CS181P Final Project Proposal #2

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1 Team

The team includes Santi Santichaivekin, Jingyi Liu, Jacob Boerma, Lorraine Zhao, and Princewill Okoroafor. The team name is Go Pika Pika! The team logo is provided below.

2 Project

We will attempt the second project listed on the project ideas:

> ML, Search, and Compression. It has been shown that ML is a form of search (we will see this during the course, for example in Montanẽz (Chapter 3)), and also shown that ML can be viewed as a form of compression (as in minimum description length approaches). Can we show compression is a form of search, search a form of compression, search a form of ML, or compression a form of ML, to make a triangle of two-way equivalences? Or taking a subset of these equivalences, can we apply a set of results from one domain to the other, such as forming no free lunch theorems for compression?

We hypothesize that all the three problems can be phrased as one another. If we prove the three-way equivalency among the three problems, then we can apply different theories from one field to another. Also, this problem is applicable to the real world, where we can solve actual real world problems by directing them as either ML, search, or compression.

3 Plan of Attack

We have noticed that there are many different kinds of machine learning problems and many different kinds of search problems, each not necessarily similar or reducible to one another. We plan to create groups or classes of problems that are reducible to one another, as well as establishing that some problems cannot be reduced to one another because they have different properties.

- Nov 25th status update: Establish three way equivalence for well defined subset problems of ML, search, compression (some arrows between the three), also establish subset problems that cannot be reduced to the others
- Dec 4th first draft: Establish more arrow between the three concepts
- Dec 11th third update: Potential candidates to be reduced to the other problems, explore the implications of the reductions¿proving bounds and theorems by leveraging the existing theorems
- Dec 16th final report: Polish the paper

4 Separation of Work

Each person will be working on different problems of his or her choosing.

- Princewill: Compression and ML
- Rose: Compression and search
- Santi: Search and ML
- Jacob: Compression and ML
- Lorraine: Search and ML