Advanced Group Overview

ML Club Officers

September 2021

1 Introduction

TJ Machine Learning Club's purpose is to teach students about both the theory and practical applications of machine learning. Throughout the year, we'll give lectures that teach the foundations of machine learning and incorporate coding competitions. Feel free to ask questions anytime during the meeting.

1.1 Leadership and Contact Info

- Captain: Aarav Khanna
- Captain: Ron Nachum
- Teaching Coordinator: Irfan Nafi (Nafi)
- Teaching Coordinator: Tarushii Goel
- Teaching Coordinator: Sauman Das
- Sponsors: Mr. Jurj and Mrs. Anderson

If you have any questions, you can reach out to any of us on Facebook or at tjmachinelearning@gmail.com. You should also join our discord! (Invite link: https://discord.gg/Qara7ma4)

1.2 Lectures

Lectures will begin with standard machine learning topics before delving into deep learning. We cover not only classical machine learning and deep learning algorithms, but also new and exciting advances in the field. The lectures will be split into a beginner series for those new to machine learning and an advanced series for those who already know the fundamentals.

1.3 Problem Sets

Problem sets will be given occasionally to help students learn and retain material. You will be given one week to complete them.

1.4 Competitions

Machine Learning Club will be holding in-house contests through Kaggle. Students will be ranked based on their achievement in these contests. As the year progresses, Machine Learning Club members can participate in real-world Kaggle competitions (`kaggle.com/competitions`). Substantial prize money is awarded to winners of contests, however, students will be competing against anyone in the entire world, so the probability of winning is extremely low. Nevertheless, Kaggle competitions are a valuable learning experience.

1.5 Rankings

Both your performance on the problem sets and competitions will contribute to your club ranking. Rankings will be used by professors at GMU and Dartmouth's Pathology Department to select students for internships. Additionally, Slingshot will automatically verify top participants in our competitions and connect them with start-ups for internships. Top participants may also be viewed favorably in next year's officer selection process and earn free ML Club T-shirts!

1.6 The Website

Most information is conveyed through the official Machine Learning Club website, `https://tjmachinelearning.com/`. Here, you can find the lectures along with any presentations, notes, rankings, or additional resources.

2 Application

2.1 Architectures and Libraries

Throughout the year, we will go over some of the most prolific frameworks used in the real world. Examples include Tensorflow, PyTorch, YOLO, Detectron2, etc. There will also be several competitions throughout the year - the results of which internships will look at.

2.2 Deployment

It is important to talk about practical implementations of machine learning on various platforms, namely on mobile and web. Cloud computing models will be looked at due to their ease of use and rapid scalability, which is essential if you plan on making something that a lot of people will use. We will be looking at how to implement AWS, Azure, and Google APIs, on the aforementioned platforms.

3   Pursuing Research

Research is arguably the most exciting way to learn. Machine learning has become the new norm due to automation and its ability to give new insights on data. We'll be discussing in-depth what it takes to do research in high school, from conferences to publications.

3.1   Science Fair

This is the most popular route to pursue research projects. We'll share some of our personal experiences at the International Science and Engineering Fair (ISEF) and what it takes to get there. There are several underrated skills such as networking and presenting that make a successful project beyond technical prowess.

3.2   Internships

Internships will typically have great mentors to do projects under. They also are likely to have advanced compute resources and unique data. For example, if a university is connected to a hospital, then they will have patient data that's only available for their private research. It's often easier to publish through an internship, particularly one associated with a university, due to prior connections.

4   Discussions

4.1   Medical Research

Machine learning is used extensively by pathology research departments, including Dartmouth's EDIT (Emerging Diagnostic and Investigative Technologies) Program. We'll be discussing recent breakthroughs and potential applications that can really serve the greater good and help save lives.

4.1.1   Protein Folding

Protein folding is an application of machine learning that DeepMind, a prominent AI company, has made significant headway on. Their latest model, AlphaFold 2, has been used to accelerate research.

4.2   Autonomous Vehicles

This is a very exciting field of computer vision research that intersects with several other areas of machine learning. We'll be discussing everything from auto-labeling video for training to shared-parameter reinforcement learning.

5   Tentative Schedule

The curriculum for the advanced group is more structured this year, however, we are always looking for suggestions and discussion topics. If you have any thoughts, message or email us!