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Type : **Poster**

Developing a Machine Learning Algorithm for Dark Matter Detection in the SuperCDMS Experiment

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The nature of dark matter is among the most longstanding mysteries in physics and astronomy, with its detection potentially enabling a deeper understanding of physics beyond the standard model. One of the most promising candidates for dark matter is the weakly interacting massive particle (WIMP), which has become the subject of various dark matter searches across the world. The Super Cryogenic Dark Matter Search (SuperCDMS) experiment uses cylindrical crystals as detectors equipped with six superconducting sensors on either end that enable excellent energy resolution and sensitivity to potential dark matter masses as low as the eV scale. Determining the position information of particle detection events is made complicated by the crystal and sensor setup, making tools like machine learning ideal. My research has focused on developing a machine learning algorithm to predict position information for a set of calibration data. The model I used was trained on a Monte Carlo simulation of the detector, with a large component of my work being the application of different scaling methods to better model real data and hence produce a more accurate model. While the development of the algorithm is still ongoing, key results have been the model's success in predicting the position information of the calibration data as well as performing well when evaluated on metrics like energy prediction. In future studies, this model will be instrumental in analyzing data from the detector, which will further our understanding of dark matter, what its mass could and couldn't be, and the limitations of superconducting detector physics.

Did you give a contributed talk at CASCA 2026?

No

If you are selected for a poster, would you be interested in giving a short flash talk on your work?

Yes

What is your career level?

Undergraduate

Which keyword describes the area of focus of this talk?

Other

Primary author(s) : Ms DALE-DAVIES, Lyssa (University of Toronto)

Presenter(s) : Ms DALE-DAVIES, Lyssa (University of Toronto)

Session Classification : Transients & Cosmology