Projects

Paper Reproduction
Or Software Engineering

The objective of having a project.

- The best way to learn in this field is to apply yourself
- This will allow you to polish your skills and learn new things
- It may also highlight areas of weaknesses you can improve

Expectations

- You will pick one project idea that you will work on for the remainder of the course
- The project has to be similar to an MVP (minimal viable product)
    - Meaning, it cannot be as easy as following a youtube tutorial
- At the end, we will have project demos

Types of Projects:

- Paper Reproduction: You are required to read and comprehend a paper and reproduce the methodology and get similar results
- Software Engineering: You are required to use machine learning solutions to develop a product that has real life utility

Note:

- Due to hardware limitations, it will be okay to downsize the architectures of the paper however the essence of the paper must still be present

Examples of **Paper Reproduction**.

U-Net: Convolutional Networks for Biomedical Image Segmentation

- Link: U-Net: Convolutional Networks for Biomedical Image Segmentation
- U-net is a popular architecture in image segmentation
- You are required to perform image segmentation on a suitable dataset

SSD: Single Shot MultiBox Detector

- Link: https://arxiv.org/pdf/1512.02325.pdf%22source%22
- SSDs are a popular and powerful real-time object detection model
- This is more complex than your basic CNN
- The task would be to implement it and train it on a dataset like PASCAL

Recurrent Neural Networks (RNN) and Robust Time Series Prediction

- Link: https://www.macs.hw.ac.uk/~dwcorne/RSR/00279188.pdf
- RNNs are a good thing to know for sequential data
- Implementing it to forecast any time-series data
- As a bonus, use an LSTM

A Neural Algorithm of Artistic Style

- Link: A Neural Algorithm of Artistic Style
- This is a fun and fascinating paper that is a mix of deep learning and art
- Use a pre-trained network to implement style transfer between two images

Musical Genre Classification

- Link: Musical genre classification of audio signals
- This paper requires working with audio data to classify different genres of music
- You are required to build a classifier as well
- Audio is often overlooked in this domain

Attention Is All You Need

- Link: Attention is All you Need
- This paper introduces the Transformer model, which is a really important tool in this domain
- You are required to implement the architecture and apply it to a translation task

Examples of **SWE Projects**.

Sentiment Analysis Extension

- Build a Chrome Extension that analyzes sentiment online
- The user should be able to view the sentiment after they highlight and select a certain length of text from any source
- Skills needed: Natural Language Processing, Chromium Development

Voice Assisted Chatbot

- Develop a chatbot that you can only interact with through voice
- The chatbot should be using an LLM under the hood for it to be valuable
- BONUS: Make it domain specific, such as giving you food recommendations
- Skills needed: API Integration, Natural Language Concepts, Speech Recognition

Automated Resume Screening System

- Create a system that will ask for certain attributes an hiring manager may look for
- Use a machine learning algorithm to look for such attributes from multiple PDFs
- Skills needed: Natural Language Processing, text classification, possibly OCR for extracting text from PDFs

Automated Data Cleaning Tool

- Create a library that automatically cleans and preprocesses datasets, identifying and handling missing values, outliers, and encoding issues
- It could be a CLI (command line interface) tool as well
- Skills Involved: Data preprocessing and cleaning techniques, development of a user-friendly interface, Python package development

Custom Image Classifier with a Web Interface

- Develop a web application where users can upload images, and the system classifies them using a model you've trained on a specific dataset
- BONUS: Think of a business use case
- Skills needed: Full-stack development, deep learning (CNNs), web frameworks (like Flask or Django for Python)

If none of these projects interest you, you can propose another paper or software engineering project that is of a similar level. Aftwards, communicate with your instructor to finalize it.

END.