

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
- **show domain knowledge of the topic you dealt with**

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

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

Background

Building-flooded

Building-non-flooded

Road-flooded

Road-non-flooded

Water

Tree

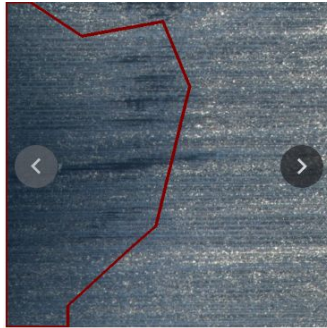
Vehicle

Pool

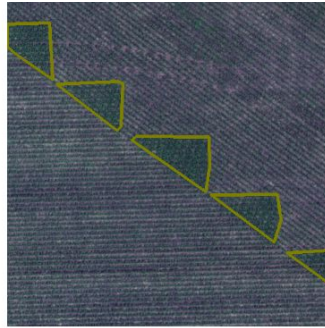
Grass

Agriculture-Vision Dataset

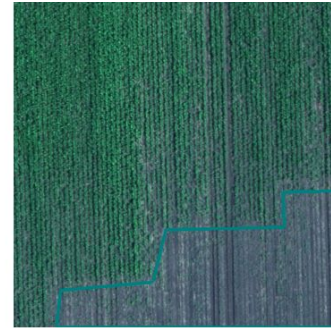
- Semantic segmentation for agriculture
- <https://www.agriculture-vision.com/agriculture-vision-2020/dataset>



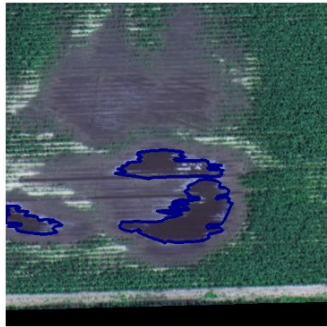
Cloud shadow



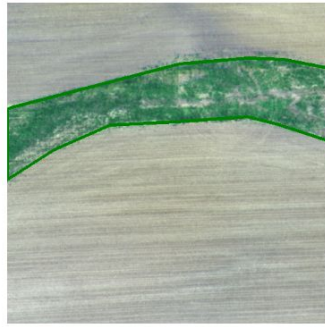
Double plant



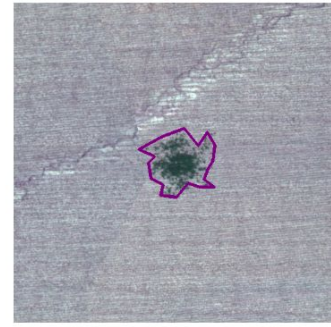
Planter skip



Standing water



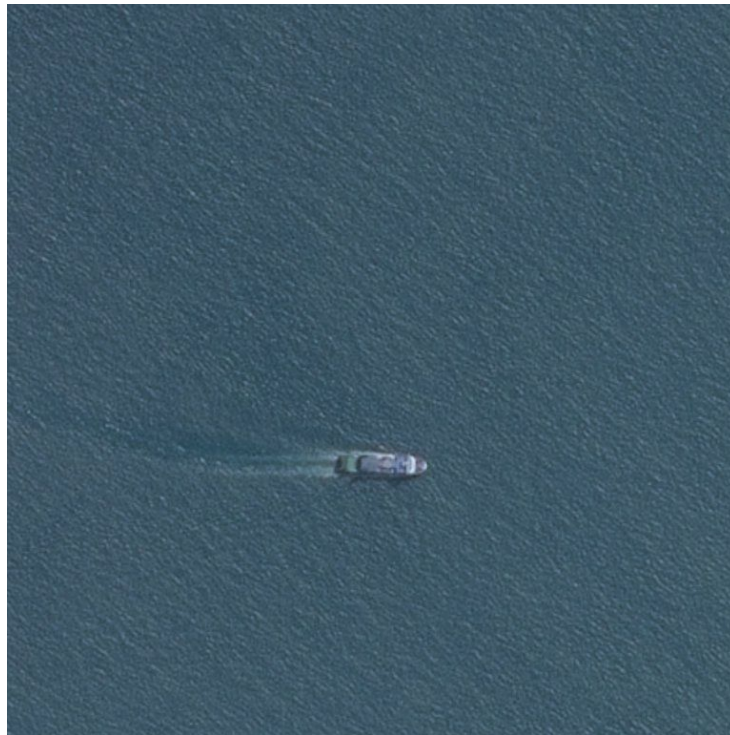
Waterway



Weed cluster

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

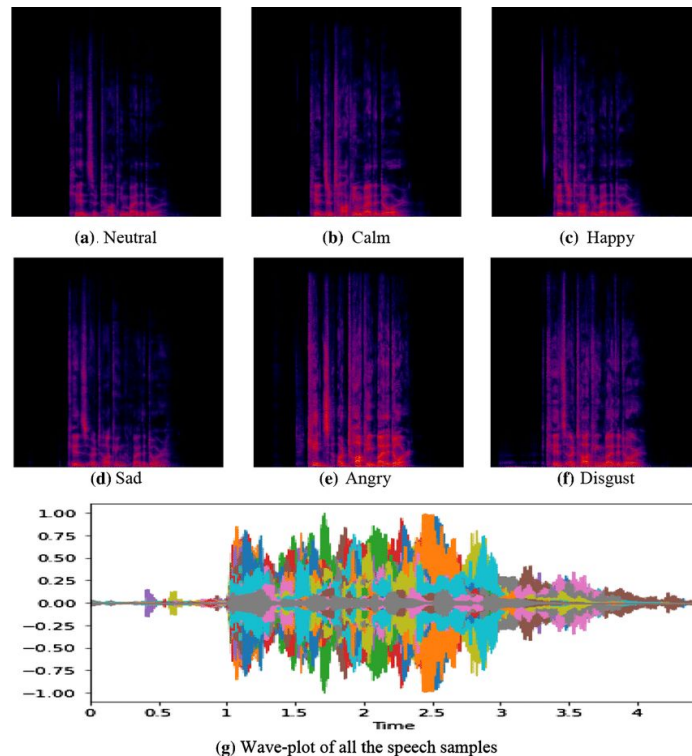
Human activity recognition

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



Emotion Classification with speech audio

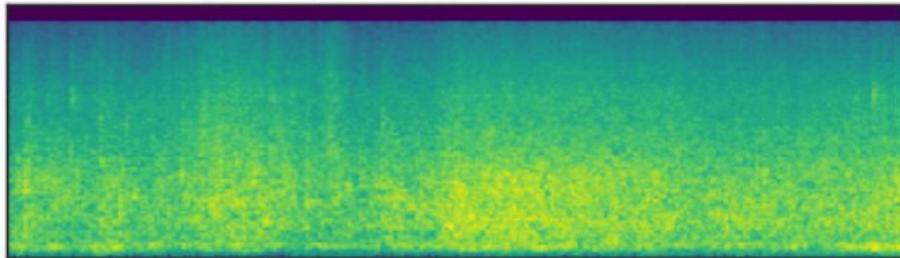
- Subset of RAVDESS: Emotion Classification
- <https://www.kaggle.com/datasets/uwrfkaggler/ravdess-emotional-speech-audio>



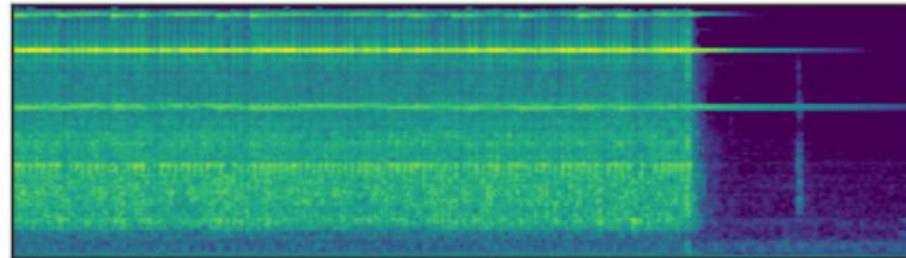
Semantic Classification with environmental audio

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

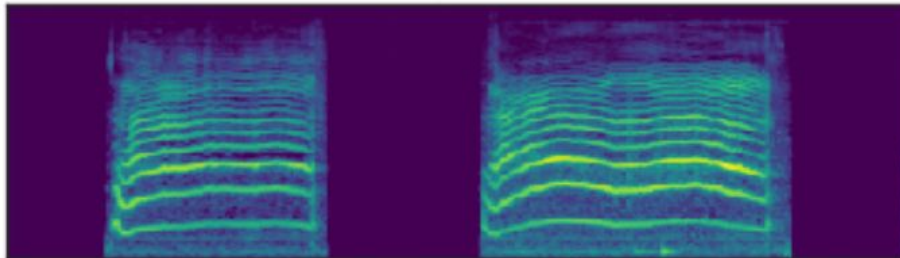
sea_waves - 5-200461-B-11.wav



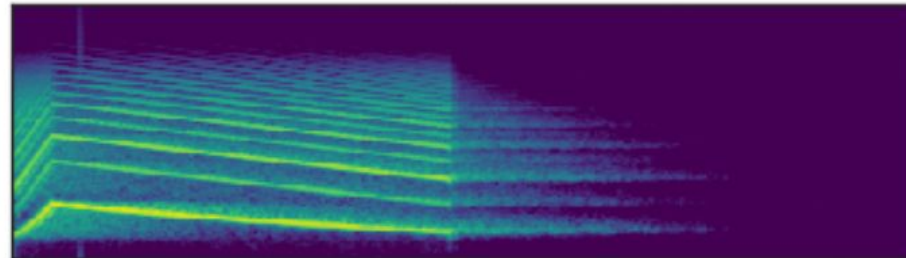
clock_alarm - 4-198841-A-37.wav



cat - 1-56380-A-5.wav

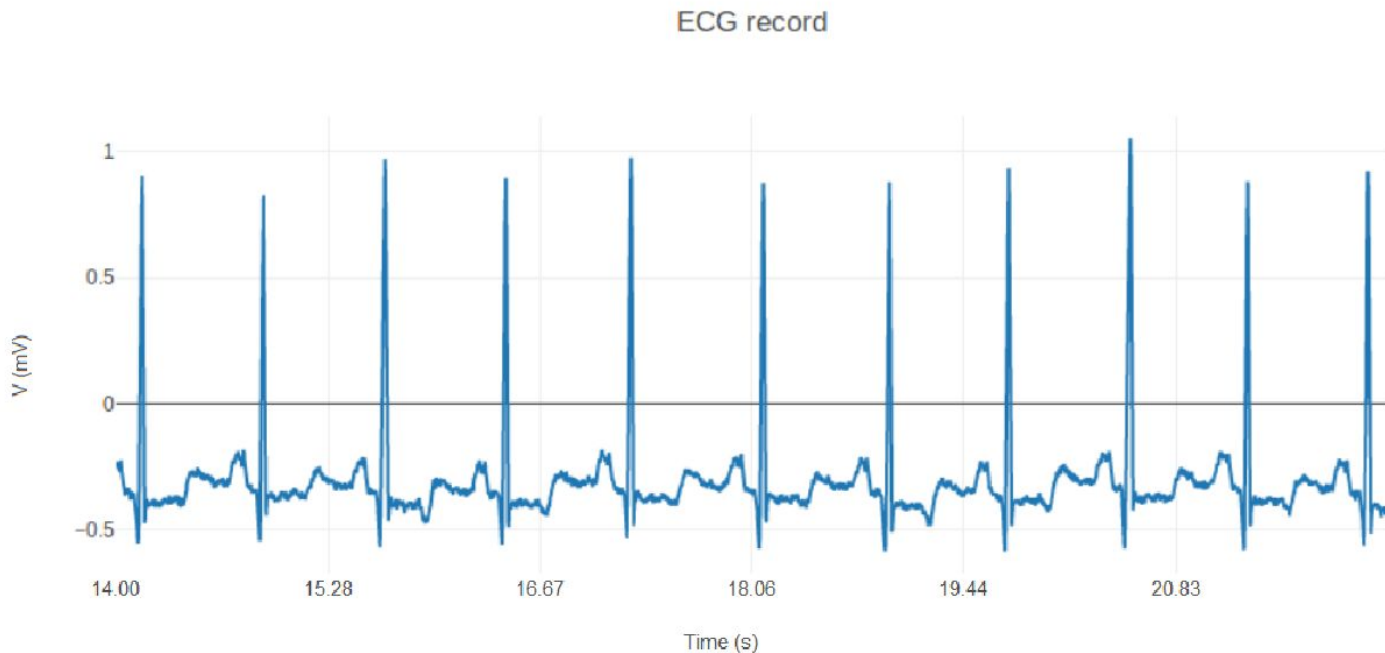


siren - 2-70938-A-42.wav



Heartbeat Recognition from ECG

- MIT-BIH dataset preprocess into heartbeat Python
- <https://www.kaggle.com/datasets/tala192/mit-bih-dataset-preprocess-into-heartbeat-python?select=MIT-BIH.csv>



Dates

- **20 / 6** - 10:30 - 13:30
- 15 / 7 - 10:30 - 13:30
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Questions?