**Phase 1 - Project Proposal**

**Group Members: Michael Liu, Genfu Liu**

**Topics**: (we have 3 possible topics we’re really interested in and have not decided on which one to choose yet and here are all of them below)

**Natural Language Processing** (Transformers):

**Track 1:** Research on a paper with code

**Description:** We will explore the capabilities of Natural Language Processing models, specifically transformers, by applying different models from research papers to novel datasets.

**Models with their Research Papers:**

* **Transformers**

Introduction: <https://dair.ai/posts/attention-is-all-you-need/>

Paper: <https://arxiv.org/pdf/1706.03762.pdf>

* **BERT** - Deep Bidirectional Transformers by Google Research:

Introduction: <https://ai.googleblog.com/2018/11/open-sourcing-bert-state-of-art-pre.html>

Paper: <https://arxiv.org/abs/1810.04805>

Code: <https://colab.research.google.com/github/tensorflow/tpu/blob/master/tools/colab/bert_finetuning_with_cloud_tpus.ipynb>

* **GPT-3** - OpenAI

Introduction: <https://openai.com/blog/gpt-3-apps/>

Paper: <https://arxiv.org/pdf/2005.14165v4.pdf>

Code: <https://platform.openai.com/docs/introduction>

* **XLNet**

Introduction: <https://dair.ai/posts/XLNet_outperforms_BERT_on_several_NLP_Tasks/>

Paper: <https://arxiv.org/pdf/1906.08237.pdf>

Code: <https://github.com/zihangdai/xlnet>

* **Gopher** – DeepMind

Introduction: <https://www.deepmind.com/blog/language-modelling-at-scale-gopher-ethical-considerations-and-retrieval>

Paper: <https://arxiv.org/pdf/2112.11446.pdf>

**Deep Reinforcement Learning** (for Games)**:**

**Track 2: Reproducing results in papers**

**Description**: We will apply the techniques of Deep Reinforcement Learning to game playing and evaluate the performance of DRL agents on a set of game environments as well as demonstrate the capabilities of DRL in complex and dynamic environments. Since some of these DRL models in the papers are quite big and still in research, the code is not available, so we will have to reproduce the results using tools such as OpenAI Gym to create much smaller and simpler models while using the techniques that was researched in the papers.

**Models with their Research Papers:**

* **OpenAI Five**: Dota 2 with Large Scale Deep Reinforcement Learning

Introduction: <https://www.youtube.com/watch?v=eHipy_j29Xw&ab_channel=OpenAI>

Website: <https://openai.com/five/>

Paper: <https://arxiv.org/pdf/1912.06680.pdf>

* **AlphaGo** - DeepMind AI Beats AlphaGo Professional Player

Introduction: <https://www.deepmind.com/research/highlighted-research/alphago>

Paper: <https://www.deepmind.com/publications/mastering-the-game-of-go-with-deep-neural-networks-tree-search>

* **MineDojo**: AI Exploring Minecraft

Introduction: <https://youtu.be/5LL6z1Ganbw>

Website: <https://minedojo.org/>

Paper: <https://arxiv.org/pdf/2206.08853.pdf>

* **AlphaZero** - DeepMind's Chess AI

Introduction: <https://www.deepmind.com/blog/alphazero-shedding-new-light-on-chess-shogi-and-go>

Paper: <https://arxiv.org/pdf/1712.01815.pdf>

* **OpenAI** - Multi-Agent Hide and Seek

Introduction: <https://openai.com/blog/emergent-tool-use/>

Paper: https://arxiv.org/pdf/1909.07528.pdf

**OpenAI Gym - Reinforcement Learning**

<https://gymnasium.farama.org/>

**Image Generation**:

**Track 1:** Research on a paper with code

**Description:** We will explore the capabilities of Image Generation models by applying different models from research papers to novel datasets to demonstrate the capabilities of Image Generation models in generating diverse and high-quality images

**Models with their Research Papers:**

* **OpenAI’s DALL·E 2** – AI Art

Introduction: <https://openai.com/dall-e-2/>

Paper: <https://arxiv.org/pdf/2204.06125.pdf>

* Generative Adversarial Networks (GAN) by Google Research

Introduction: <https://self-distilled-stylegan.github.io/>

Paper: <https://arxiv.org/pdf/2202.12211.pdf>

* pix2pix - Image-to-Image Generation

Website: <https://affinelayer.com/pixsrv/>

Code: <https://self-distilled-stylegan.github.io/#paper>

Paper: <https://arxiv.org/pdf/1611.07004.pdf>