Robot Physicist

Team = [Manoj Kumar, Michele Ceru, Phil Yeres]
Advisor = Kyle Cranmer

Project mentors

Advisor: Professor Kyle Kranmer, NYU Physics

Unofficial mentor: Brenden Lake, CDS

The problem:

Particle physics experiments are expensive to perform

Physicists optimize their experiments by running simulated experiments

Our goal: design a proof of concept “robot physicist” that efficiently finds optimal experiment configurations

Experimental model components

1. Experimental settings (phi)
2. Quantities that we would like to infer (theta)
3. Data generated from the experiment (X)

Project phase 1: toy data

1. Using a known distribution we generate data from it for fixed theta and phi
2. Estimate P(X | theta, phi)
3. infer P(theta | X, phi) = P(X | theta, phi) P(theta | phi) / P(X | phi)
4. Run loops from 1-3 for different phi to find the max information gain

Project phase 2: physics data

- With real data, the ground truth P(X | theta, phi) is unknown
- We'll use likelihood-free inference to estimate P(theta | X, phi) using

  https://github.com/diana-hep/carl for higher dimensional X

Thanks!