**Machine Learning 1- Yilmaz**

**2024-2025 Quarter 2 Project**

### **Project Topics**

Your first task is to pick a project topic. The project needs to be an **algorithmic project**: **Pick a problem or family of problems, and develop a new learning algorithm, or a novel variant of an existing algorithm, to solve it.** You can concentrate on some subfield of machine learning that you want to explore more.

Once you have identified a topic of interest, it can be useful to look up existing research on relevant topics by searching related keywords on an academic search engine such as: [http://scholar.google.com](http://scholar.google.com/). You may also concentrate on the algorithms we have learned so far and may want to read up on their variations to come up with your own variation. **However, you are NOT restricted to the algorithms we have learned in class so far.**

After coming up with your own algorithm and implementing it, I expect you to compare its performance against the related algorithms. For that purpose, you can use any data set you want.

Please refrain from choosing your topic merely based on the code you could find using sites like paperswithcode.com. The topics can be simple but you could still do valuable research if you could grasp the topic itself.

**Grading:**

The final report and presentation will combine to be the majority of the grade. Projects will be evaluated based on:

* **The technical quality of the work**. (I.e., Does the technical material make sense? Are the things tried reasonable? Are the proposed algorithms or applications clever and interesting? Do the authors convey novel insight about the problem and/or algorithms? Does the project have sufficient scope for the given team size?)
* **Originality**. (Did the authors add their own data processing, methods, or analysis? Does the final project avoid being a mirror image of existing papers/projects with no net new work?)
* **Communication.** (Are the authors able to clearly and effectively explain the work that they did, including context, methods, and results? Do the paper and presentation balance clarity with rigor?)

In order to highlight these components, it is important you present a solid discussion regarding the learnings from the development of your method, and summarizing how your work compares to existing approaches.

**Project Parts: Proposal, Final Report, and Presentation**

**Proposal (due December 12 or 13, 2024 based on your section):**

Your project proposal should include the following information:

* **Motivation**: What problem are you tackling?
* **Method**: What machine learning techniques are you planning to improve upon?
* **Intended experiments**: What experiments are you planning to run? How do you plan to evaluate your machine learning algorithm?

Presenting pointers to one relevant dataset and one example of prior research on the topic are a valuable addition.

**Proposal**:

**Motivation**: Crowd counting plays a key role in many areas like event management, public safety, and urban planning. It's important to count people accurately in real-time to ensure safety and help manage large gatherings. However, traditional methods often struggle with problems like occlusions, varying crowd densities, and lighting changes. Using depth information in combination with standard images can improve accuracy by providing a better sense of the space and arrangement of people. This is especially useful for real-time applications, where computational efficiency is critical. The goal of this proposal is to create a lightweight model that uses both depth and image data to improve crowd counting in real-time settings.

**Method**: We are proposing to improve on previous models to have both depth embedding and light weight features for fast and accurate computation.

**Intended Experiments**: We intend to compare the accuracy, speed, and performance of our model in comparison to the two papers we researched below. Possible Dataset Link: <https://paperswithcode.com/dataset/shanghaitech>

* Papers:
  + [Scale-aware Crowd Counting via Depth-embedded Convolutional Neural Networks](https://www.porikli.com/mysite/pdfs/porikli%202019%20-%20Scale-aware%20crowd%20counting%20with%20depth-embedded%20convolutional%20neural%20networks.pdf)
    - Large Computational CNN
    - Uses depth embedding
  + [DLCDnet: a lightweight crowd density estimation model for real-time video surveillance](https://link.springer.com/article/10.1007/s11554-023-01286-8)
    - Light weight model
    - No depth embedding