

Università degli  
Studi di Milano-Bicocca



# Final Exam

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# Description of the final exam

**Goal:** The final exam will be a full project in deep learning.

**Steps** that you will need to perform:

1. Analyze the dataset
  - a. give some insights on the types and the spans of the variables
2. [OPT.] Select the variables to keep
  - a. specify the criteria that you used to select the variables
3. Pre-process the dataset
  - a. define data normalization
4. Define a data augmentation strategy if is required from the task
5. Create a neural architecture in Pytorch to address the problem under investigation
6. Assess the performance of your model
7. Create a dashboard for using your model in production



## What you will need to deliver and present

### **Code [50%]**

- You need to submit your code, well commented
- Create also a readme file containing the instructions to make it work
- During the exam you can show your dashboard
- The code relative to the neural networks must be done in PyTorch

### **Presentation [50%]**

- During the exam, you will perform a presentation of 10-15 min on your work
- The presentation must include:
  - an introduction to the problem
  - data analysis
  - [OPT] state of the art (i.e. methods doing your same task)
  - presentation of your method
  - comparison with other solutions
  - numerical results
  - screenshots of your dashboard
  - conclusions



## Datasets

- You can choose among several datasets in the next slides or
- you can choose a dataset you like
- The vote will keep into account the difficulty of the task



## Aerial drone dataset for semantic segmentation

- Dataset for semantic segmentation
- <https://www.tugraz.at/index.php?id=22387>
- <https://www.kaggle.com/datasets/bulentsiyah/semantic-drone-dataset>



# Flood detection

- Evaluation of natural disasters
- [https://github.com/BinaLab/FloodNet-Supervised\\_v1.0](https://github.com/BinaLab/FloodNet-Supervised_v1.0)

Real Image	Ground Truth Segmented Image	QA Pair
 Image Class: Non-Flooded		<p>What is the overall condition of the given image? <b>Non-Flooded</b></p> <p>How many buildings are non flooded? <b>6</b></p> <p>How many buildings are in this image? <b>6</b></p> <p>Is the entire road flooded? <b>No</b></p> <p>What is the condition of the road in this image? <b>Non-Flooded</b></p>
 Image Class: Flooded		<p>How many buildings are in this image? <b>19</b></p> <p>Is the entire road flooded? <b>No</b></p> <p>What is the condition of the road in this image? <b>Flooded and Non-Flooded</b></p> <p>How many buildings are flooded? <b>19</b></p>
 Image Class: Flooded		<p>What is the condition of the road in this image? <b>Flooded</b></p> <p>How many buildings are in the image? <b>5</b></p> <p>How many non flooded buildings can be seen in this image? <b>3</b></p>

Background

Building-flooded

Building-non-flooded

Road-flooded

Road-non-flooded

Water

Tree

Vehicle

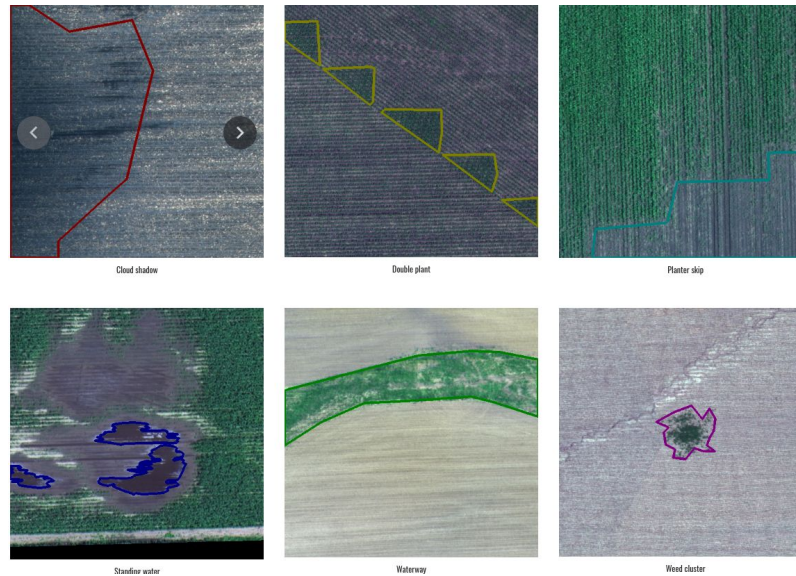
Pool

Grass



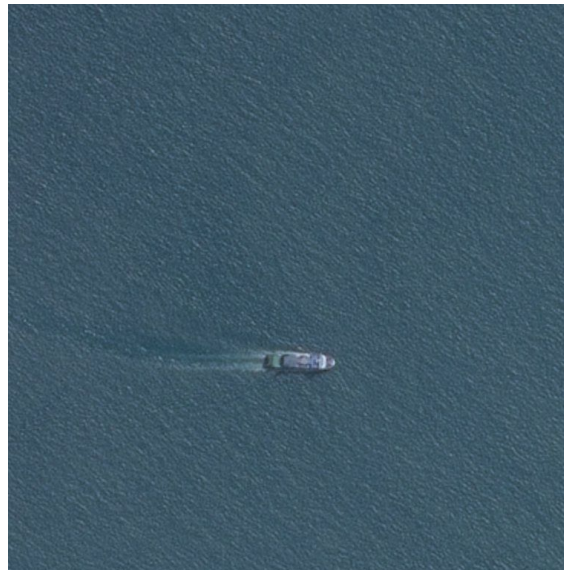
# Agriculture-Vision Dataset

- Semantic segmentation for agriculture
- <https://www.agriculture-vision.com/agriculture-vision-2020/dataset>



## Ship Detection

- Ship localization
- <https://www.kaggle.com/competitions/airbus-ship-detection/data>





## Building segmentation

- Ship localization
- <https://www.aicrowd.com/challenges/mapping-challenge>



# 1D signals

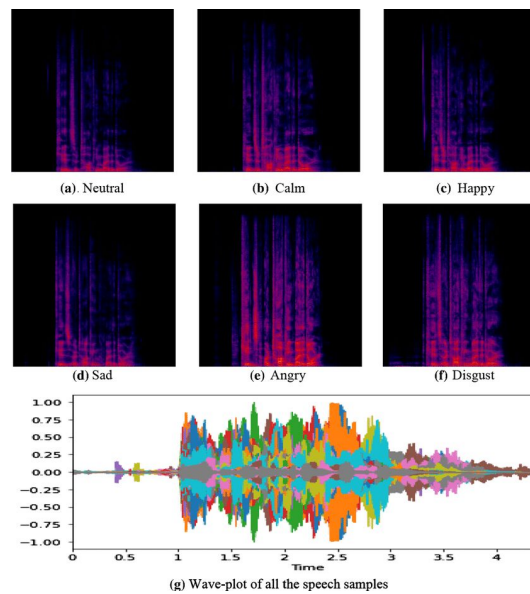
# Human activity recognition

- <https://www.kaggle.com/datasets/uciml/human-activity-recognition-with-smartphones>



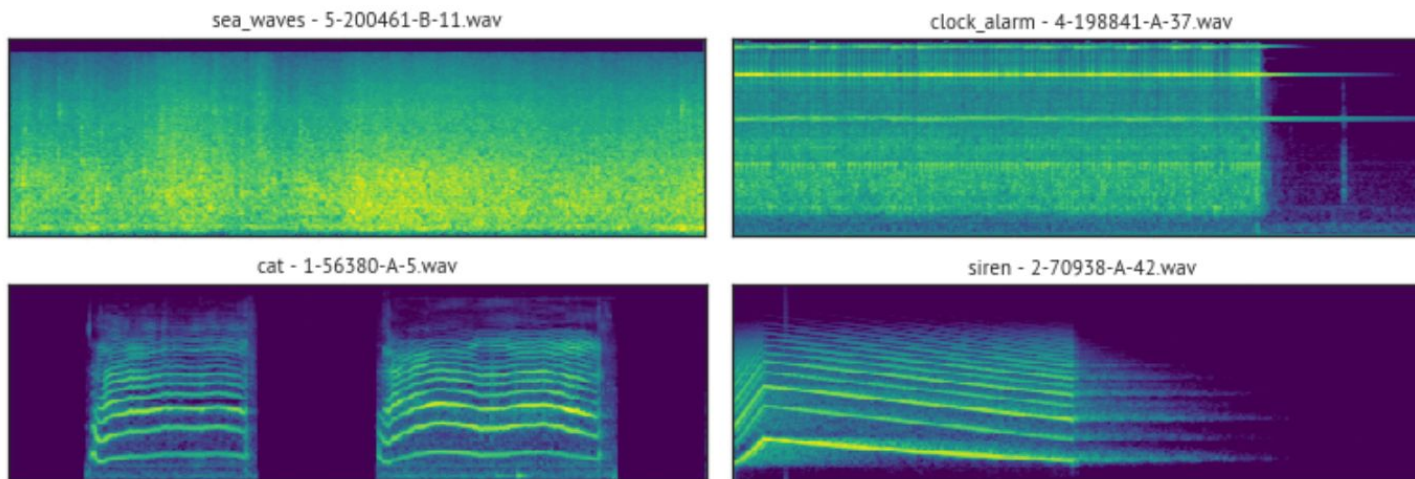
## Emotion Classification with speech audio

- Subset of RAVDESS: Emotion Classification
- <https://www.kaggle.com/datasets/uwrfkaggler/ravdess-emotional-speech-audio>



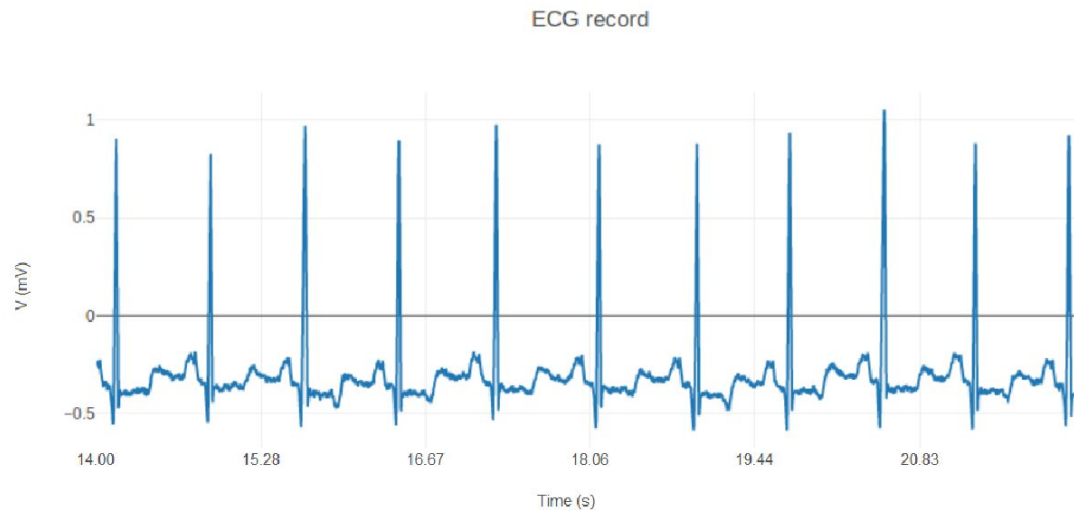
## Semantic Classification with environmental audio

- ESC-50: 50 semantic classes
- <https://github.com/karolpiczak/ESC-50>



# Heartbeat Recognition from ECG

- MIT-BIH dataset preprocess into heartbeat Python
- <https://www.kaggle.com/datasets/tala92/mit-bih-dataset-preprocess-into-heartbeat-python?select=MIT-BIH.csv>







Questions?