A Review of “Model-Agnostic Meta-Learning for Fast Adaptation of Deep Networks” by Finn et al. (C. Alexander Hirst)

“Learning to learn”. How can we make machine learning algorithms flexible, able to adapt to new tasks quickly (with little training data)?

- A hallmark of human intelligence, we are able to leverage relevant past experiences to quickly learn (i.e. driving in town, with small car -> driving in city, with SUV)
- For AI agents deployed to the real-world, they will have to adapt to unseen data quickly and safely
- “Life-long Learning”
- Few-shot Meta-Learning: Train a model that can quickly adapt to a new task using only a few training points and training iterations.

Analysis of Least Squares Support Vector Machines for Learning Solutions to Partial Differential Equations (DeAnna Gilchrist)

Poisson Equation on Rectangular Domain.

Review of Error Bounds for Gaussian Process Regression (John Jackson)

Deep Learning against COVID-19 (Arturo Freydig Avila)
- classification of infected lungs via x-ray data using convolutional neural nets
- Recurrent Neural Networks to predict spread of COVID-19 in Mexico
- Mask detection in images

Implicit Acceleration by Overparameterization (Arora, Cohen, Hazan 2018) (Mike McCabe)

Distributed and Inexact Proximal Gradient Method for Online Convex Optimization (Amirhossein Ajjoloeian)

Student projects

- Applied Math (BS/MS/PhD)
- Math (PhD)
- Engineering Physics (BS)
- Computer Science (PhD)
- Electrical & Comp. Eng. (BS/PhD)
- Aerospace (PhD)
- Mechanical Eng. (BS)

Generating an Operation on Embeddings Using Neural Networks (Jordan DuBeau and Albany Thompson)

The goal of our project was to design a neural network that could help create an embedding algebra. An embedding algebra consists of a set $E$ of strictly increasing functions $N \rightarrow N$ (we call the members of $E$ embeddings), together with an operation $\ast$ such that the following conditions hold for all embeddings $a, b, c$:

1. $a \ast b$ is an embedding,
2. If $b$ is not the identity function, then $\text{crit}(a \ast b) = a(\text{crit}(b))$ (see below), and
3. $a \ast (b \ast c) = (a \ast b) \ast (a \ast c)$.

In item (2), we understand $\text{crit}(f)$ for a strictly increasing function $f : N \rightarrow N$ to be the smallest $n$ for which $f(n) > n$, called the critical point of $f$. Every strictly increasing function $N \rightarrow N$ has a critical point, with the exception of the identity function.