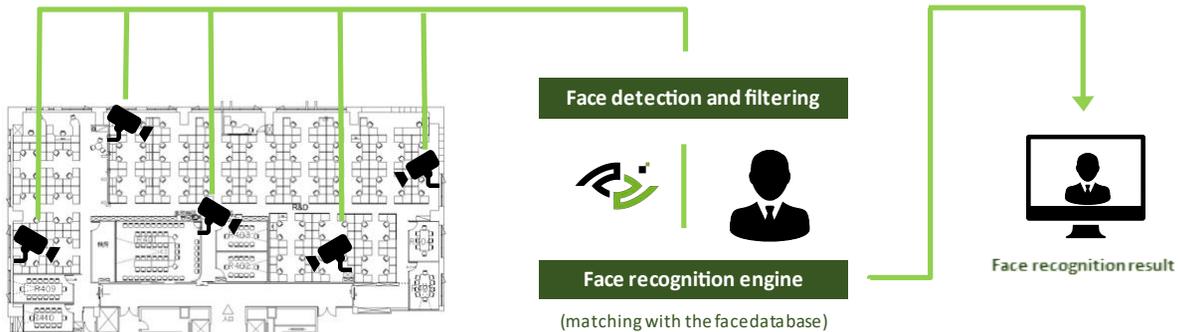# AICUDA TECHNOLOGY

Artificial Intelligence Face Recognition

Next generation artificial intelligence face recognition

Aicuda's VAIDIO Series enable the simultaneous identification of multiple persons in real time accross several live camera streams. VAIDIO face recognition continuously detect and recognize faces of persons in the camera's field of view. VAIDIO face search enables the rapid search of a person in video footage based on the upload of images of the target person's face. The face search engine avoids privacy regulations and restrictions as names and faces are not stored in the database. The face search algorithms compare a target face against all faces in the recorded video and not against a known face database.

Face detection and filtering

Face recognition engine
(matching with the face database)

Face recognition result

The VAIDIO face recognition solution relieves operators from continuous monitoring and let the technology do the surveillance for them. Detected faces are shown on a map with camera location and time stamp.

High Performance

- Identify persons across multiple cameras in < 2 seconds to enable fast response time

- Accuracy > 95% for environments with good camera angles and lighting

- The face in the upload image and video should be at least 120 pixels for high accuracy > 95%

Cost Saving

- No need to purchase expensive built-in face recognition cameras

- Multiple cameras can share the face recognition software running on the platform to save license costs

- Intelligent video filter for filtering out images without a face - only images with faces are fed to the face recognition engine

Easy Maintenance

- The face recognition engine can be upgraded on the server side for ease of maintenance

- The VAIDIO face recognition engine is easy to integrate with ONVIF IP cameras

- Unified user interface, learn once and apply to different face recognition engines

AICUDA TECHNOLOGY

Examples of use cases

Missing persons in public places - missing child in shopping mall: a child can easily get lost in a shopping mall. Manual effort of searching for the child on video footages and physically surveying the area takes a lot of time and the likelihood of finding the child decreases as more time passes. With VAIDIO face search, security officers can quickly upload an image of the child and obtain a full list of camera feeds that show the child. Based on the camera and time stamp, the security officers can locate the child almost immediately.

Crime suspect management: quickly identify and alert for blacklisted individuals (thief, robber, terrorist) when they appear in the camera's field of view. Face search is used for airport security to identify suspects as they go through check-in by automatically scanning and matching their faces to a face database. Face search is also used for school campus protection to identify, locate and stop a weapon carrier to prevent a mass shooting at school. Face recognition enables authorities to locate the suspect and trace his movements within seconds using multiple camera feeds.

Attendance management: students are compared to a face database for check-in as they enter a class room and check-out as they leave a class room. Administration effort of teachers decrease and time to respond increase in case students are missing or leave campus without permission.

Biometric Characteristics

Biometric identification is facing a variety of challenges because the faces captured by the cameras are not exactly identical to the reference faces in the photo library. VAIDIO face recognition algorithms are able to recognize the following variations:
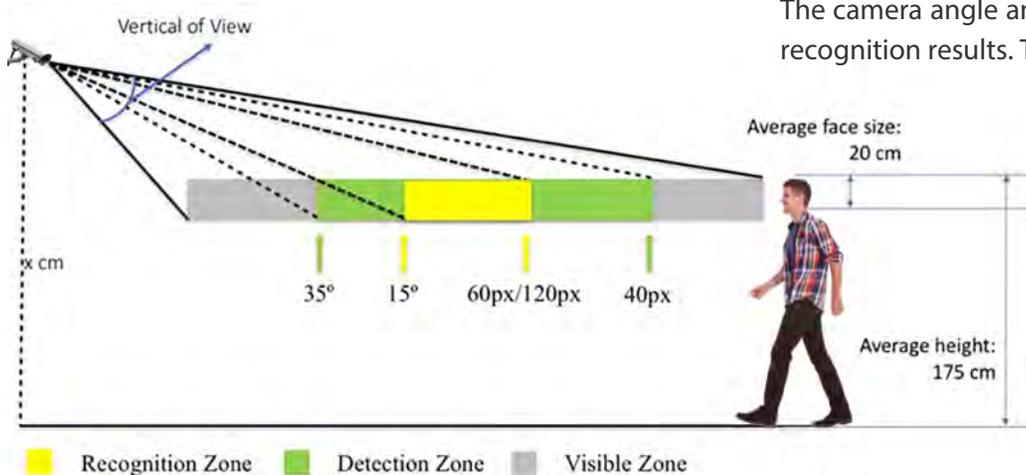- Changes in facial expression
- Changes in beard and hairstyle
- Changes due to moderate aging
- Partial occlusions of the face such as hats, scarves caps, glasses and sunglasses
- Variations in lighting conditions and ambient illumination down to 1 LUX
- Head pose deviations up to 35° horizontally and vertically
- Blur (out of focus or motion)
- Video artifacts due to compression

Camera installation

Color information is not a requirement for face recognition. Grayscale images of at least 8 bits (256 gray values) are supported. Since the face sizes may vary from one person to another, the face resolutions are typically estimated by measuring the distance between the center of the eyes (interocular distance) in pixels.

The camera angle and focal length affect the face recognition results. The optimal resolution involves 50 pixels between the eyes, which can be considered $\pm$ 6 cm, so a resolution of 833 pixels / meter is required. At a distance of 20 meters, this value represents a lens of $\pm$ 65 mm or 46 mm for the frame resolutions of 720p or 1080p, respectively.

Vertical of View

x cm

35°   15°   60px/120px   40px

Average face size: 20 cm

Average height: 175 cm

Recognition Zone   Detection Zone   Visible Zone

VAIDIO 100 Series SMB

Intelligent appliance for small-and-medium sized video surveillance deployments. Reliable and easy to set up. It is the ideal solution for customers requiring a cost-effective solution. The VAIDIO search engine is intuitive and based on easy-to-use natural language interface.

VAIDIO VSB 110 / 130

◎ Highlights

- Excellent value for an intelligent surveillance appliance
- VAIDIO solutions are trained, not programmed
- Significant time and cost savings
- Out of the box solution
- 2 year warranty on hardware / 1 year software maintenance
- Supports all ONVIF devices

Ideal for:

- Small-sized installations: companies, hotels, retail stores, schools

Simple Configuration

The open architecture technology of the VAIDIO Series makes it easy to integrate with 3rd party hard- and software products. Connect to surveillance cameras for live streaming or to NVR or DVR for playback. Meta data is extracted from video files and stored on the VAIDIO appliance for fast video search and review.

VAIDIO VSB 510 / 530 / 550 / 570

VAIDIO 500 Series Enterprise

Intelligent appliance ideal for mid-sized as well as large-sized video surveillance installations. Reliable, cost-effective and easy to deploy and maintain. Powerful solution for the most demanding artificial intelligence tasks.

There are 4 enterprise models available. VAIDIO VSB 510 is offered with a single NVIDIA 8GB High Performance GPU. VAIDIO VSB 530 and 550 are equipped with a dual NVIDIA 8GB High Performance GPU. VAIDIO VSB 570 is offered with a dual NVIDIA 16GB High Performance GPU.

◎ Highlights

- High-performance intelligent appliance
- Up to 128 channels
- VAIDIO solutions are trained, not programmed
- Out of the box solution
- 2 year warranty on hardware / 1 year software maintenance
- Supports all ONVIF devices

Ideal for:

- Mid-sized installations: corporate facilities, supermarkets
- Large-sized installations: airports, banks, campus grounds, casinos, city surveillance, entertainment venues, public facilities, shopping centers, theme parks, tourist attractions

Key Functions

Aicuda VAIDIO Face Search is a sub-function of Face Recognition. The face search algorithm compares uploaded target faces with faces from camera streams or uploaded videos. Run face search by uploading an image of a person of interest or by selecting a detected face from live stream cameras. In both ways VAIDIO face search checks all selected history records in a pre-defined time frame and shows the face images that match the target face. Face search results include information about age and gender, location and time stamp.

Features

Face Detection	• Auto face detection from IP cameras or user uploaded videos / images. • Supports age and gender detection. • Simultaneous detection of multiple faces in one video / photo. • Decode live streams into video frames and store the frames with faces as images in VAIDIO.
Face Recognition	• Auto face detection from IP cameras or user uploaded videos / images. • Simultaneous detection of multiple faces in one video / photo. • Compare faces with pre-defined watchlists. • Supports multiple black lists / white lists. • Compare and display face similarities. • Enable 1:1 and 1: N face matching. • Provide full image and 10 second playback clip of the event when a face appears.
Video / Image Live View	• Easy integration with ONVIF IP cameras. • Unique ID for every detected face. • Store faces as images including time stamp. • Supported video formats: MPEG2, MPEG4, AVI. • Supported image formats: JPG, JPG2000, PNG, BMP, TIFF. • Enable live view as video wall.
Alert	• Alert and log when a pre-defined face is recognized. • Alert when a face is detected that is not in any list. • Show detected face on a map with camera location. • Create track and direction of target face with location and time stamp.
3rd Party Support	• Compatible with cameras like Axis, Bosch, Hanwha, Mobotix, Sony and others. • Compatible with leading VMS like Axxonsoft, Digifort, Genetec, ISS, Milestone and Qognify. • Provide RESTful API to obtain face information and related events.
System Structure	• O/S: Microsoft Windows or Linux (physical or virtual machine). • Supports megapixel IP cameras with a minimum resolution of 1MP (720p). Supports 4K and 8K IP cameras. • Minimum camera frame rate: 15 fps. • Multiple face detection and face recognition engines run in parallel as a cluster in active-active mode. • Face detection and face recognition are load-balanced in the server(s).

Deep Learning Technology

Surveillance is a repetitive and mundane task. This may cause performance dips for human beings. Aicuda Technology is developing AI solutions based on deep learning to let the technology do the surveillance for us.
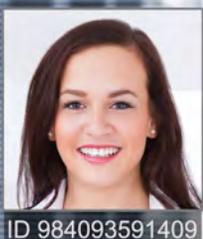
Customer pain points

- Inability to perform object and person search in recorded video files from multiple sources like surveillance camera, internet or smartphone.

- Option for fast, real-time search for hundreds of object types is not available.

- Accidental elimination or overlooking of key video events due to human errors.

- High false alarm rates due to the inability to distinguish different object types in legacy sensor-based systems.

- Unavailability of an all-in-one solution that is able to support video search, face search & recognition, intrusion detection, weapon detection and real time alerts with a high accuracy rate.

Aicuda VAIDIO customer benefits

Aicuda VAIDIO face recognition is the industry's first artificial intelligence solution with a simple and easy user interface. The intelligent software eliminates the need to manually inspect hours of video for objects or persons of interest. The VAIDIO series seamlessly transforms video into actionable intelligence.

- **All-in-One Solution**
  Supports multiple functions like video search, face search and face recognition, fire detection, intrusion detection, license plate recognition, and weapon detection.

- **Ability to learn**
  Platform is able to learn from experience using a multi-layer neural network. It is trained to recognize humans, items and patterns, not programmed.

- **Intuitive, easy-to-use interface**
  Google-like search engine and intuitive result display based on easy-to-use natural language interface.

- **Plug-and-play**
  Out of the box ready to use artificial intelligence solution with pretrained self learning artificial intelligence models.

- **Partner Proven**
  Fully compatible with ONVIF IP cameras like Axis, Bosch, Hanwha, Mobotix and Sony. Compatible with leading VMS, including Axxonsoft, Digifort, Genetec, ISS, Milestone, Qognify and others.

- **Significant increase in productivity**
  Rapidly pinpoint persons and objects of interest. Review hours of video in minutes.

Product Specifications

Model	VAIDIO VSB-110	VAIDIO VSB-130	VAIDIO VSB-510	VAIDIO VSB-530	VAIDIO VSB-550	VAIDIO VSB-570
Product Image						
Model Series	VAIDIO 100 series	VAIDIO 100 series	VAIDIO 500 series	VAIDIO 500 series	VAIDIO 500 series	VAIDIO 500 series
Video Search	Max. 13 channels	Max. 26 channels	Max. 26 channels	Max. 52 channels	Max. 52 channels	Max. 96 channels
Intrusion Detection	Max. 8 channels	Max. 16 channels	Max. 16 channels	Max. 32 channels	Max. 52 channels	Max. 64 channels
FR / FS	Max. 4 channels	Max. 8 channels	Max. 8 channels	Max. 16 channels	Max. 32 channels	Max. 32 channels
FR Database	1000 persons (5 faces per person)	1000 persons (5 faces per person)	10,000 persons (5 faces per person)	10,000 persons (5 faces per person)	10,000 persons (5 faces per person)	10,000 persons (5 faces per person)
Object Left Behind	Max. 4 channels	Max. 8 channels	Max. 8 channels	Max. 16 channels	Max. 32 channels	Max. 32 channels
AI PPE	Max. 8 channels	Max. 16 channels	Max. 16 channels	Max. 32 channels	Max. 52 channels	Max. 64 channels
AI People Count	Max. 2 channels	Max. 4 channels	Max. 4 channels	Max. 8 channels	Max. 16 channels	Max. 16 channels
AI Vehicle Count	Max. 2 channels	Max. 4 channels	Max. 4 channels	Max. 8 channels	Max. 16 channels	Max. 16 channels
Clustering	Yes	Yes	Yes	Yes	Yes	Yes
Form Factor	Tower-PC	Tower-PC	1U-Server	2U-Server	2U-Server	2U-Server
CPU	Intel Core i5	Intel Core i7	Intel Xeon	Dual Intel Xeon	Dual Intel Xeon	Dual Intel Xeon
AI GPU	NVIDA Performance GPU 4GB	NVIDA Performance GPU 8GB	NVIDA Performance GPU 8GB	NVIDA Performance Dual GPU 8GB	NVIDA Performance Dual GPU 8GB	NVIDA Performance Dual GPU 16GB
AI Storage	Include one 1TB HDD 1x 3.5" SATA III internal disk bay	Include one 2TB HDD 1x 3.5" SATA III internal disk bay	Include one 2TB HDD 2x 3.5" SATA III hot swap disk bay	HDD not included 6x 3.5" SATA III hot swap disk bay	HDD not included 6x 3.5" SATA III hot swap disk bay	HDD not included 6x 3.5" SATA III hot swap disk bay
Network	One Gigabit Ethernet	One Gigabit Ethernet	Dual Gigabit Ethernet	Dual Gigabit Ethernet	Dual Gigabit Ethernet	Dual Gigabit Ethernet
System HDD	240GB SSD	240GB SSD	480GB SSD	Dual 480GB SSD	Dual 480GB SSD	Dual 480GB SSD
Memory	8GB	16GB	16GB	32GB	64GB	64GB
RAID Support	No RAID Support	No RAID Support	RAID 0,1 Support	RAID 0,1,5,6 Support	RAID 0,1,5,6 Support	RAID 0,1,5,6 Support
HDD Support	1, 2, 4, 6, 8, 10, 12TB	1, 2, 4, 6, 8, 10, 12TB	1, 2, 4, 6, 8, 10, 12TB	1, 2, 4, 6, 8, 10, 12TB	1, 2, 4, 6, 8, 10, 12TB	1, 2, 4, 6, 8, 10, 12TB
Stackable	Yes	Yes	Yes	Yes	Yes	Yes
Rack Mount	No	No	Yes	Yes	Yes	Yes
Video File Format	MP4,WMV,AVI, MOV,MPG	MP4,WMV,AVI, MOV,MPG	MP4,WMV,AVI, MOV,MPG	MP4,WMV,AVI, MOV,MPG	MP4,WMV,AVI, MOV,MPG	MP4,WMV,AVI, MOV,MPG
Supported codecs	H.264, H.265, MJPEG, MPEG1, MPEG2, MPEG4, VC1, VP8, VP9	H.264, H.265, MJPEG, MPEG1, MPEG2, MPEG4, VC1, VP8, VP9	H.264, H.265, MJPEG, MPEG1, MPEG2, MPEG4, VC1, VP8, VP9	H.264, H.265, MJPEG, MPEG1, MPEG2, MPEG4, VC1, VP8, VP9	H.264, H.265, MJPEG, MPEG1, MPEG2, MPEG4, VC1, VP8, VP9	H.264, H.265, MJPEG, MPEG1, MPEG2, MPEG4, VC1, VP8, VP9
File-Based Ingestion	Multi File Videos or Single File Videos	Multi File Videos or Single File Videos	Multi File Videos or Single File Videos	Multi File Videos or Single File Videos	Multi File Videos or Single File Videos	Multi File Videos or Single File Videos
Warranty	2 years warranty HW 1 year SW maintenance	2 years warranty HW 1 year SW maintenance	2 years warranty HW 1 year SW maintenance	2 years warranty HW 1 year SW maintenance	2 years warranty HW 1 year SW maintenance	2 years warranty HW 1 year SW maintenance

* For every camera channel with Aicuda Technology Video Analytics, Video Search is automatically included.
* People Counting includes people counting, person reverse direction movement, person fall / crouch and loitering detection.
* Vehicle Counting includes vehicle counting, vehicle reverse direction movement and illegal parking detection.
* Design and specifications are subject to change without notice.

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