Core Technology for your Application
Neurotechnology is a developer of high-precision algorithms and software based on deep neural network (DNN) and other artificial intelligence powered technologies. Drawing from years of academic research in the fields of neuroinformatics, image processing and pattern recognition, Neurotechnology was founded in 1990 in Vilnius, Lithuania. Currently the company offers this range of products and technologies:

- **Biometric person identification** is applicable from small apps to national-scale solutions. Since 1997, more than 200 products and version upgrades have been released. Over 3,000 system integrators, security companies and hardware providers in more than 140 countries integrate the fingerprint, face, iris, voice and palm print biometric technologies into their solutions. The MegaMatcher line of products is used for both civil and forensic applications, including border crossings, criminal investigations, systems for voter registration, verification and duplication checking, passport issuance and other projects.

- **Computer vision** technologies are being actively developed for a variety of applications. For instance, they are used in SentiSight.ai, an interactive web platform for developing AI-based image recognition applications. Also, they power SentiVeillance technology for live video streams analytics in real-time surveillance solutions, as well as SentiGaze eye movement tracking technology and SentiSculpt 3D object model reconstruction technology.

- **Robotics** R&D efforts are focused on the “programming by demonstration” approach and its practical implementation in various neural network structures. SentiBotics ready-to-use robotics development kit is available for researchers and developers.

Also, the **Ultrasound Research Group** undertakes research in the fields of ultrasonic particle manipulation, parametric array and transducer technology. It develops patent-pending technologies, novel algorithms, hardware and electronics solutions for ultrasonics applications.
Technology Awards

- **FVC-onGoing.** In 2019 MegaMatcher SDK palm print matching algorithm has shown the top result at the FVC-onGoing evaluation. The algorithm was the most accurate overall and fastest among the five most accurate contenders.

- **MINEX III Compliance.** In 2018 Neurotechnology’s fingerprint template generator algorithm has been ranked the first in the NIST MINEX interoperability category; the fingerprint matching algorithm ranked second and, when combined, the two become the most accurate high speed fingerprint recognition system. The latest fingerprint algorithm for smart cards submission has also demonstrated significant improvement in reliability with proven outstanding template generator at enhanced performance in the same year. Previously, MegaMatcher SDK technology was recognized as fully MINEX compliant during other NIST MINEX evaluations.

- **IREX IX Evaluation.** In 2018 Neurotechnology iris recognition algorithms have earned top rankings in NIST IREX IX evaluation, with second-best accuracy and fastest speed achievements in the NIST IREX IX evaluation. The iris matching algorithm was almost 50 times faster than the most accurate contender. Historically, Neurotechnology showed top results in the earlier IREX evaluations in 2009, 2012 and 2013.

- **FRVT Ongoing.** In 2018 Neurotechnology has been ranked among 8 most accurate face recognition algorithm vendors out of 39, with tenth most accurate algorithm out of 78 in the FRVT leaderboard. The submission was also ranked as one of the best in two difficult scenarios, with second most accurate result on a complex dataset collected from operational photos related to ongoing criminal investigations, and fourth most accurate result with unconstrained, photojournalism-style photos.

- **Kaggle Competition on DNN-based species classification.** In 2017 Neurotechnology researchers won first place in a Kaggle competition with deep neural network based computer vision solution for classifying fish species.

- **PFT II Evaluation.** In 2017 Neurotechnology fingerprint algorithm was submitted to NIST Proprietary Fingerprint Template Evaluation II. The algorithm’s template matching accuracy was among the best participants in most of the experiments.

- **WSQ 3.1 Certification.** In 2011 FBI certified Neurotechnology’s implementation of WSQ image format support.

MegaMatcher Automated Biometric Identification System

Turnkey multi-biometric solution for national-scale identification projects

- Proven in national-scale projects
- Multiple complex biometric transactions processing
- High speed and accuracy
- Fingerprint, face, iris and palmprint modalities supported
- NIST MINEX-compliant fingerprint engine, NIST IREX proven iris engine
- Scalable, modular architecture
- On-premise solution and cloud service available
- High availability and fault tolerance
- Customization possible for project needs

MegaMatcher Automated Biometric Identification System (ABIS) is a complete system for the deployment of large-scale multi-biometric projects. The modular and customizable solution provides services for high-performance, scalable systems with multiple transactions.

The solution is intended for national-scale projects, like biometric voter registration with records deduplication, passport issuing, border control, as well as other civil or criminal AFIS/ABIS.

MegaMatcher ABIS is available as on-premise solution and as cloud service:

- MegaMatcher ABIS on-premise solution is designed as a complete system with all necessary components for deploying a large-scale biometric system. The solution includes ready-to-use services and applications for running on regular hardware.
- MegaMatcher ABIS cloud service is designed to make the system more accessible from multiple platforms and locations. The secure integrated cloud service provides functionality for enhancing its use as a solution for large and national-scale projects.

MegaMatcher ABIS is based on technologies, which have been proven in national-scale projects:

- Voter registration systems with user deduplication in DR Congo, Venezuela, Bangladesh, Sierra Leone.
- Passport and ID systems running in Indonesia, Ukraine, Mexico, El Salvador, Colombia, Bosnia & Herzegovina, Sri Lanka, as well as a number of local systems in India.
- Criminal AFIS running in several Indian states and Mexico Yukatan.
- Other solutions, like border control systems, banking solutions or access control systems deployed in more than 30 countries.
Large-scale biometric projects may have specific system requirements. MegaMatcher Automated Biometric Identification System (ABIS) features **modular architecture**, which allows to adapt to different functional and performance requirements. MegaMatcher ABIS on-premise solution includes these services, modules and components:

- **MegaMatcher ABIS Client Application** is a modular web-based application designed to operate with the MegaMatcher ABIS solution. It provides the following functionalities:
  - Identity Management - for people enrollment, their records updating, deleting and biometric or demographic search.
  - Adjudication - a visual tool designed for operators to examine questionable biometric matching results.
  - Latent Fingerprint Editor - a visual tool for forensic experts, which allows to analyze fingerprint images, perform automatic and manual enhancements as well as fingerprint feature points management.
  - System Administration - designed to manage MegaMatcher ABIS system using role-based access control.
- **MegaMatcher ABIS API** is a web services-based interface (RESTful) designed for easy and quick integration with third-party systems. Integrators can develop client-side applications using the API to meet specific requirements.
- **Management Service** is the core component of MegaMatcher ABIS responsible for orchestrating the work of all system services and managing the workflow of operations.
- **Image Processing Service** is used for biometric data quality assessment and biometric data extraction from fingerprint, palmprint, face and iris images.
- **Matching Service** is a high-performance biometric engine based on MegaMatcher Accelerator technology, which performs identity verification, person identification and records deduplication operations.

Taking into account different business needs and specific project requirements, some customization might be required. This may include developing custom user interface, workflow scenarios, person’s record structure (biometric and demographic data, additional data fields). Neurotechnology offers **custom project development** service for providing a customized MegaMatcher ABIS based solution, as well as implementing additional functionality.
MegaMatcher technology is designed for large-scale AFIS and multi-biometric systems developers. The technology ensures high reliability and speed of biometric identification even when using large databases. MegaMatcher is available as a software development kit that allows development of large-scale single- or multi-biometric fingerprint, face, voice, iris and palm print identification products for Microsoft Windows, Linux, macOS, iOS and Android platforms.

The most prominent MegaMatcher SDK integration examples are:

- **Bangladesh Voter Registration Project** registered more than 80 million citizens using biometric face and fingerprint technology.
- **Indian States Criminal AFIS** solution has been deployed in the police departments of seven Indian states and the National Institute of Criminology and Forensic Science of India.
- **Indonesia distributed passport issuance system** with a centralized biometric matching component based on MegaMatcher technology.
- **El Salvador's National Passport System** – the nationwide multi-biometric passport and immigration system based on MegaMatcher multi-biometric technology.
- **Bosnia and Herzegovina Biometric Passport and ID System** is based on MegaMatcher technology
- **Border control systems in Spanish airports** use MegaMatcher for multi-biometric face and fingerprint identification.

MegaMatcher SDK is available for a competitive price with flexible licensing options and free customer support.

See demo video: https://youtu.be/x9v9m5LzSg
These types of MegaMatcher SDK are available:

- **MegaMatcher Standard SDK** for developing a client/server based multi-biometric fingerprint-face-voice-iris identification product. This SDK is suitable for network-based and web-based systems with database size ranging from several thousand records up to million records. The SDK includes ready-to-use server-side software and a set of components for developing client-side applications on Microsoft Windows, Android, iOS, Linux and macOS.

- **MegaMatcher Extended SDK** for developing a large-scale network-based AFIS or multi-biometric identification product. The fault-tolerant scalable cluster software allows to perform fast parallel matching, processes high number of identification requests and handles databases with practically unlimited size. The SDK includes all components of MegaMatcher Standard SDK and MegaMatcher Accelerator software. This SDK also allows to develop network-based and web-based systems.

<table>
<thead>
<tr>
<th>MegaMatcher 11.1 SDK biometric engines technical specifications</th>
<th>Fingertips</th>
<th>Faces</th>
<th>Irides</th>
<th>Voiceprints(2)</th>
<th>Palmprints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal image resolution or size</td>
<td>500 ppi</td>
<td>64 pixels between eyes</td>
<td>640 x 480 pixels</td>
<td>-</td>
<td>500 ppi</td>
</tr>
<tr>
<td>Template extraction speed (per minute) on a smartphone(3)</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>not supported</td>
</tr>
<tr>
<td>on a PC(4)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>15</td>
</tr>
<tr>
<td>on a server(5)</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>350</td>
</tr>
<tr>
<td>Template size (kilobytes)</td>
<td>0.8 - 8.0</td>
<td>0.2 - 0.5</td>
<td>2.3</td>
<td>3.5 - 4.5</td>
<td>33.0</td>
</tr>
<tr>
<td>Matching speed (templates per second)</td>
<td>200,000</td>
<td>200,000</td>
<td>200,000</td>
<td>8,000</td>
<td>4,000</td>
</tr>
</tbody>
</table>

(1) Here a template contains one biometric record (fingerprint, palmprint, face, voiceprint or iris respectively). MegaMatcher SDK allows to store multiple biometric records (fingerprints, palmprints faces, voiceprints and irises) in a single template.

(2) Voiceprint engine specifications are provided for 5-second long voice samples.

(3) Android or iOS device (smartphone or tablet) with at least Snapdragon S4 SoC, running at 1.5 GHz.

(4) PC with at least Intel Core i7-4771 processor, running at 3.5 GHz.

(5) Server hardware with at least Dual Intel Xeon Gold 6126 processors, running at 2.6 GHz.

MegaMatcher **SDK Trial** and **product brochure** can be downloaded from Neurotechnology web site.
MegaMatcher Accelerator

Solution for large-scale AFIS or multi-biometric systems

- Ready-to-use
- Fast matching
- Multiple modalities support
- Scalable architecture
- ISO & ANSI standards support
- Suitable for duplicates search

MegaMatcher Accelerator 11.0 is a hardware/software solution that provides high speed, high volume biometric identification for national-scale projects. The Extreme and Extended version are designed to run on server hardware and perform fast biometric template matching on the server-side of a large-scale AFIS or multi-modal system. The Standard version and Development Edition are designed to be run on a common PC. All version require minimal configuration and accept requests from client software via network or the Web.

The most prominent MegaMatcher Accelerator integration examples are:

- **DR Congo Voter Registration Project** has used 11 MegaMatcher Accelerator Extreme units to perform massive, simultaneous deduplication of 46.5 million enrolled voters for the DRC 2018 elections; the records were processed in less than 2 months.

- **Venezuela Voter Registration System** proved its speed and accuracy with biometric data from nearly 18 million registered people during the 2012 Venezuelan presidential election.

- **Ukraine’s National ID System** is intended for creating a data bank with Ukrainian citizens biometric information. More than 12 million people have been enrolled by the end of 2018.

- **Mexico Multi-Biometric Enrollment System** has been implemented for high-volume iris, face and fingerprint identification, with 5 million taxpayers enrolled by the end of 2014.

MegaMatcher Accelerator can be used within a biometric system that contains templates with any number of fingerprint, palmprint, iris and/or face records. The technology provides enough speed to provide adequate response time for national-scale systems, as well as complete duplicate searching in a reasonable time. The scalable architecture allows the combination of multiple MegaMatcher Accelerator units into a cluster for tasks involving larger databases.
The MegaMatcher Accelerator 11.1 Extreme software is designed to run on server hardware with dual Xeon processors, GPU and at least 512 MB of memory. Each MegaMatcher Accelerator 11.1 Extreme unit can store 160,000,000 fingerprints and 200,000,000 irises and 40,000,000 faces.

The MegaMatcher Accelerator 11.1 Extended software is designed to run on server hardware with dual Xeon processors and at least 128 MB of memory. Each MegaMatcher Accelerator 11.1 Extended unit can store 40,000,000 fingerprints and 50,000,000 irises and 10,000,000 faces and 4,000,000 palmprints.

The MegaMatcher Accelerator 11.1 Standard and Development Edition software are intended to run on a PC with Intel Core i7 processor and 16 GB of memory. Each PC with MegaMatcher Accelerator 11.1 Standard or Development Edition software can store 4,000,000 fingerprints and 5,000,000 irises and 1,000,000 faces and 400,000 palmprints.

MegaMatcher Accelerator 11.1 Extreme, Extended, Standard and Development Edition licenses can be purchased by new and existing MegaMatcher Extended SDK customers. Server hardware is optionally available.

The table below shows the performance of MegaMatcher Accelerator fast fingerprint, face and iris matching engines:

<table>
<thead>
<tr>
<th>One template contains:</th>
<th>Extreme</th>
<th>Extended</th>
<th>Standard</th>
<th>Development Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 fingerprint record</td>
<td>1,200,000,000</td>
<td>100,000,000</td>
<td>35,000,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>2 fingerprint records</td>
<td>600,000,000</td>
<td>55,000,000</td>
<td>18,000,000</td>
<td>500,000</td>
</tr>
<tr>
<td>4 fingerprint records</td>
<td>300,000,000</td>
<td>27,000,000</td>
<td>8,000,000</td>
<td>250,000</td>
</tr>
<tr>
<td>10 fingerprint records</td>
<td>120,000,000</td>
<td>10,500,000</td>
<td>3,500,000</td>
<td>100,000</td>
</tr>
<tr>
<td>1 face record</td>
<td>1,200,000,000</td>
<td>100,000,000</td>
<td>35,000,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>1 iris record</td>
<td>700,000,000</td>
<td>200,000,000</td>
<td>70,000,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>2 iris records</td>
<td>350,000,000</td>
<td>100,000,000</td>
<td>35,000,000</td>
<td>500,000</td>
</tr>
<tr>
<td>1 palmprint record</td>
<td>not supported</td>
<td>2,000,000</td>
<td>600,000</td>
<td>20,000</td>
</tr>
<tr>
<td>2 palmprint records</td>
<td>not supported</td>
<td>1,000,000</td>
<td>300,000</td>
<td>10,000</td>
</tr>
</tbody>
</table>

The MegaMatcher Accelerator 11.1 Development Edition 30-day trial is available for download.
MegaMatcher On Card SDK offers matching on card technology that stores person’s fingerprint, iris and face templates on a smart card and performs template matching in a microprocessor embedded in the card, instead of matching biometric information on a PC’s processor. This method ensures that personal biometric information does not transfer to an external computer as it would in a more basic template-on-card system.

The MegaMatcher On Card SDK is developed utilizing a set of ISO/IEC standards to enable interoperability with and easy integration into existing smart card and/or biometric systems.

MegaMatcher On Card algorithm for fingerprint matching on a smart card is compliant with the same NIST MINEX III criteria used to evaluate much more resource-intensive PC-based algorithms. MegaMatcher On Card provides a number of advantages over a standard fingerprint/iris/face identification system or similar products for smart cards, including:

- **Accuracy.** MegaMatcher On Card provides the same level of accuracy of an AFIS system in a verification process using ISO/IEC 19794-2 compact card minutiae format templates together with the security of storage of biometric templates and matching algorithm on a smart card. Face and iris modalities on-card verification precision conforms to the large scale multi-biometric MegaMatcher SDK accuracy rates of Neurotechnology’s compact format templates matching.

- **Configurability.** MegaMatcher On Card fingerprint algorithm has different performance configurations that can be chosen according to the operating scenario, the requirements to matching accuracy, the smart card platform speed and memory constraints.

- **Multi-biometrics.** The face and iris matching engines can be used as an additional or alternative factor of authentication that enhances the fingerprint verification. Fingerprint, iris and face templates can be stored on a single card together with the fingerprint, iris and face matching algorithms.
MegaMatcher On Card SDK provides a number of advantages over a standard fingerprint, iris and face identification system or similar products for smart cards, including:

- **Easy integration.** Implementing the system will not require major overhauls of existing infrastructure, as MegaMatcher on card is developed utilizing a set of ISO/IEC standards (7816-3, 7816-4, 7816-9, 7816-11 and 19794-2) to enable interoperability with and easy integration into existing smart card and/or biometric systems.

- **Different smart card platforms supported.** MegaMatcher On Card can be integrated at different stages of the card life cycle for various smart cards platforms. The post-issuance library gives the possibility to rapidly integrate match-on-card in projects where time constraints are critical. On the other hand the possibility to store the code directly into the ROM mask and the partnership with several card vendors offer a faster matching on card solution and the possibility to maintain more EEPROM available for post-issuance applications.

- **Security and privacy.** Biometric verification can replace or be combined with less secure (e.g., PIN) authentication techniques to achieve higher security. The original template remains on the smart card, providing a safeguard against misuse of information or fraudulent scanning systems.

<table>
<thead>
<tr>
<th>Memory requirements for MegaMatcher On Card 11.1 biometric verification engines</th>
<th>Code size</th>
<th>Required RAM (1)</th>
<th>Template size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fingerprint verification engine (1)</td>
<td>6.1 - 11.0 kilobytes</td>
<td>960 - 2,200 bytes</td>
<td>600 - 2,100 bytes</td>
</tr>
<tr>
<td>Fingerprint verification engine (2)</td>
<td>less than 13.7 kilobytes</td>
<td>less than 600 bytes</td>
<td>less than 1024 bytes</td>
</tr>
<tr>
<td>Face verification engine (3)</td>
<td>less than 6.1 kilobytes</td>
<td>less than 150 bytes</td>
<td>less than 850 bytes</td>
</tr>
<tr>
<td>Iris verification engine (2)</td>
<td>less than 8.9 kilobytes</td>
<td>less than 650 bytes</td>
<td>less than 1150 bytes</td>
</tr>
<tr>
<td>Tri-modal verification engine (2)</td>
<td>less than 24.9 kilobytes</td>
<td>less than 750 bytes</td>
<td>see specific modalities above</td>
</tr>
</tbody>
</table>

(1) Native level integration (maximized accuracy configuration)
(2) Java Card post-issuance libraries (maximized speed configuration)
(3) The Java Card post-issuance libraries utilize Java level RAM for internal matching engine routines. The native level integrations temporary utilize RAM available at the native level while the internal routines run, thus consuming no static Java level RAM.

Template matching speed depends on microcontrolller capabilities and operating system of a specific smart card model.

MegaMatcher On Card SDK product brochure is available for downloading from Neurotechnology web site.
VeriFinger is a fingerprint identification technology designed for biometric systems developers and integrators. The technology assures system performance with fast, reliable fingerprint matching in 1-to-1 and 1-to-many modes.

VeriFinger is available as a software development kit that allows development of stand-alone and Web-based solutions on Microsoft Windows, Linux, macOS, iOS and Android platforms.

The VeriFinger algorithm is based on deep neural networks and follows the commonly accepted fingerprint identification scheme, which uses a set of specific fingerprint points (minutiae) along with a number of proprietary algorithmic solutions that enhance system performance and reliability.

- **Rolled-to-flat** fingerprints matching.
- Tolerance to fingerprint translation, rotation and deformation.
- Identification capability.
- Image quality determination.
- Adaptive image filtration.
- Features generalization mode.
- Compact fingerprint template.
- Scanner-specific algorithm optimizations for better performance.
The following VeriFinger SDKs are available:

- **VeriFinger Standard SDK** is designed for **PC-based, embedded and mobile** biometric application development. It includes Fingerprint Matcher and Extractor component licenses, programming samples and tutorials, fingerprint scanner support modules and software documentation. The SDK allows the development of biometric applications for Microsoft Windows, Linux, macOS, iOS and Android operating systems.

- **VeriFinger Extended SDK** is designed for biometric **Web-based** and network application development. It contains all features and components of the Standard SDK. Additionally, the SDK includes Fingerprint Client component licenses for PCs and mobile clients, sample client applications, tutorials and a **ready-to-use matching server** component.

### VeriFinger 11.1 algorithm technical specifications

(for a PC with Intel Core i7-4771 processor)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanner resolution</td>
<td>500 ppi recommended</td>
</tr>
<tr>
<td></td>
<td>250 ppi minimal</td>
</tr>
<tr>
<td>Template extraction time</td>
<td>0.6 seconds</td>
</tr>
<tr>
<td>Matching speed</td>
<td>40,000 fingerprints per second</td>
</tr>
<tr>
<td>Template size (configurable)</td>
<td>800 – 8,000 bytes</td>
</tr>
<tr>
<td>Maximum database size</td>
<td>Limited by the amount of free RAM</td>
</tr>
</tbody>
</table>

VeriFinger **algorithm demo** application, **30-day SDK Trial** and product **brochure** are available for downloading from Neurotechnology web site.
VeriLook SDK

Face identification for stand-alone or Web applications

- Live face detection
- Webcam capable
- Gender classification
- Age evaluation
- Emotions recognition
- Smile, open-mouth, closed-eyes, glasses and facial hair detection
- Near-infrared and visible light spectrum facial images matching
- Multiplatform: Microsoft Windows, Android, iOS, Linux and macOS

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

VeriLook is available as a software development kit that allows development of stand-alone and Web-based solutions on Microsoft Windows, Android, iOS, Linux and macOS platforms.

The VeriLook algorithm implements advanced face localization, enrollment and matching using robust digital image processing algorithms, which are based on deep neural networks:

- Multiple face detection in a single frame with simultaneous processing.
- Gender, age, the presence of open-mouth, closed-eyes, glasses, dark-glasses, beard and mustache, as well as person’s emotions can be optionally determined for each face in an image.
- Live face detection prevents breaching the system with photos in front of a camera.
- Tolerance to face posture allows for ±180 degrees of head roll, ±15 degrees of head pitch (nod) and ±90 degrees of head yaw (bobble).
- Multiple samples of the same face can be stored in a biometric template.
- Identification capability.
- Near-infrared and visible light spectrum face images can be used for face recognition and matched against each other.
- All-in-one component available for simple integration of facial recognition technology into high-security applications, like mobile banking transactions, which need only biometric identity verification.

Millions of algorithm deployments worldwide over the past 15 years.
The following VeriLook SDKs are available:

- **VeriLook Standard SDK** is designed for **PC-based, embedded or mobile** biometric application development. It includes Face Matcher, Face Extractor and Face Verification component licenses, programming samples and tutorials and software documentation. The SDK allows the development of biometric applications for Microsoft Windows, Linux, macOS, iOS or Android operating systems.

- **VeriLook Extended SDK** is designed 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 for PCs and mobile / embedded devices, sample client apps, tutorials and a **ready-to-use matching server** component.

### VeriLook 11.1 algorithm technical specifications
(for a PC with Intel Core i7-4771 processor)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal face size on an image</td>
<td>32 pixels between eyes</td>
</tr>
<tr>
<td>Recommended face size on an image</td>
<td>64 or more pixels between eyes</td>
</tr>
<tr>
<td>Single face template extraction time</td>
<td>0.6 seconds</td>
</tr>
<tr>
<td>Matching speed</td>
<td>40,000 faces per second</td>
</tr>
<tr>
<td>Template size (configurable)</td>
<td>194 or 464 bytes</td>
</tr>
<tr>
<td>Maximum database size</td>
<td>Limited by the amount of free RAM</td>
</tr>
</tbody>
</table>

VeriLook **algorithm demo** application, **30-day SDK Trials** and product **brochure** are available for downloading from Neurotechnology web site.
VeriEye iris identification technology is designed for biometric systems developers and integrators. The technology includes many proprietary solutions that enable robust eye iris enrollment under various conditions and fast iris matching in 1-to-1 and 1-to-many modes.

VeriEye is available as a software development kit that allows development of stand-alone and Web-based solutions on Microsoft Windows, Linux, macOS, iOS and Android platforms.

The proprietary algorithm implements advanced iris segmentation, enrollment and matching using robust digital image processing algorithms:

- Robust eye iris detection even when there are obstructions to the image, visual noise and/or different levels of illumination.
- Automatic interlacing detection and correction results in maximum quality of iris features templates from moving iris images.
- Image quality estimation can be used during iris enrollment to ensure that only the best quality iris template will be stored into database. Also, cosmetic (decorative) contact lens, which obscure an iris with some artistic or fake iris texture and/or change iris color, can be detected.
- Gazing-away eyes are correctly detected, segmented and transformed as if looking directly into the camera.
- Correct iris segmentation is obtained even when irises or their boundaries are not perfect circles and even not ellipses or the centers of the iris inner and outer boundaries are different.
- Eyelids, which partially occlude an iris, are detected and segmented from the iris image.
VeriEye is available as the following SDKs:

- **VeriEye Standard SDK** is designed for **PC-based, embedded and mobile** biometric application development. It includes Iris Matcher and Extractor component licenses, programming samples and tutorials, iris scanner support modules and software documentation. The SDK allows the development of biometric applications for Microsoft Windows, Linux, macOS, iOS and Android operating systems.

- **VeriEye Extended SDK** is designed for biometric **web-based** and network application development. It includes all features and components of the Standard SDK. Additionally, the SDK contains Iris Client component licenses for PCs and mobile devices, sample client applications, tutorials and a **ready-to-use matching server** component.

### VeriEye 11.1 algorithm technical specifications

<table>
<thead>
<tr>
<th>Spec</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal iris image diameter</td>
<td>64 pixels</td>
</tr>
<tr>
<td>Recommended iris illumination</td>
<td>Near-infrared</td>
</tr>
<tr>
<td>Iris template extraction time</td>
<td>0.6 seconds</td>
</tr>
<tr>
<td>Matching speed</td>
<td>40,000 irises per second</td>
</tr>
<tr>
<td>Template size</td>
<td>2.3 kilobytes</td>
</tr>
<tr>
<td>Maximum database size</td>
<td>Limited by the amount of free RAM</td>
</tr>
</tbody>
</table>

VeriEye algorithm demo application, 30-day SDK Trial and product brochure are available for downloading from Neurotechnology web site.
VeriSpeak voice identification technology is designed for biometric system developers and integrators. The text-dependent speaker recognition algorithm assures system security by checking both voice and phrase authenticity. Voiceprint templates can be matched in 1-to-1 (verification) and 1-to-many (identification) modes.

VeriSpeak is available as a software development kit that enables the development of stand-alone and Web-based applications on Microsoft Windows, Linux, macOS, iOS and Android platforms.

The VeriSpeak algorithm implements advanced voice enrollment and voiceprint matching using proprietary sound processing technologies:

- **Text-dependent algorithm.** The text-dependent speaker recognition is based on saying the same phrase for enrollment and verification. VeriSpeak determines if a voice sample matches the template that was extracted from a specific phrase enrolled by the person. This method assures protection against the use of a covertly recorded random phrase from that person. It may be also used for liveness check by requesting users to pronounce a specific phrase and prevent the using of voice recording.

- **Two-factor authentication with a passphrase.** VeriSpeak can be configured to work in a scenario where each user records a unique phrase (such as passphrase or an answer to a “secret question” that is known only by the person being enrolled). Later a person is recognized by his or her own specific phrase.

- **Text-independent algorithm.** Different phrases for user enrollment and recognition are more convenient, as this method does not require each user to remember the passphrase. It may be combined with the text-dependent algorithm to perform faster text-independent search and then verify with the more reliable text-dependent algorithm.
VeriSpeak is available as the following SDKs:

- **VeriSpeak Standard SDK** is designed for PC-based, embedded or mobile biometric application development. It includes Voice Matcher and Extractor component licenses, programming samples and tutorials and software documentation. The SDK enables the development of biometric applications for Microsoft Windows, Linux, macOS, iOS or Android operating systems.

- **VeriSpeak Extended SDK** is designed for biometric web-based and network application development. It includes all features and components of the Standard SDK with the addition of Voice Client component licenses for PCs and Android devices, sample client applications, tutorials and a ready-to-use matching server component.

### VeriSpeak 11.1 algorithm technical specifications (for a PC with Intel Core i7-4771 processor)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal audio sampling rate</td>
<td>11025 Hz</td>
</tr>
<tr>
<td>Minimal audio bit depth</td>
<td>16-bit</td>
</tr>
<tr>
<td>Voice template extraction time</td>
<td>0.6 seconds</td>
</tr>
<tr>
<td>Matching speed (unique phrase mode)</td>
<td>1,700 voiceprints per second</td>
</tr>
<tr>
<td>Matching speed (fixed phrase mode)</td>
<td>8,000 voiceprints per second</td>
</tr>
<tr>
<td>Template size</td>
<td>3.5 – 4.5 kilobytes</td>
</tr>
<tr>
<td>Maximum database size</td>
<td>Limited by the amount of free RAM</td>
</tr>
</tbody>
</table>

The specifications are given for 5-second long voice samples.

VeriSpeak 30-day SDK Trial and product brochure are available for downloading from Neurotechnology web site.
The Face Verification SDK is designed for integration of facial authentication into enterprise and consumer applications for mobile devices and PCs. The simple API of the library component helps to implement solutions like payment, e-services and all other apps that need enhanced security through biometric face recognition, while keeping their overall size small for easy deployment to millions of users.

Available on Android, iOS, Microsoft Windows, macOS and Linux platforms.

The Face Verification SDK is intended for developing applications which perform end-user identity verification in mass scale systems like:
- online banking and e-shops;
- government e-services;
- social networks and media sharing services.

The SDK is based on the VeriLook algorithm, which provides advanced face localization, enrollment and matching using robust digital image processing algorithms based on deep neural networks.

Different face liveness detection functionalities are included to implement anti-spoofing mechanism with the possibility of configuring the balance between security and usability of the application. The Face Verification SDK is able to prevent a security breach with placing a photo in front of the camera by determining whether a face in a video stream is “live” or a photograph. The liveness detection can be performed in passive mode, when the engine evaluates certain facial features, and in active mode, when the engine evaluates user’s response to perform actions like blinking or head movements.

- Compact library for deployment on mobile devices.
- Based on VeriLook technology with millions of deployments worldwide.
- Live face detection prevents spoofing.
- Android, iOS, Microsoft Windows, macOS and Linux supported.
- Programming samples in multiple languages included.
Face Verification SDK offers these functions and features for large-scale identity verification systems:

- **Simple, high-level API.** The API provides operations for creating face templates from camera or still image, face verification against a specific previously created face template, importing face templates which were created with VeriLook algorithm, as well as performing face liveness check.

- **Privacy and security.** The face images and biometric templates are kept on the client-side and do not leave the end-user device. The face images are required only for template creation and face liveness detection, thus they can be disposed just after performing these operations.

- **Live face detection.** A conventional face identification system can be tricked by placing a photo in front of the camera. Face Verification SDK is able to prevent this kind of security breach by determining whether a face in a video stream is “live” or a photograph. ICAO compliance check can be optionally used to strengthen the liveness check.

- **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 position.** The Face Verification SDK allows head roll, pitch and yaw variation up to 15 degrees in each direction from the frontal position during face detection and up to 45 degrees in each direction during face tracking.

- **Transaction-based licensing.** Face Verification SDK is licensed for each successful biometric operation. This model requires to pay only for successfully created biometric templates or passed liveness check operations, while having unlimited free template verification operations.

- **Centralized transaction accounting.** Biometric transactions licensing and accounting is performed by the Face Verification Server component which can be run on customer’s premise or at Neurotechnology-hosted cloud. This licensing architecture allows the user to track easily how much biometric transactions are performed. The connection to the Server component is usually required only during new user enrollment, and the verify operation is designed to be performed completely offline.

An **algorithm demo** app for Android, **SDK Trial** for all platforms and product **brochure** are available for downloading from Neurotechnology web site.
FingerCell SDK

Fingerprint identification for embedded platforms

- Fast performance even on low speed processors
- Verification and identification
- Compact fingerprint template and unlimited database size
- ANSI and ISO biometric standards support.
- Cross platform algorithm with compact portable source code
- FingerCell Demo Unit with pre-installed algorithm is optionally available

FingerCell technology is designed for embedded biometric systems developers and features **compact**, **sensor-independent** and **cross-platform** fingerprint recognition algorithm. It offers decent **performance** on various embedded devices based on low-power microcontrollers or processors.

FingerCell is available for integrators as Software Development Kits (SDK) with FingerCell library or source code for developing a fast and reliable system on embedded or mobile platform.

FingerCell is designed to provide decent reliability and identification speed for various embedded devices and platforms. The FingerCell algorithm includes these proprietary solutions:

- Fingerprint template extraction from an image and verification against another template is performed in less than **less than 0.7 seconds** on a **168 MHz** ARM Cortex-M4 family processor, which is acceptable for embedded systems.

- FingerCell is suitable not only for fingerprint verification (1-to-1 matching), but also for identification (1-to-many matching).

- FingerCell is designed for easy implementation into very various and specific applications. The algorithm's **source code** is sensor independent; therefore it can be ported to various platforms and hardware. Compiled code and internal data arrays require only **128 kB** of memory and therefore can be implemented in low memory microchips, thus reducing hardware costs. Larger fingerprints processing will need some additional memory.

- FingerCell Demo Unit. Neurotechnology offers pre-installed FingerCell algorithm on testing hardware for the technology evaluation. The Demo Unit is available on request.
FingerCell SDK provides interoperability with other Neurotechnology biometric SDKs or third party products, as it can generate and match templates in ANSI/ISO formats. FingerCell SDK components are designed for using in different scenarios:

- **Template extraction and matching on embedded device.** This scenario offers privacy and security, as biometric templates do not leave the device.
- **Template extraction on embedded device, template matching on smart card.** Privacy and security is achieved by smart card usage for identity verification, as biometric information is only transferred from embedded device to smart card and is not exposed. *MegaMatcher On Card* or other vendors match-on-card technologies can be used.
- **Template extraction on embedded device, template matching on server or cloud.**
- **Template extraction on PC or mobile device, template matching on embedded device.**

<table>
<thead>
<tr>
<th>FinerCell 3.2 algorithm technical specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>(for embedded hardware based on ARM Cortex-M4F microcontroller, running at 168 MHz)</td>
</tr>
<tr>
<td><strong>Minimal recommended fingerprint image resolution</strong></td>
</tr>
<tr>
<td><strong>Template extraction time</strong></td>
</tr>
<tr>
<td><strong>Template verification time</strong></td>
</tr>
<tr>
<td><strong>Matching speed</strong></td>
</tr>
<tr>
<td>**Template size with 16</td>
</tr>
<tr>
<td><strong>Maximum database size</strong></td>
</tr>
</tbody>
</table>

FingerCell technology capabilities can be evaluated with **30-day SDK Trial** for Microsoft Windows. The trial is available for downloading from Neurotechnology web site.
NCheck Bio Attendance is an end-user biometric system designed to automate attendance control. The system may be used in a wide range of business applications, from employee time tracking to check-in at events, clubs, clinics, public and commercial facilities.

The NCheck software uses biometric fingerprint, face and iris identification to track the time of each user presence. It automatically calculates summary time for each user and generates printable reports. The software is designed for installation on a desktop computer or laptop or tablet (PC) that is running under Microsoft Windows. Also, NCheck can be used on Android-based smartphones or tablets.

- **Full control on user attendance.** All arrival and departure events for every registered person are stored. There are no limitations on how many times a user checks with the system, so all leaves can be registered with the systems.
- **GPS logging.** NCheck can optionally determine and store user location during checking. This feature is useful for remote employee attendance tracking.
- **Employee groups and shift schedules.** Users can be arranged into groups according to organization’s structure. Rosters can be created and assigned for each group. Restrictions can be specified for each user group.
- **Bring Your Own Device.** NCheck Bio Attendance may be used in BYOD scenario, when employees or other users install a small Android app on their personal smartphones or tablets and perform check-in or check-out by making selfie photos. The client app can communicate with NCheck cloud or server-side NCheck installation on premises.
- NCheck product brochure and fully functional 30-day trial version of the application are available for downloading.

See demo video: https://youtu.be/Eo3SSX---64
The NVeiler Video Filter is a plug-in for VirtualDub video processing software. The plug-in automatically detects faces in a frame and hides them by using pixelation effect. Also it is capable to track the moving faces in subsequent frames and hide them, as well as detect new faces without user intervention.

Users can choose to hide selected faces or parts of the faces, as well as use the plug-in for hiding other objects.

- **Automatic face detection** – The plug-in’s internal engine is able to detect faces in a frame. All detected faces will be pixelated. Users can configure face detection parameters or disable it.
- **Manual face selection** – Users can select faces by hand if the automatic face detection is disabled. The selected faces will be hidden whereas non-selected faces will remain visible.
- **Face part or non-face objects hiding** – The plug-in allows to select and hide a part of a face by choosing a corresponding rectangular region in a frame. Also this method allows to choose non-face objects to be hidden (i.e. car license plates, logos, etc.)
- **Automatic tracking** – Users do not have to deal with all selected frames as each detected face or selected object will be tracked and obscured in all subsequent frames automatically until it will disappear.
- NVeiler product brochure and fully functional 30-day trial version of the plug-in are available for downloading.
SentiVeillance Server and SDK

Persons or vehicles recognition and tracking for surveillance systems and VMS

- Biometric persons identification and tracking
- Pedestrians and vehicles tracking and classification
- Automated license plate recognition (ALPR) for moving vehicles
- Real-time watch list check with automatic event triggering, logging and reporting.
- Search for events in a timeframe by person ID, gender or age.
- Large surveillance systems support with multiple video stream processing.

SentiVeillance Server is a ready-to-use software for easy integration of biometric face identification, vehicle and pedestrian classification and tracking, as well as automatic license plate recognition into operating video management systems (VMS). The ready-to-use software analyzes live video streams, which are served by a VMS from surveillance cameras.

A video management system (VMS) usually provides only motion detection functionality and can help to filter out parts of video from surveillance cameras when there is no movement. SentiVeillance Server software enhances existing VMS with these features and functions:

- Ready-to-use software needs only configuration for connecting VMS.
- Compatible with Milestone XProtect VMS and Luxriot Evo S and Evo Global video management systems.
- All video streams received from connected VMS are analyzed in parallel. Biometric recognition is performed in real-time. All watch list match events trigger alerts, which are sent back to the VMS.
- Each SentiVeillance Server can analyze up to 10 video streams in parallel. Several Servers can connect to the same VMS, as well as several VMS can be connected to the same Server, meaning surveillance systems with any number of cameras supported.
- SentiVeillance SDK is optionally available for developing software that performs biometric face identification, vehicles and pedestrians classification and tracking, with optional license plate recognition for detected vehicles.

List of possible uses includes law enforcement, traffic monitoring, security, attendance control, visitor counting, traffic monitoring and other applications.
The technology, which powers the SentiVeillance Server software and SentiVeillance SDK, features real time performance, capability to process data from multiple video streams in parallel and automatic events logging and reporting. The technology supports these modalities:

- **Biometric face recognition** – based on deep neural networks, it provides reliable face detection and tracking with accurate identification against large watch list databases. Optionally, gender classification and age estimation, as well as facial attributes detection (smile, glasses, beard etc) can be performed.

- **Vehicle or human detection, classification and movement tracking** – performs object detection of moving and static objects in the scene, their classification and tracking until they disappear. This modality can determine object type (pedestrian, car, bike, truck or bus), as well as perform its color and movement vector estimation.

- **Automated license plate recognition (ALPR)** – SentiVeillance ALPR algorithm can process traffic data by simultaneously reading vehicle license plates from multiple moving vehicles. The algorithm is tolerant to camera position and can read license plates from longer distance and higher angle. Vehicle recognition and ALPR modalities can be used together to prevent cheating with replaced license plates by checking if recognized license plate corresponds other registration data, like vehicle color or type, and not being spoofed or moved from another vehicle.

The SentiVeillance SDK also provides these specific capabilities for software developers:

- **Automatic enrollment** for unknown persons with further identification of these persons.

- **Video files processing**, either in real time as coming from a virtual camera, or at maximum possible speed depending on available hardware resources.

- **Programming samples and tutorials** for each of the supported modalities are intended for helping software developers to integrate the needed functionality into their systems.

- **Flexible licensing**, based on the number of processed video streams.

SentiVeillance algorithm demo application, 30-day Server software Trial and SDK Trial are available for downloading from Neurotechnology web site.
SentiBotics Navigation SDK

Imitation learning-based autonomous robot navigation kit

The software development kit is designed for researchers and engineers working on autonomous robot navigation projects. The kit may be also used for educational purposes in universities and other education institutions.

SentiBotics Navigation SDK relies on a single webcam and two low cost ultrasonic range finders for input and allows autonomous navigation over long distances (hundreds of meters or more). The new SDK enables navigation system training with further adaptation to visual changes in the environment through additional user input. The SDK features:

- **Imitation learning based autonomous robot navigation** – a user first runs the robot in the desired closed trajectory using the control interface. During this process, a deep neural network is trained on captured images of the environment and control pad commands. Once the training is complete, the robot may be placed at any point along the learned trajectory and it will function autonomously within that environment.

- **Object learning and recognition** – users may enroll objects of interest into the included object recognition engine for additional enhancement of the controller-learned space.

- **Robot and environment simulation** – a test environment, complete with an office layout and simulated SentiBotics robot, is included.

- **Basic obstacle handling** – the robot can use its two front-facing ultrasonic sensors to detect obstacles, such as a person crossing the trajectory.

- **Autonomous recharging** – a robot can be trained to look for the charging station and connect to it when needed, using its object recognition and precise positioning capabilities.

Available as either a software-only option for integration into existing robotics hardware, or as a ready-to-run robotics system that includes Neurotechnology’s mobile reference platform prototype.

See demo video: https://youtu.be/szkdsh3KETA
A robotics kit with ready-to-run mobile robot prototype is optionally available with SentiBotics Navigation SDK. The robotic hardware consists of:

- **Tracked platform**, capable of carrying a payload of up to 10 kg.
- **Two 3D cameras** that allow the robot to “see” and recognize objects at a range of 0.15 to 3.5 meters.
- **Onboard computer** (Intel NUC i5 computer with 8 GB of RAM, 64 GB SSD drive, 802.11n interface).
- **Battery** (20 Ah 4-cell LiFePO₄) with charger.
- **Autonomous recharging** hardware with a docking station.
- RGB camera and 3D sensor.
- Control pad.

The SentiBotics Navigation Software Development Kit (SDK) is intended to be used either with a robot, based on SentiBotics platform or in a Gazebo simulation. The SDK also provides easy integration with custom mobile robot hardware. SentiBotics Navigation SDK includes:

- One SentiBotics Navigation component installation license.
- Set of ROS packages including source codes (in Python and C++) of all algorithms and full documentation.
- ROS-based infrastructure that allows users to rapidly integrate third party robotics algorithms, migrate to other hardware (or modify existing hardware) and provides a unified framework for robotic algorithm development.
- Video tutorials how to train and run navigation controllers, learn and recognize objects.
- SDK documentation.
- Robot hardware specifications.

**30-day SDK trial** is available for running in Gazebo robotics simulator.

Please contact us for more information on licensing SentiBotics kit and ordering it.
SentiMask SDK

3D face tracking for augmented reality apps and digital characters control

- Real-time face detection and tracking
- Facial pose, landmarks, shape and expression estimation
- 3D facial mesh generation
- Gender and age estimation
- Glasses, beard, mustache and hat detection
- Works with regular webcams and smartphone cameras
- Integration with other software

SentiMask is designed for development of augmented reality applications, which use real-time 3D face tracking technologies for motion capture and controlling 3D digital character’s facial expressions or mapping animated avatars on user’s face. The technology works with regular cameras and common PC or smartphones and is available as a software development kit that provides for the development of 3D face tracking systems for Microsoft Windows, Android, iOS, macOS and Linux.

The possible applications of the SentiMask technology include:

- **Motion capture** for 3D characters’ face animation in entertainment applications, like computer games, communication apps etc.;
- **Augmented reality** applications, like virtual makeup, appearance changes evaluation, etc.
- **Facial features analytics** for interactive applications, which provide user experience based on person’s gender, age or facial expression.

The technology has these capabilities for 3D face tracking applications:

- Facial features detection and tracking from live video is performed in real time on a regular PC or smartphone.
- **Face-based analytics** allow to estimate person’s age and gender, as well as recognize 23 different facial expressions and determine if the person has beard, mustache, glasses or hat.
- **3D facial mesh** (wireframe model) is reconstructed from a facial image. A custom texture can be applied to the mesh, or the mesh points can be used as a reference for changing the appearance of an animated character.
- SentiMask-generated data can be used in a custom application or passed to a 3D modelling software, as well as game engines.

See demo video: http://youtu.be/z_zRa6S9oV0

![QR Code](image)
SentiMask SDK distribution package contains:

- One SentiMask component installation license for PC or Mac;
- One Mobile SentiMask component installation license for iOS or Android;
- SentiMask algorithm;
- Device Manager Library for video capture;
- Programming samples in C++ for Microsoft Windows, macOS and Linux;
- Programming samples in Objective C for iOS;
- Programming samples in Java for Android;
- SentiMask SDK documentation.

SentiMask has these specifications and usage recommendations:

- Only one face in a frame is processed. If there are more than one face in a frame, the largest one is processed.
- 32 pixels is the minimal distance between eyes for a face on video stream to perform face detection reliably.
- Face posture tolerance allows ±180 degrees head roll, ±25 degrees head pitch and ±35 degrees head yaw.
- Face detection and facial features estimation in a video frame is performed in 8 milliseconds on a PC with Intel Core i7-4790 processor running at 3.6 GHz clock rate.

SentiMask 30-day SDK Trial and product brochure are available for downloading from Neurotechnology web site.
SentiSight.ai is a place to build task-specific AI models for image recognition using modern deep-learning techniques. The platform provides capabilities for object detection and image classification. It is easy to use and automatically performs most of the image-processing tasks. No coding is required.

The generated AI models can be used for a wide variety of image analysis tasks in this application fields:

- **Industry** - detect corrupted products on conveyors, like damaged boxes or rotten apples.
- **Agriculture** - recognize culture in large fields, detect plants which need watering, separate ripe and raw fruits.
- **Medicine** - detect tissue anomalies in microscopic images, like corrupted cells.
- **Retail** - identify or validate items at a self-service cash register.
- **Social media** - moderate, validate and filter user content, like detecting nudity or guns, as well as block photos with embedded logos, spam text or QR codes.
- **Data management** - group pictures by type, shape, size or similarities, like classify animal species or identify activity type.
- **Infrastructure** - analyze aerial photos to locate i.e. road potholes, broken rails, damaged solar panels etc.
- **E-commerce** - tag product images by extracting information from them, like item type, color or printed logo, as well as offer similar products based on provided photo or image.
- **Advertising** - capture face images and analyze them for emotional reactions after showing certain ad or content.

Try it online: [https://www.sentisight.ai/](https://www.sentisight.ai/)
The interactive environment of SentiSight.ai is designed for training deep-learning models and provides these capabilities:

- **Image labeling toolkit** – allows attaching labels to images for image classification, object detection and image segmentation models. An intuitive interface makes labeling faster and easier. Output labels are automatically saved in a format suitable for deep-learning algorithms.

- **Training environment** – a model can be trained on the prepared images without any coding via the intuitive user interface.

- **Interactive statistics** – information about the model’s performance is produced after the training process. Prediction accuracy, precision, recall and many other metrics allow users to measure their models’ performance. This information can be immediately viewed and filtered to briefly state how efficient the model is as well as give guidance on its improvement.

- **Online model use** – all models trained by a user can be employed to make predictions based on new, previously unseen images. The models can be used online inside the SentiSight.ai platform or via a REST API.

A **custom project** can be ordered if a task seems to be “non-standard” or rather complicated. In this case our experts will take care of the model’s setup and training. The user just needs to take care of image labeling.

See the [www.sentisight.ai](http://www.sentisight.ai) website for more information.
SentiSculpt SDK

3D object models creation from regular images

- Converts series of photos into 3D model
- Works with common camera
- Automated 3D model generation
- Reconstructs point clouds, generates meshes, maps textures
- Export to widely supported 3D graphics and CAD formats

SentiSculpt is designed for software developers who want to use computer vision-based 3D object model reconstruction from images in their applications. Object models are created automatically from sets of photos, which were captured from different angles using regular cameras or smartphones.

SentiSculpt is available as a software development kit that provides for the development of 3D object model creation systems for Microsoft Windows.

SentiSculpt generates models which are suitable for wide range of applications, including virtual or augmented reality, video games creation, 3D printing, computer aided design, architecture etc. The object size may range from a small toy to a large building. The technology is designed to work with common cameras instead of expensive 3D scanners.

The SentiSculpt technology has these capabilities for 3D object model reconstruction:

- Series of object photos made from different angles are needed for 3D model reconstruction. Each photo is analyzed by the advanced computer vision algorithms, and certain features of the object are captured for the creation of a realistic 3D model.
- The photos for the 3D object model reconstructions can be made with an off-the-shelf camera or a smartphone. A tripod can be used for improving photography quality. The optimal model creation performance needs 2-5 megapixel camera resolution.
- Simple workflow does not require any advanced skills for 3D model creation, as the input is usually a folder with images. The algorithm analyzes each image, recreates the shooting angle, extracts the necessary features and adds them to the object model.

SentiSculpt SDK 30-day trial is available for downloading.

See demo video: https://youtu.be/IewLNiWfN1U
SentiGaze SDK

Real-time eye movement tracking using webcam and PC

- Webcam and common PC required, no specialized hardware
- Real-time eye movement tracking without physical contact
- Heat map generation for single and multiple subjects’ gaze stats
- Application control with gaze
- Accessibility for disabled people
- Compatible with other Neurotechnology products

SentiGaze is designed for developers who want to use computer vision-based gaze tracking in their applications. The technology works with webcam and common PC. Usage convenience is ensured by contactless eye movement tracking and calibration to specific screen size and user position.

SentiGaze is available as a software development kit that provides for the development of gaze tracking systems for Microsoft Windows.

The possible applications of the SentiGaze technology include:

- Heat map based research and analytics for single and multiple subjects, like testing usability of websites and apps, film screening, advertising research for both TV and static ads.
- Device and application control, like full or auxiliary control of an application or device, working with multiple screens, video games, accessibility for disabled people.
- Medical and scientific research which needs to detect and track subject’s eye movement.

SentiGaze can be used with other Neurotechnology products for applications which require additional biometric data. For example, biometric algorithms from VeriLook SDK can be used to determine subject’s gender and detect emotions, or even identify a previously enrolled subject.

SentiGaze algorithm demo application and 30-day SDK trial are available for downloading.

See demo video: https://youtu.be/B7P6VI4GRGE