



UNIVERSITÀ  
DEGLI STUDI  
DI PADOVA

IIU  
DIPARTIMENTO  
DI INGEGNERIA  
DELL'INFORMAZIONE



# DIGITAL FORENSICS AND BIOMETRICS

## A.A. 2025/2026

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AVAILABLE PROJECTS & REPORTS



Machine learning related



Deep-learning related



Possible topic for thesis

- The project will be **assigned by the lecturer** (in order to be considered valid).
- Please **communicate project preferences and groups in advance using the appropriate forms on the moodle page of the course**. Only one person per group needs to fill the form.
- Project assignment will take **into account student preferences and project distribution** (in order to assign an equal number of students to each title). Selection and assignment will follow a First Come Fist Served (FCFS) policy – i.e., your preferences will be satisfied depending on the submission time.

## STANDARD PROGRAMMING PROJECTS

It possible to take these in groups made of **two persons max**

## #1: ANOMALY DETECTION

Given a dataset (images/audio files/network traces), build an autoencoder that maps the input data into a latent feature space. On the top of this representation, design an anomaly detection mechanism that identify/classify the non-nominal values. AD can be performed using classical ML solutions or DL-based approaches. Dataset will be assigned by the lecturer.

The project can be developed in Python or any language.

Extends Lab session 2



Project consists in two tasks:

- Build a latent representation
- On such feature space, perform AD using isolation forest, One-class SVM, autoencoder ...

Second part does not need DL solutions.

Different algorithms can be implemented.

## #2: AUDIO DEEPFAKE DETECTION

Given a database of synthetic/real audio, design a classifier that is able to distinguish fake audio from real one.

Dataset: <https://www.asvspoof.org/index2019.html>

Example software: <https://github.com/sksmta/audio-deepfake-detection>  
<https://github.com/Jerald-Golden/Audio-Deepfake-Detection>

Project can be developed in Python, MATLAB.



Classifier can be done using CNN, RNN or simple SVM, random forest, etc... on Spectrograms or FFT frames.

Can use other sources: mention them!!!

Some original work need to be done!

#3 ENVIRONMENTAL SOUND DEEPFAKE DETECTION  
(GRAND CHALLENGE)

- In this project, we are going to create a group of students, aided by PhD students, to work on the ESDD dataset (Environmental sound deepfake detection)  
<https://sites.google.com/view/esdd-challenge>
- The work is part of ICASSP 2026 Grand Challenge, promoted by IEEE SPS society.
- References are here <https://2026.ieeeicassp.org/sp-grand-challenges/#gc-5>

Develop a deepfake sound detection method and test it on the dataset provided

Some softwares are already available; results will be published on a global ranking, winners will be invited to present their work at ICASSP 2026, Barcelona.

**Deadline to join: Oct. 13, 2025**



- Registration deadline: October 13, 2025
- Progress phase: until ~ November 16, 2025
- Test sets release: November 17, 2025
- Ranking phase: November 17, 2025 ~ November 26, 2025
- Leaderboard release: November 27, 2025

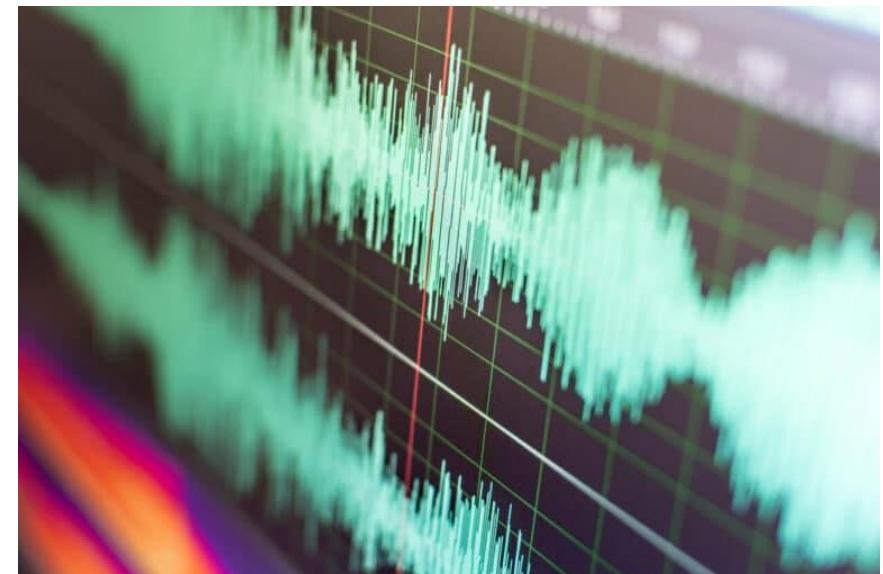
## #4: AUDIO EVENT CLASSIFICATION

Given a database of audio files, design a classifier that is able to distinguish different events

Dataset: <https://www.kaggle.com/datasets/afisarsy/raw-audio-of-accident-and-crime-detection>

<https://www.kaggle.com/datasets/afisarsy/enhanced-audio-of-accident-and-crime-detection/data>

Project can be developed in Python, MATLAB.





Classifier can be done using CNN, RNN or simple SVM, random forest, etc... on Spectrograms or FFT frames.

Can use other sources: mention them!!!

Some original work need to be done!

## #5: MORE THAN WORDS: SPEAKER RECOGNITION DATASET

Starting from lab experience nr. 4 and 5, classify different users from their speech.

Input dataset is provided at

<https://www.kaggle.com/datasets/vjcalling/speaker-recognition-audio-dataset>

Two approaches: closed-set and open-set.

**Closed-set:** divide data into three groups: training, validation and testing.

**Open-set:** divide speakers into three sets: training, validation and testing. Features generated during training are to be used in testing comparing feature array with a sample array.

Project can be developed in Python, MATLAB.



Classifier can be done using CNN, RNN or simple SVM, random forest, etc...

Can use other sources: mention them!!!

Some original work need to be done.

## #6: KEYSTROKE DYNAMICS PEOPLE IDENTIFICATION

Starting from lab experience nr. 4 and 5, classify different users from keystroke dynamics

Input dataset is provided at

<https://zenodo.org/records/7886743>

Two approaches: fixed-text and free-text.

Identify the different users by their typing pattern. Divide data into known (training) and unknown (testing). It is possible to follow an anomaly detection approach where nominal data (belonging to a single user) trains a single user-dependent classifier: multiple classifiers can be combined together (extend lab 2).

Project can be developed in Python, MATLAB.



Classifier can be done using classical methods or deep learning based: CNN, RNN or simple SVM, random forest, etc...

You can follow and anomaly detection approach.

Can use other sources: mention them!!!

Some original work need to be done.

## CASE STUDY

These option is **individual**.

# CASE STUDY: WRITE A FORENSIC REPORT

You will be given a video sequence (e.g., video surveillance file)

The depicted event will be either a sequence of explosions, a car passing by, or a man walking away..

Starting from the videosurveillance frames, you need to estimate some information from the video (detect the sequence of explosions, make the license plate of the car readable, compute the height of the guy).

Write a proper report documenting your conclusions.

Evidences:

- disk image
- image of video from videsurveillance
- audio file

