3945 – Advanced Machine Learning, Spring 2022
Final Projects

Lecturers: Dr. Leon Anavy, Mr. Alon Oring

I In this assignment, you will work in pairs to choose one topic from a list we provide on the course website and prepare a presentation and a report summarizing your work. Your presentation should be 20 minutes long, including time for questions. Your report should be 1-2 pages long.

You will submit a single presentation file (.ppt or equivalent) and a report file (.pdf) zipped together. You may include additional files that are relevant to your presentation (code, video, etc.).

Part 0: Choose a topic
1) Review the list of topics below and select a topic to present.
2) Mark your selection in the file available in the course website. Note that every topic can only be selected by 2 groups and the selection is on a first come first served basis. Respect your friends and their selection.
3) Read the paper carefully and take notes.

Part 1: Class presentation
4) Prepare a presentation that discusses the following:
   - Relevant background
   - The main topic of the paper
   - The key findings of the paper
   - The implications of the paper for the field of machine learning
5) Present your work in class
6) Answer any questions from the class

Part 2: Summarizing report
7) Write a summary of the paper that includes the following:
   - Relevant background
   - A brief overview of the paper
   - The main points of the paper
   - The implications of the paper for the field of machine learning

Submission Guidelines
- Submit the work in pairs. Only one submission for each pair.
- Your submission should include a single zip file.
- The submitted file should follow the naming convention:
  - 3945_FinalReport_XXX_YYY.zip
    Where:
    o XXX and YYY are your student numbers (IDs)
    For example: 3945_FinalReport_123456789_987654321.zip
- Your report should be clear, coherent, and concise.
- All figure and plots should include captions, labels and data units. Pay attention to data visualization guidelines.

Grading
Your presentation and report will be graded on the following criteria:
- Accuracy
- Clarity
- Organization
- Engagement
- Overall quality

Resources
The following resources are available to help you complete this assignment:
- The list of papers provided by the instructor
- The course reading list and presentations
- Online resources such as Google Scholar and Arxiv

Topic list

Field	Title	Resource
XAI + Unsupervised	Explainable k-Means and k-Medians Clustering	Explainable k-Means and k-Medians Clustering
Unsupervised	Densirty preserving t-SNE and UMAP	Density-Preserving Data Visualization Unveils Dynamic Patterns of Single-Cell Transcriptomic Variability
Unsupervised	The problems with using t-SNE and UMAP	The Specious Art of Single-Cell Genomics
Boosting	XGBoost	XGBoost: A Scalable Tree Boosting System
Boosting	Boosting Neural Networks	Boosting Neural Networks, Gradient Boosting Neural Networks: GrowNet
Boosting	Deep learning vs. XGBoost for Tabular data	Tabular Data: Deep Learning is Not All You Need
XAI	The Disagreement Problem in XAI	The Disagreement Problem in Explainable Machine Learning: A Practitioner's Perspective
XAI	XAI in Deep Learning	Network Dissection: Quantifying Interpretability of Deep Visual Representations
XAI	XAI in Deep Learning	Feature Visualization
Performance measures	F1 micro and macro averaging	Confidence interval for micro-averaged F1 and macro-averaged F1 scores
Performance measures	AUC calculation	Fast Implementation of DeLong's Algorithm for Comparing the Areas Under Correlated Receiver Operating Characteristic Curves