

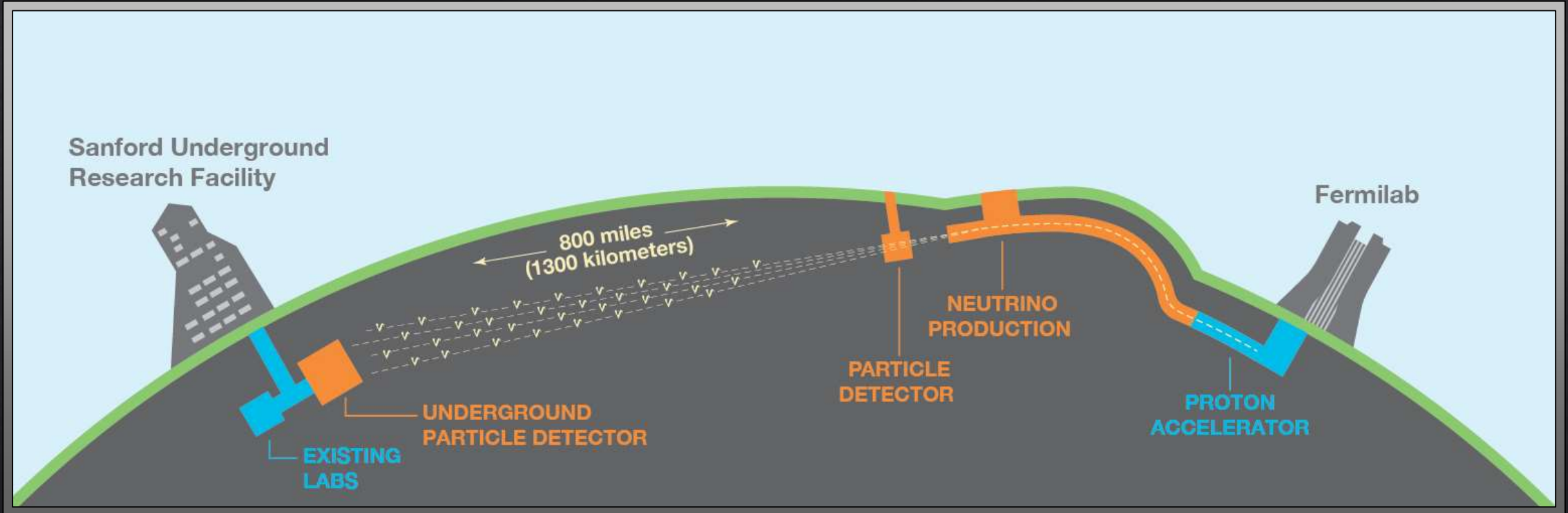


# Data Reduction for ProtoDUNE Detector Control System

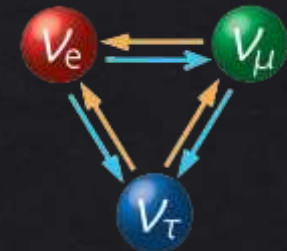
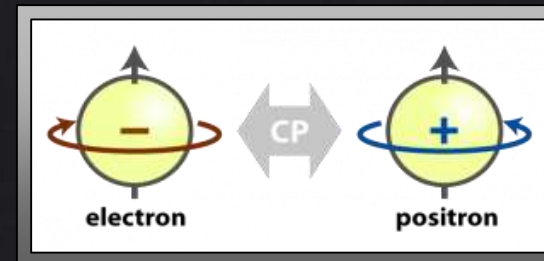
Ernest Sorokun

Mentor: Dr. Lino Gerlach (Brookhaven National Laboratory, USA)

# Deep Underground Neutrino Experiment

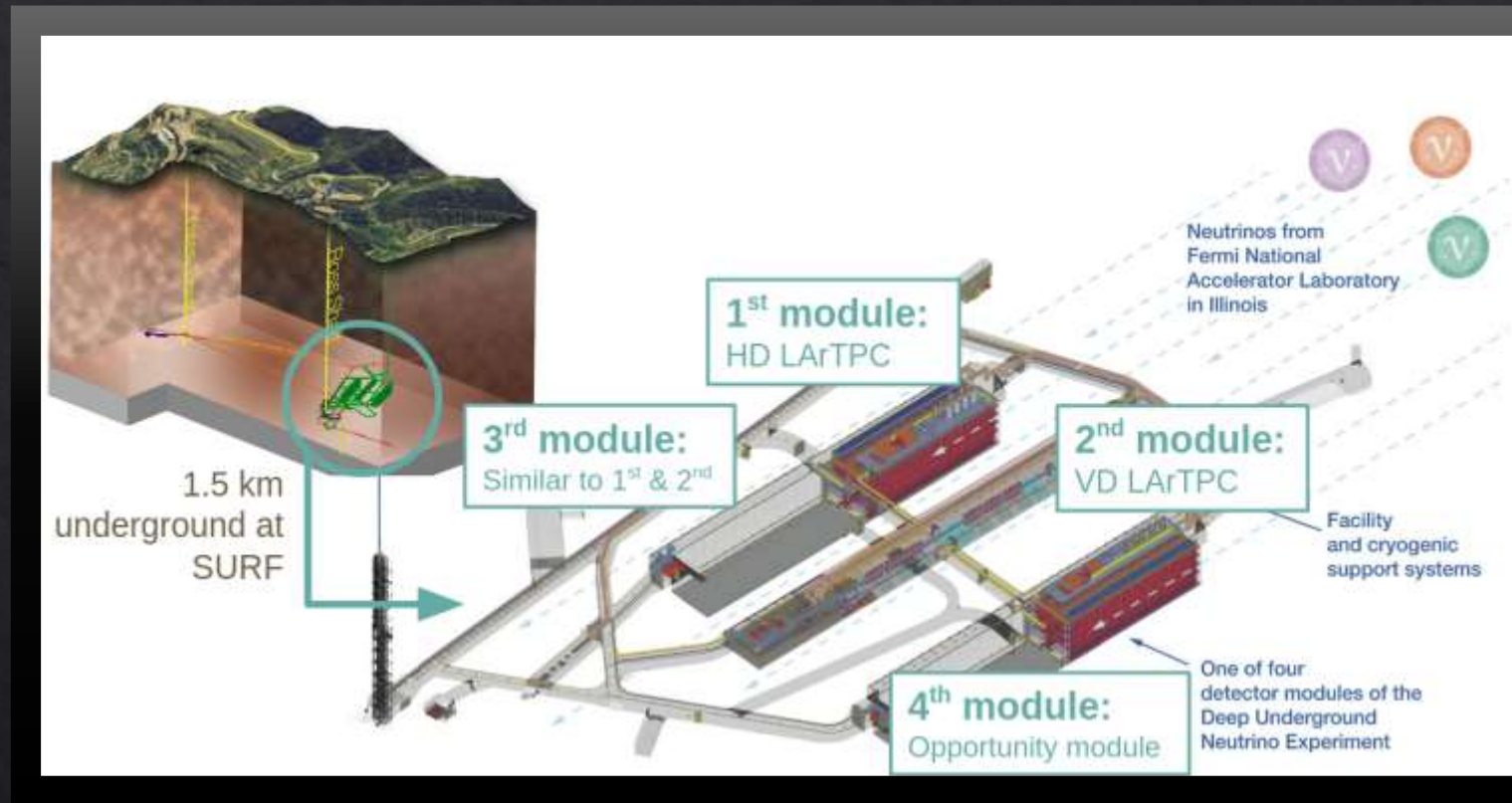
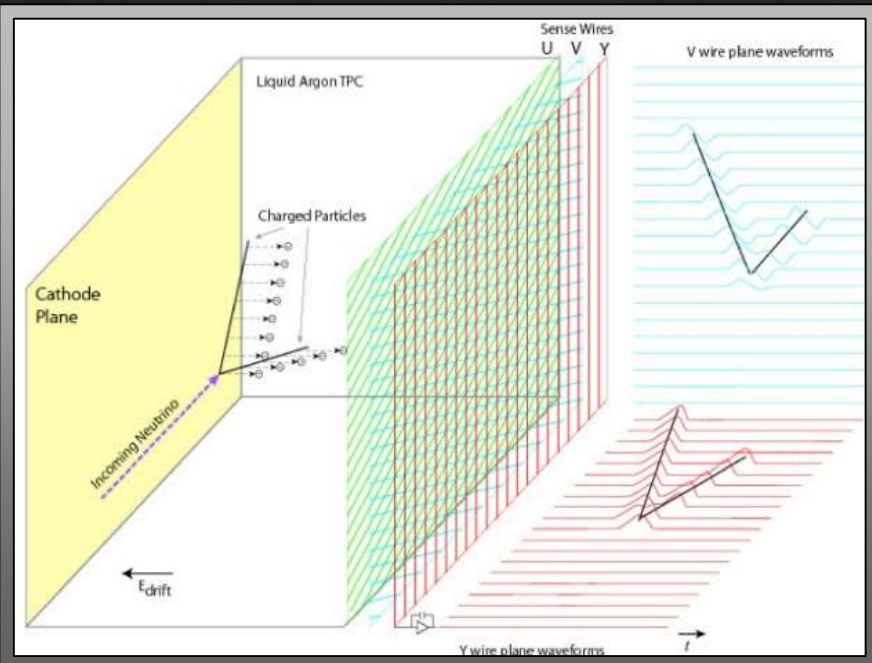


- Determine CP violation in neutrino sector
- Investigate supernovae
- Search for proton decay



# The Liquid Argon Time Projection Chamber (LArTPC)

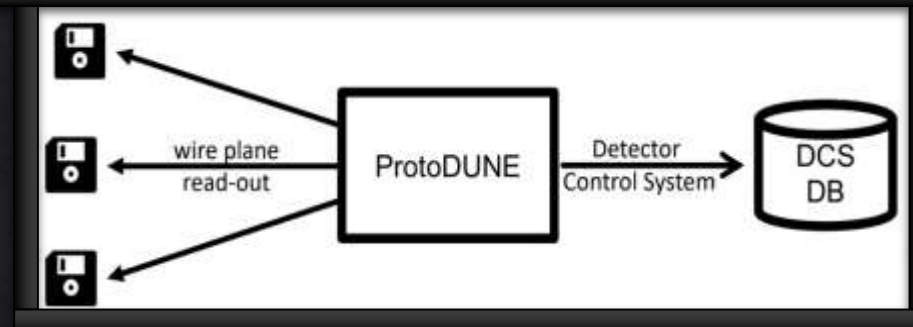
Size  
60m × 12m × 14m  
17 000 tons of  
Liquid Argon



# Detector Control System

Collects data about:

- Temperature of the Cryostat
- Purity
- Pressure of the LAr
- Voltage between the wire planes



# Data Reduction

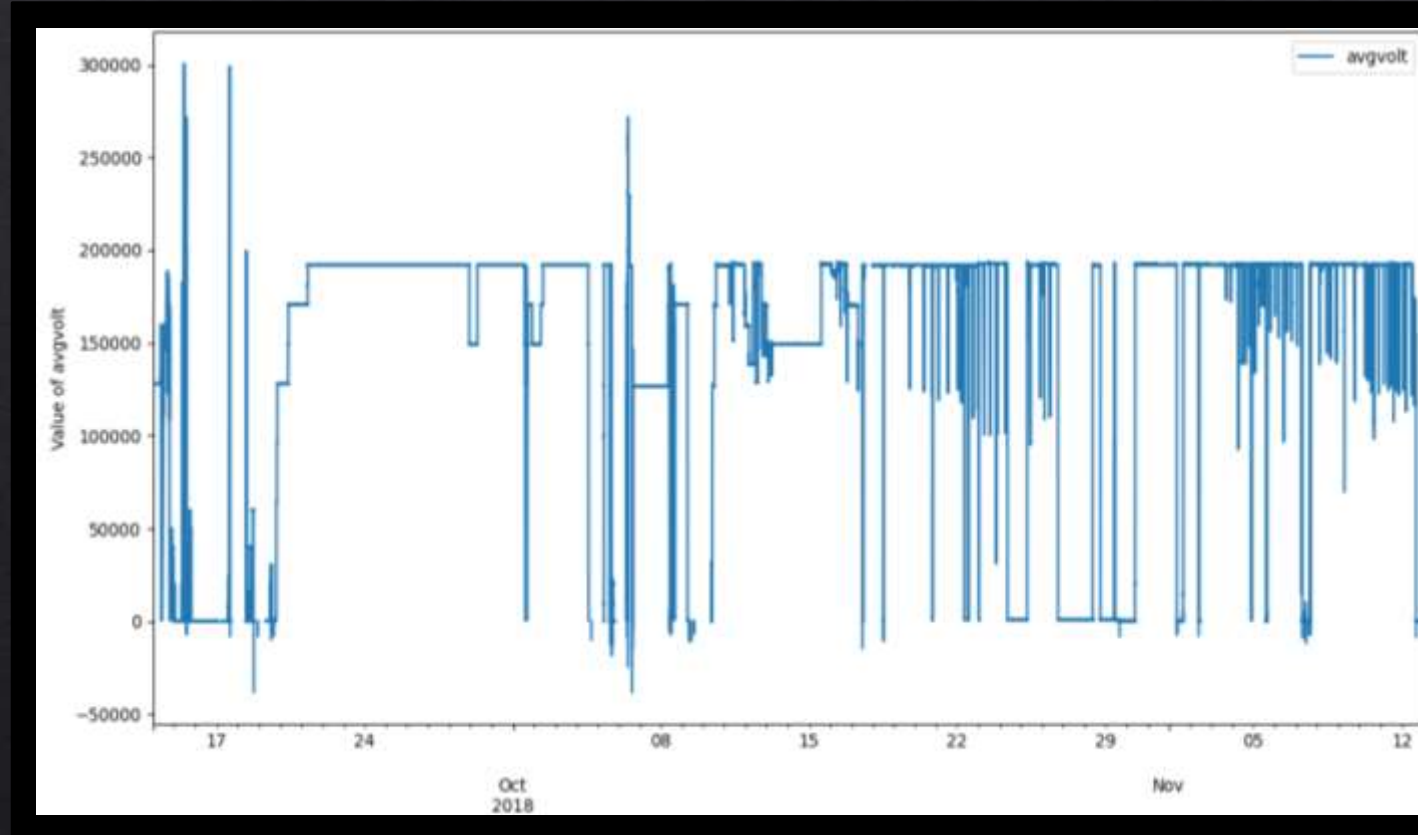
Reconstruction of particle trajectories in LArTPC is critically dependent on understanding the conditions under which the data were acquired

One use case of this data is to exclude periods of unstable high voltage (from short cuts, power cuts, etc. . . ) for further data analysis.

Currently, these unstable periods are identified as cases where the system resistance is lower than a hand-picked value.

My project is to improve this filtering system with an unsupervised Machine Learning approach (e.g. Anomaly Detection).

That is, using data that was collected in previous years; we can create an algorithm that would automatically detect abnormal behavior of the system.



# Anomaly Detection / Clustering

Anomaly detection (aka outlier analysis) is a step in data mining that identifies data points, events, and/or observations that deviate from a dataset's normal behavior.

