

Optimization and Calculating Correlations for XENON

Zoë Bilodeau

Introduction

Senior at Skidmore College

Major: Computer Science, Minor: Studio Art

Previous research experience: Investigating factors that affect trust in COVID technologies.

Mentors: Tina Peters and Chris Tunnell with the XENON Dark Matter Project

XENON Project

Current version: XENONnT

Goal of this project is to detect dark matter

A dual-phase time projection chamber
(TPC) filled with liquid and gaseous xenon

Located in Gran Sasso, Italy

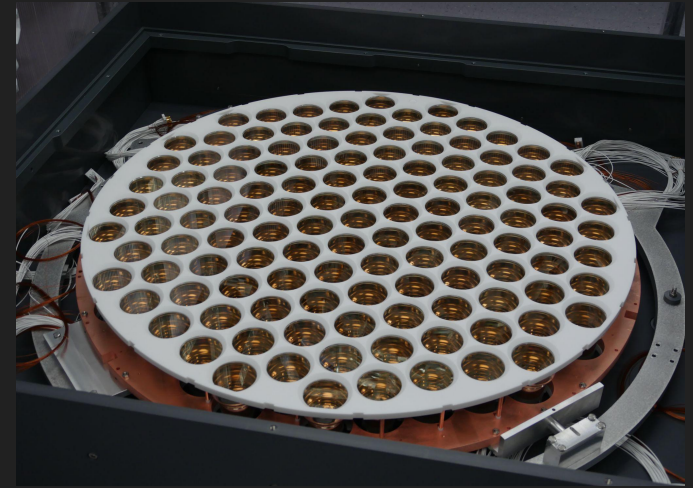


A picture of the last version of the XENON experiment,
XENON1T

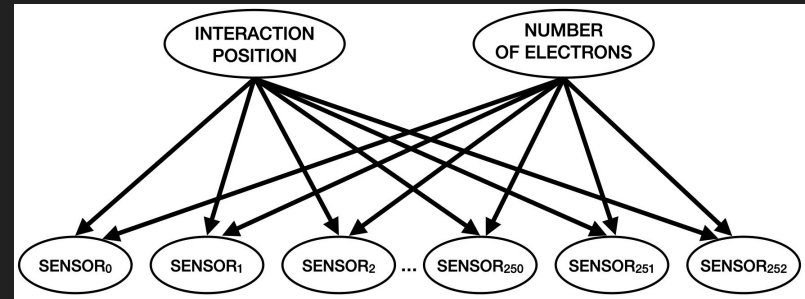
<http://xenonexperiment.org/>

My Project and Goals

- Positional reconstruction
 - Bayesian Network
- Find correlations between sensors concerning the number of photons they're detecting
 - Add relationships between sensors in Bayesian Network
 - Optimize Poisson PMF generation
 - Optimize integration over multidimensional Poisson distributions
- Use relationships to fill in gaps of information left by broken sensors.



Array of sensors on the bottom of the tank
<http://xenonexperiment.org/>



Our Bayesian Network
<https://arxiv.org/abs/2205.10305>