Learning Teaching Training Activity (LTTA)
Intellectual Output 2 - Design and Implementation of Open-source Privacy-preserving Toolkit and Application Programming Interfaces

Marios Belk, Cognitive UX GmbH

Agenda

Intellectual Output 2

- Overview

- Main Achievements

- Implemented Technologies

- **Design and Implementation of Open-source Privacy-preserving Toolkit and Application Programming Interfaces**

- *Lead:* Cognitive UX GmbH

- *Participating Partners:*
  - University of Patras
  - University of Cyprus
  - University of Coimbra ISR

- *Output type:* Services / structures – E-learning platform

- *Media:* Software, Service, Publications

IO2 - Tasks and Task Leaders

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- Task 2.1: Architecture Design
  - *Lead:* Cognitive UX GmbH
  - *Participating:* University of Patras, University of Cyprus, University of Coimbra
- Task 2.2: Privacy-preserving Biometrics
  - *Lead:* University of Cyprus
  - *Participating:* University of Patras, University of Coimbra, Cognitive UX GmbH
- Task 2.3: Development of Voice-, Image- and Interaction-based Algorithms
  - *Lead:* Cognitive UX GmbH
  - *Participating:* University of Patras, University of Cyprus, University of Coimbra
- Task 2.4: Integration and Verification Testing
  - *Lead:* Cognitive UX GmbH
  - *Participating:* University of Patras, University of Cyprus, University of Coimbra

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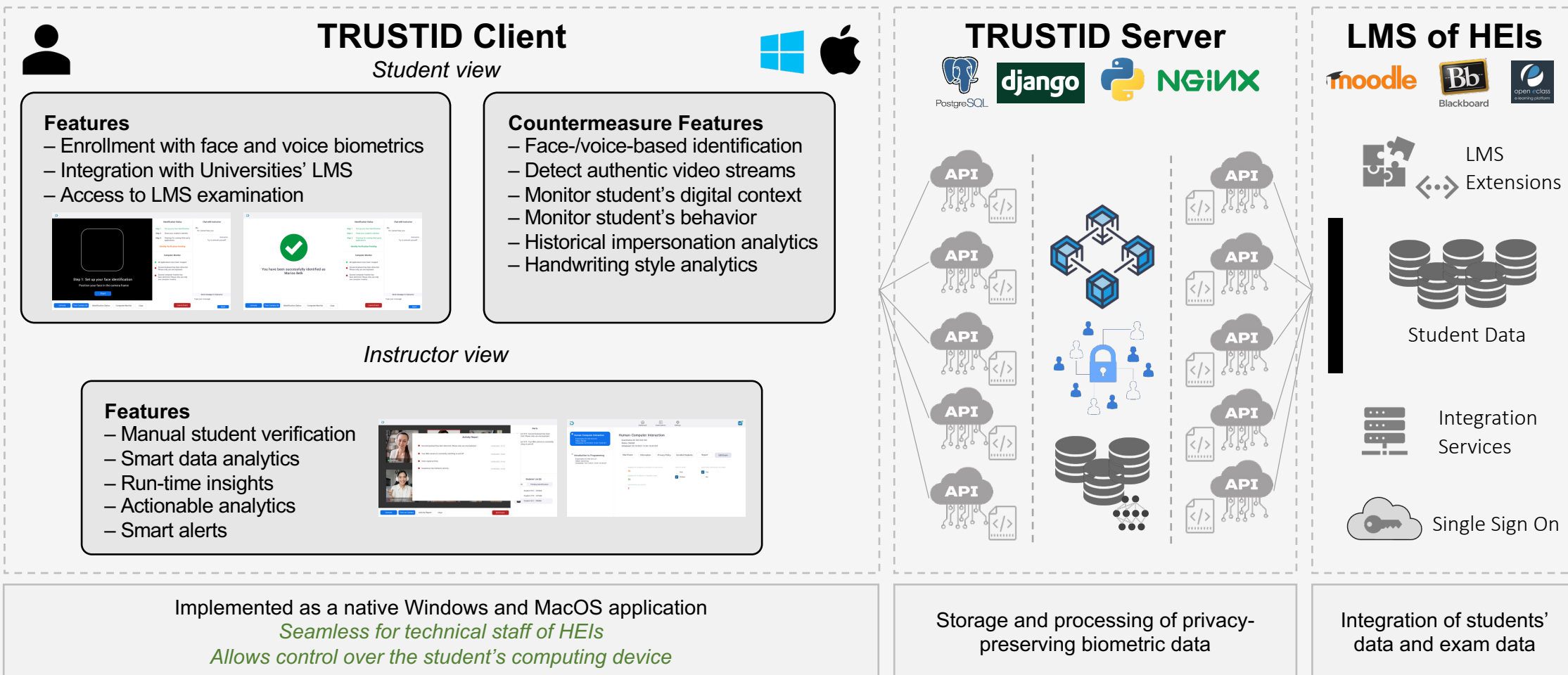of the European Union

Summary of Outcomes (1/2)

- Designed and developed the final version of the TRUSTID platform and associated tools and mechanisms for continuous student identification

- Enhanced native client software applications (implemented as both native Windows and MacOS applications), enabling students and instructors to interact with the implemented mechanisms of TRUSTID

- Enhanced back-end system, which consists of an Application Programming Interface, which exposes a series of system end-points of TRUSTID

- Major update to the architecture for privacy-preservation

- Integrated all the technologies under interoperable platform

- Major improvement of the face identification enrollment mechanism (vs. Web-based enrollment) enabling end-users to enroll in the TRUSTID system through recording of face-based images that are used for training the face-based identification models

- Mechanism for LMS integration (e.g., Moodle authentication), examination management, synchronization)

- Updated machine learning-based algorithms and mechanisms for face-based identification

- Integrated a new machine learning-based algorithms and mechanisms for voice-based identification and interaction-based identification

- Implemented a privacy-preserving wallet smartphone application

TRUSTID High-level Framework

TRUSTID Client
Student view

Features
– Enrollment with face and voice biometrics
– Integration with Universities' LMS
– Access to LMS examination

Countermeasure Features
– Face-/voice-based identification
– Detect authentic video streams
– Monitor student's digital context
– Monitor student's behavior
– Historical impersonation analytics
– Handwriting style analytics

Instructor view

Features
– Manual student verification
– Smart data analytics
– Run-time insights
– Actionable analytics
– Smart alerts

TRUSTID Server

LMS of HEIs

LMS Extensions

Student Data

Integration Services

Single Sign On

Implemented as a native Windows and MacOS application
Seamless for technical staff of HEIs
Allows control over the student's computing device

Storage and processing of privacy-preserving biometric data

Integration of students' data and exam data

:: https://trustid-project.eu

Student Interaction

Architectural Design and Technology Stack

- Server-side **web API**

- **Django** REST Framework

- **NGINX** (Web server, Reverse proxy, Load balancer)

- **Gunicorn** (Application server that implements the Web Server Gateway Interface)

- **Celery** (Asynchronous task queue based on distributed message passing)

- **RabbitMQ** (Message broker)

- **PostgreSQL**

- **Docker**

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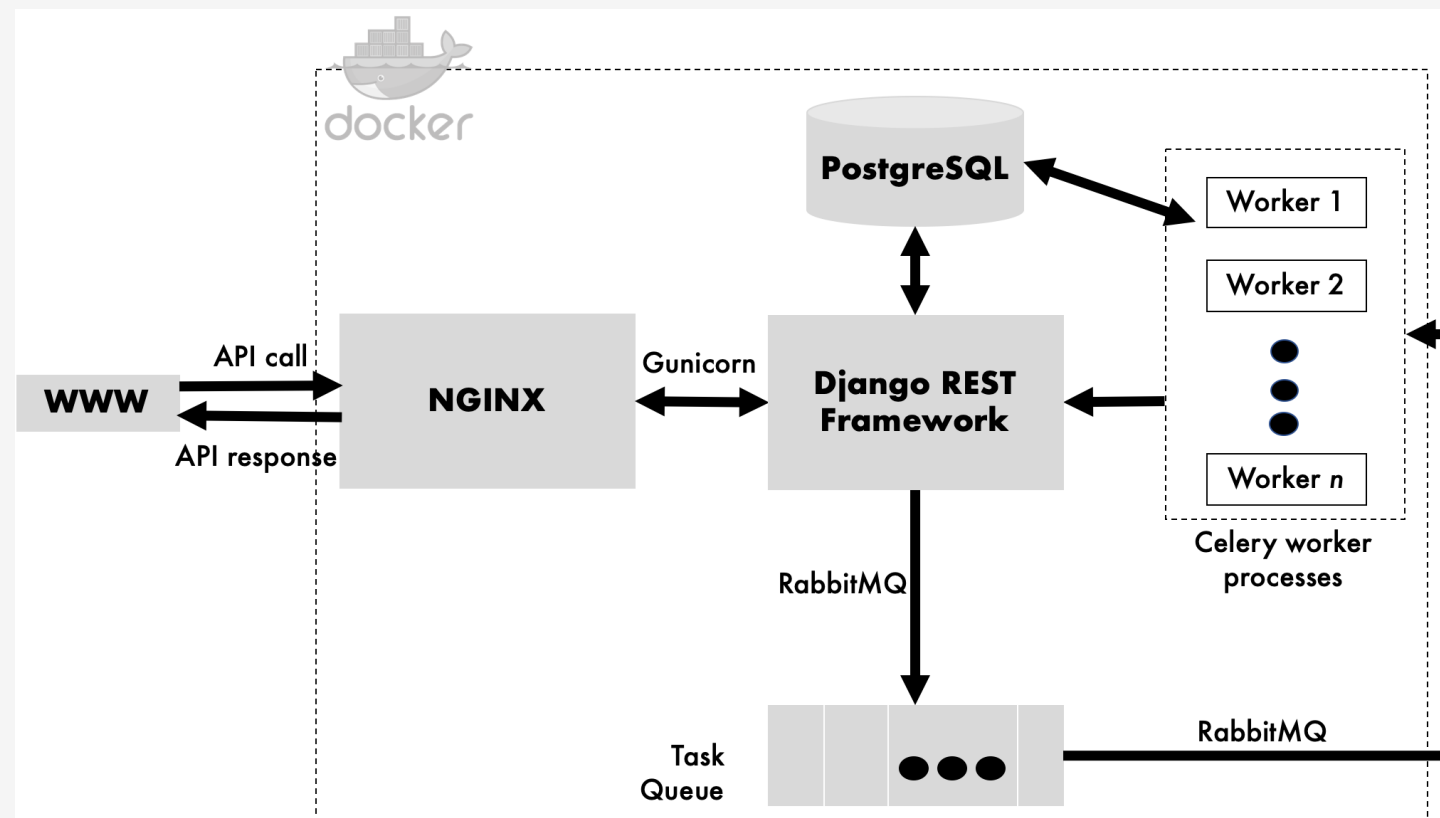
Client Application

Windows and MacOS

Integrated Login

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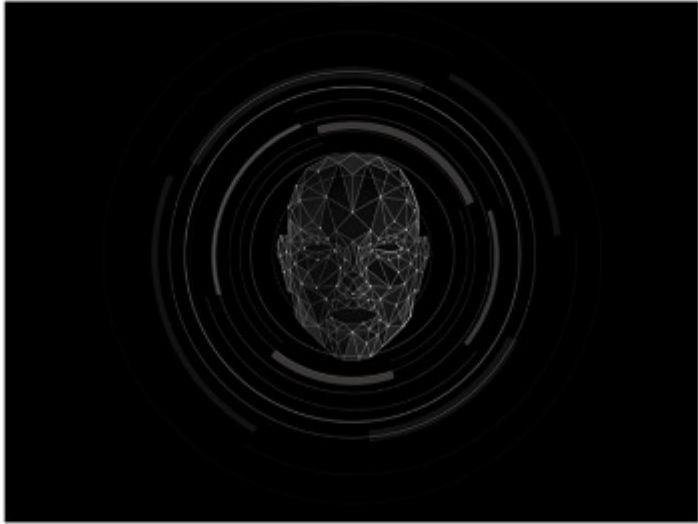
Register Face Biometrics

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Register Voice Biometrics

Control and Manage Biometrics

Continuous Face Identification

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Continuous Voice Identification

Digital Written Examination Scenario

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Written Examination

Multiple Choice Questions

What does the ERASMUS acronym stand for?

European Commitee Agency Scheme for the Mobility of University Students

European Community Action Scheme for the Mobility of University Students

European Continental Agility Scheme for the Mobility of University Students

European Congress Ambassador Scheme for th Mobility of University Students

Monitoring

Camera capture is enabled

Voice capture is enabled

Checkup running applications is enabled

TRUSTID will periodically capture your photo and voice for continuous identification purposes and will checkup the running applications and processes on your computer

User Feedback Mechanism

○ I will impersonate with another person

○ I will open a forbidden application

Send Feedback

Close Exam

Oral Examination Scenario

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Examination Management Dashboard

Examination Management

LMS Integration and Synchronization Tools

TRUSTID Backend – Application Programming Interface

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Web API – Documentation

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Wallet for biometrics models

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- Pair mobile application with TRUSTID system to fetch and store the biometric models locally

Wallet for biometrics models

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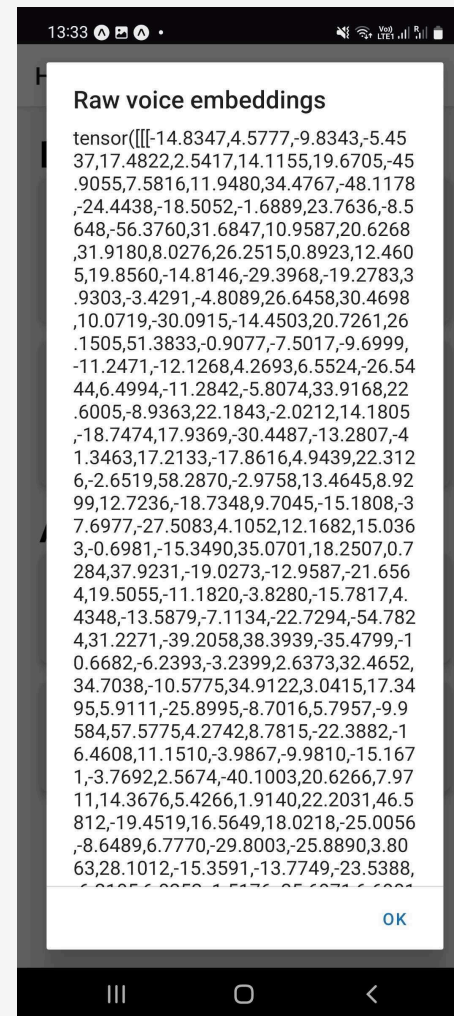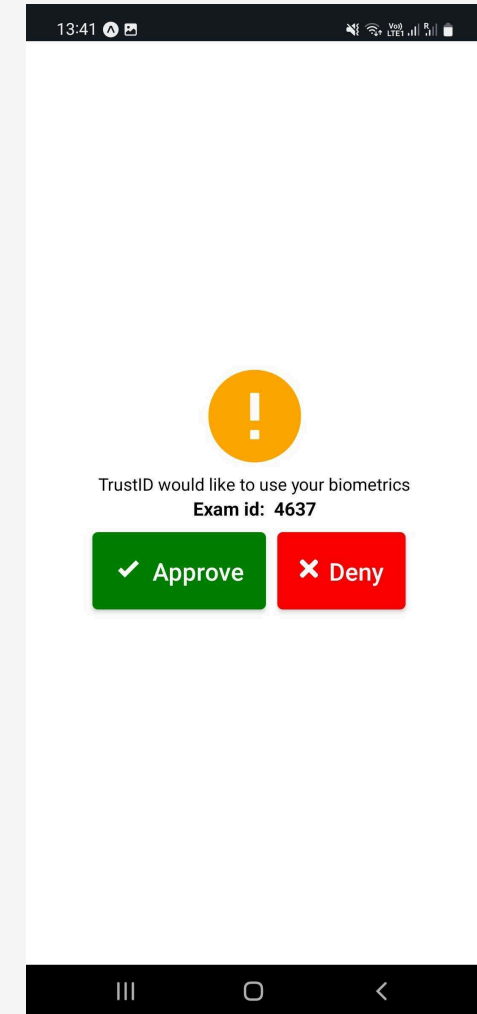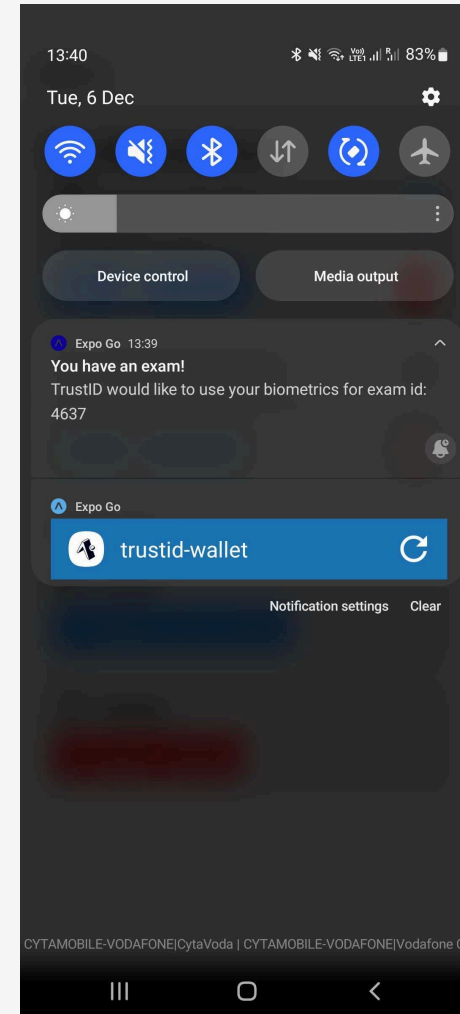Erasmus+ Programme
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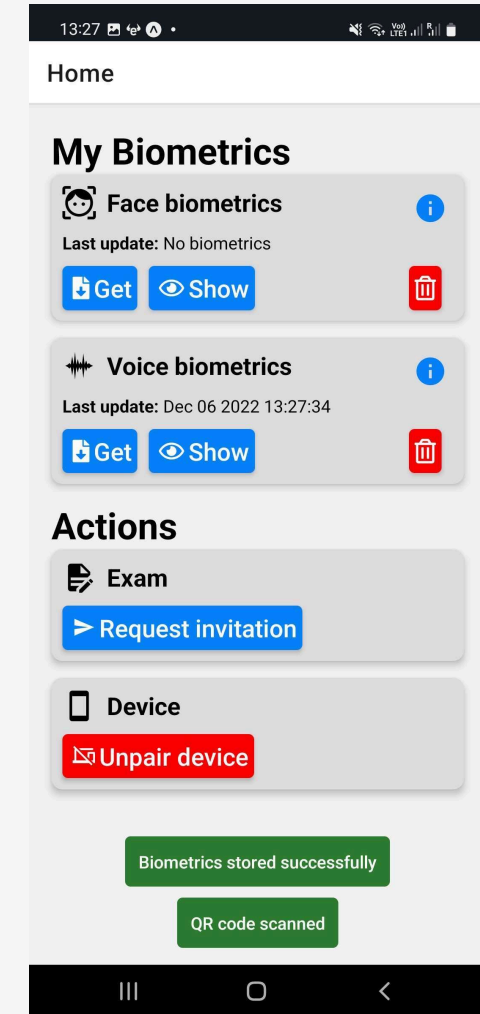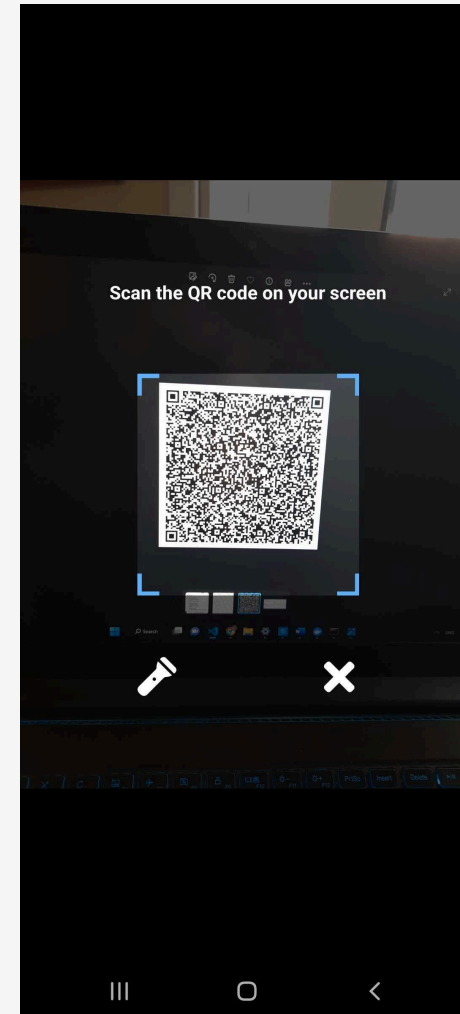
- Management of biometrics models
  - Display
  - Delete
  - Privacy policy
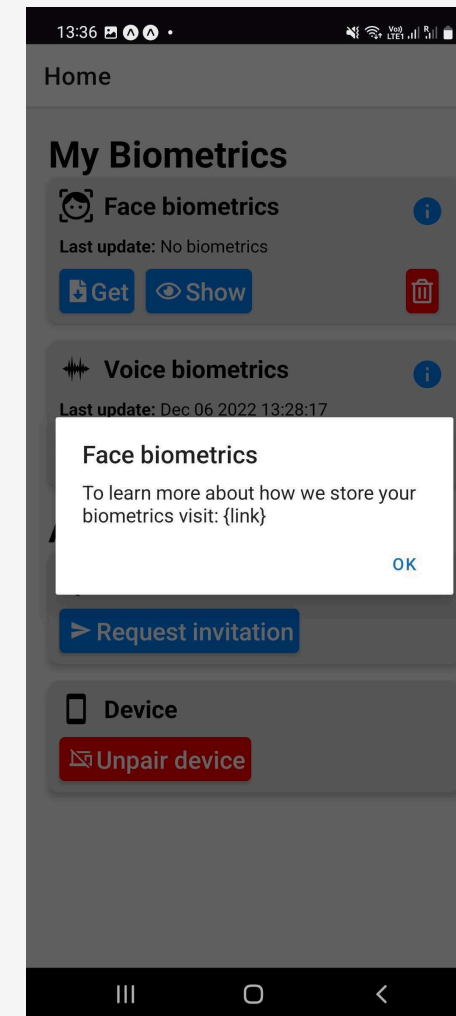
Wallet for biometrics models

- Push notification for approval of sharing of biometrics models during online examination

Thank you!

Marios Belk, Cognitive UX GmbH