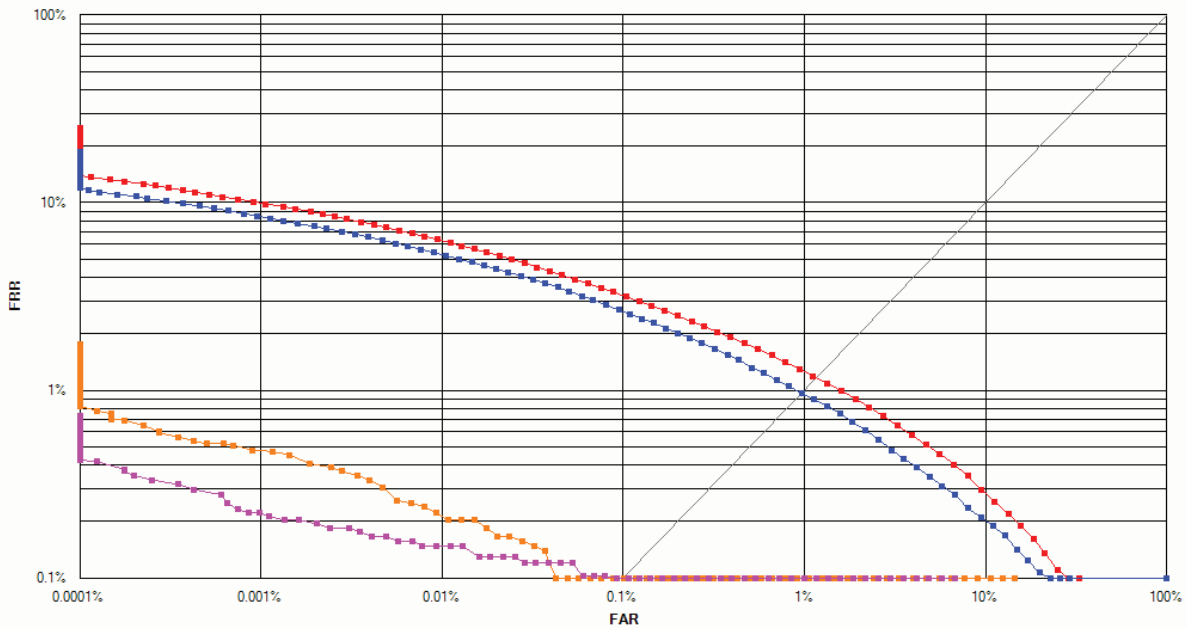


VeriLook 5.0 algorithm with face templates from FRGC database, ROC II:
- Experiment 1, minimize template size scenario
- Experiment 1, maximize matching accuracy scenario
- Experiment 2, minimize template size scenario
- Experiment 2, maximize matching accuracy scenario



VeriLook 5.0 algorithm with face templates from FRGC database, ROC III:
- Experiment 1, minimize template size scenario
- Experiment 1, maximize matching accuracy scenario
- Experiment 2, minimize template size scenario
- Experiment 2, maximize matching accuracy scenario

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VeriLook Demo, Trial SDK and Related Products

VeriLook **algorithm demo** application and VeriLook **30-day SDK Trial** are available for downloading at ***www.neurotechnology.com/download.html***.

These products are related to VeriLook SDK:

- **VeriLook Surveillance SDK** - allows to create software for performing biometric face identification using live video streams from high-resolution digital surveillance cameras. See “VeriLook Surveillance SDK” brochure for more information.
- **MegaMatcher SDK** – intended for development of AFIS or multi-biometric face, fingerprint, iris and palm print identification products. See “MegaMatcher SDK” brochure for more information.
- **MegaMatcher On Card SDK** – a product for fingerprint and face matching on smart cards. See “MegaMatcher On Card SDK” brochure for more information.
- **FaceCell EDK** – intended for development of embedded and mobile face identification systems. See “FaceCell EDK” brochure for more information.

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Licensing VeriLook SDK

To **develop** a product based on VeriLook 5.0 technology, an integrator should obtain VeriLook 5.0 Standard SDK (EUR 339) or VeriLook 5.0 Extended SDK (EUR 859).

Integrators can develop only an **end-user** product using VeriLook SDK and sell/install the product to their own customers. If an integrator wants to develop and sell a VeriLook based development tool (with custom API, programming possibilities, samples, etc.), he/she will need to become a value-added reseller (VAR).

To **deploy** the product that was developed with VeriLook 5.0 SDK, the integrator should obtain only additional VeriLook 5.0 component licenses for product installations. Also the additional VeriLook 5.0 component licenses may be required during development of the product. The additional VeriLook 5.0 component licenses can be obtained by VeriLook 5.0 SDK customers at any time.

The table below lists the components of VeriLook 5.0 SDK and shows the availability of the additional component licenses for the customers of VeriLook 5.0 Standard SDK and VeriLook 5.0 Extended SDK:

	VeriLook Standard SDK	VeriLook Extended SDK
• Face Extractor	+	+
• Face BSS		+
• Face Client		+
• Face Matcher	+	+

A license for a VeriLook component is required for **each PC** or **each server CPU** that runs this component. The following license types are available:

- Single computer license.
- Concurrent network license.
- Enterprise license.

VeriLook 5.0 Standard SDK includes:

- 1 Face Extractor license.
- 1 Face Matcher license.

VeriLook 5.0 Extended SDK includes:

- 1 Face Extractor license.
- 3 Face Client licenses.
- 1 Face Client concurrent license.
- 1 Face Matcher license.
- Matching Server license.

Please also refer to *MegaMacher 4.0, VeriFinger 6.3, VeriLook 5.0, VeriEye 2.3 SDK License Agreement* at Neurotechnology web site for all licensing terms and conditions.

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Single computer license

A single computer license allows to install and run a VeriLook 5.0 component installation on a single Personal Computer or on one Server CPU. The component license will not be lost if computer will be reinstalled.

The following license management options are available:

- license activation online by communicating with Neurotechnology's server;
- license activation by email;
- license activation using volume license manager;
- license management using volume license manager on LAN or Internet.

Single computer license activated over Internet or by email is not suitable for virtual environments. Volume license manager used as a dongle or license management over network would be required.

Concurrent network licenses

Face Client concurrent license allows to install Face Client component on an unlimited number of computers. Volume license manager is used to manage these licenses across the computers connected to the LAN or Internet. An application should obtain Face Client license for capturing process and to perform template creation (extraction). In average this takes 10-20 seconds and after this time the license can be released to be available for another user. Even one Face Client concurrent license can be shared among tens of users.

This type of licensing is especially **useful for web-based** software.

The allowed number of simultaneously running Face Client component instances is limited by the number of obtained concurrent licenses. Additional licenses can be obtained at any time.

The following license management options are available:

- License management by storing a file with a concurrent license on one PC connected to LAN or Internet. The file with the concurrent license is send by email after purchasing the license.
- License management using volume license manager on LAN or Internet.

VeriLook 5.0 enterprise license

VeriLook enterprise license allows an **unlimited use** of VeriLook components in the end-user products in the certain territory, market segment or project. These limitations would be included in the licensing agreement.

The enterprise license price depends on the application size and the number of potential application's users within the designated territory, market segment or project. VeriLook enterprise licenses are provided only for big projects, with price range starting at **EUR 20,000**.

VeriLook algorithm **source code** may be included with a special source code licensing agreement for the selected customers, who are going to obtain VeriLook enterprise license for at least EUR 100,000 or more.

For more information please contact us.

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Volume license manager

Volume license manager is **used on site by integrators or end users** to manage obtained licenses for VeriLook 5.0 components. It consists of license management software and a dongle, which are used to store the number of obtained licenses. An integrator or an end-user can use the volume license manager in the following ways:

- **Activating the single computer licenses.** An installation license for a VeriLook 5.0 component will be activated for using on a particular computer. The license quantity for the VeriLook component in the license manager will be decreased by the amount of activated licenses.
- **Managing the single computer or concurrent licenses on LAN or Internet.** The license manager allows to manage installation licenses for VeriLook components across the computers on LAN or Internet. The number of managed licenses for a VeriLook component is limited by the number of licenses in the license manager. No license activation is needed and the license quantity is not decreased. Once issued, the license is assigned to certain computer on the network.
- **Using a license manager as a dongle.** The volume license manager containing at least one license for a VeriLook 5.0 component can be used as a dongle that allows to run VeriLook 5.0 component installation on a particular computer.

Additional VeriLook 5.0 component installation licenses for the license manager can be purchased anytime. Neurotechnology will generate a special update file and send it to you. Then you will just have to enter the file to the license manager to add these purchased licenses.

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Prices for VeriLook products

- The prices are **effective from January 10, 2011**. The prices may change in the future, so please **download and review the latest version** of the brochure before making an order.
- Quantity discounts do not accumulate over time.
- The prices do not include any local import duties or taxes.
- Product shipping cost depends on delivery country
- Our customers can gain a discount for our products by getting the Solution Partner status.

VeriLook 5.0 SDK

VeriLook 5.0 Standard SDK	€ 339.00
VeriLook 5.0 Extended SDK	€ 859.00

Face Client concurrent licenses

Price per license	€ 390.00

Face components (prices per single computer license)

Quantity	Face Extractor	Face Client (1)	Face Matcher
1-9	€ 20.00	€ 25.00	€ 25.00
10-19	€ 15.00	€ 18.00	€ 18.00
20-49	€ 13.00	€ 16.00	€ 16.00
50-99	€ 11.00	€ 14.00	€ 14.00
100-199	€ 10.00	€ 12.50	€ 12.50
200-499	€ 9.00	€ 11.00	€ 11.00
500-999	€ 8.00	€ 10.00	€ 10.00
1000-1999	€ 7.00	€ 9.00	€ 9.00
2000-3999	€ 6.40	€ 8.00	€ 8.00
4000-7999	€ 5.80	€ 7.00	€ 7.00
8000 and more	Please contact us for more information		

(1) Face Client component is not available for VeriLook Standard SDK customers.

License management

Volume license manager	€ 16.00

VeriLook 5.0 enterprise license

VeriLook 5.0 enterprise license	Please contact us for more information

VeriLook products can be ordered:

- online, at ***www.neurotechnology.com/cgi-bin/order.cgi***
- via a local Neurotechnology distributor; the list of distributors is available at ***www.neurotechnology.com/distributors.html***

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