

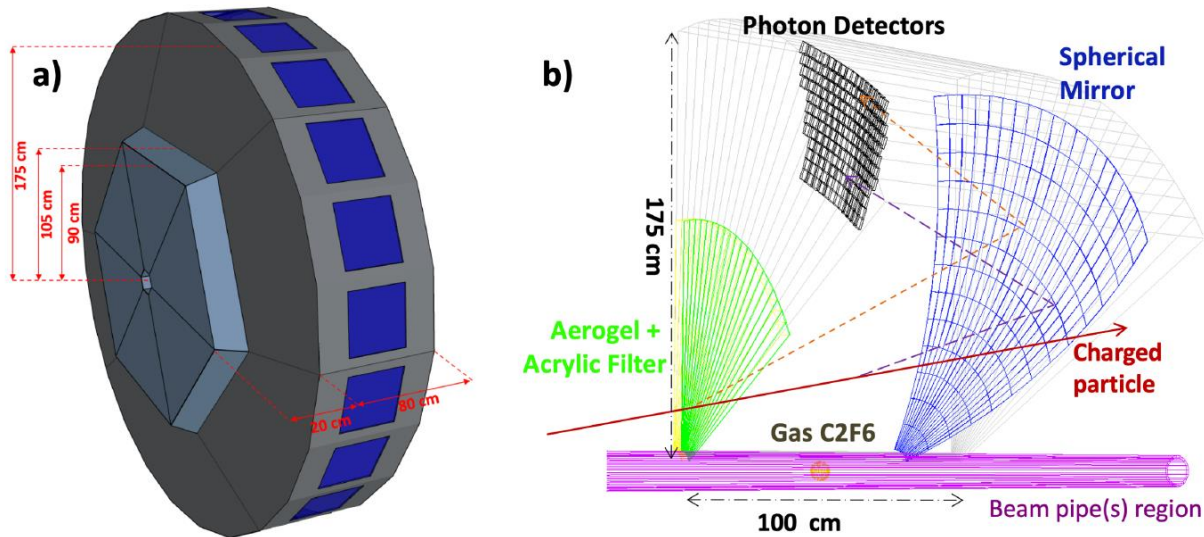
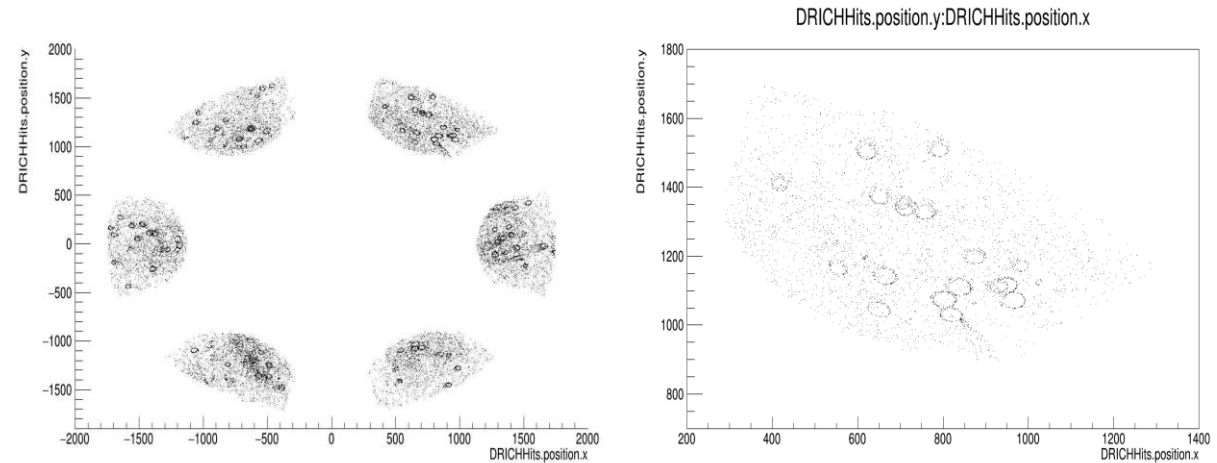
Particle Identification at the EIC dRICH Detector using Deep Learning

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Introduction

- Brookhaven National Laboratory proposed the Electron-Ion Collider which is scheduled to be built in the 2020s.
- The EIC facility is a high polarization and high luminosity collider.
- Home to the dRICH detector, the focus of our studies.



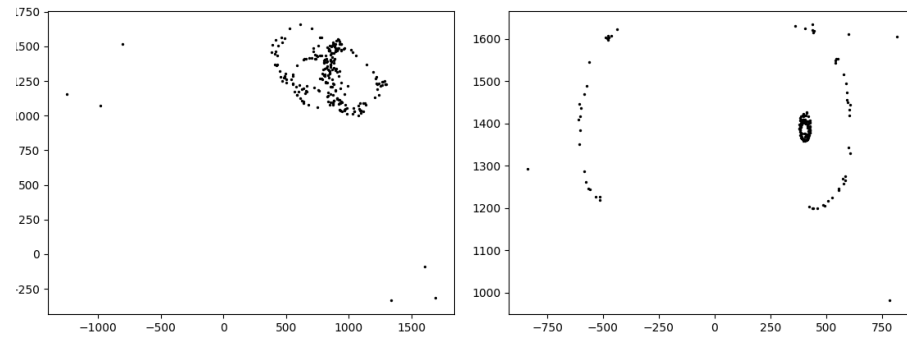
- This problem is a highly visual one, which lends itself nicely to convolutional neural networks.
- Convolutional neural networks are used to identify the particle types using the varying ring sizes.
- Data is sparsified to save on space, MinkowskiEngine is the package used for sparse convolutions.

Results

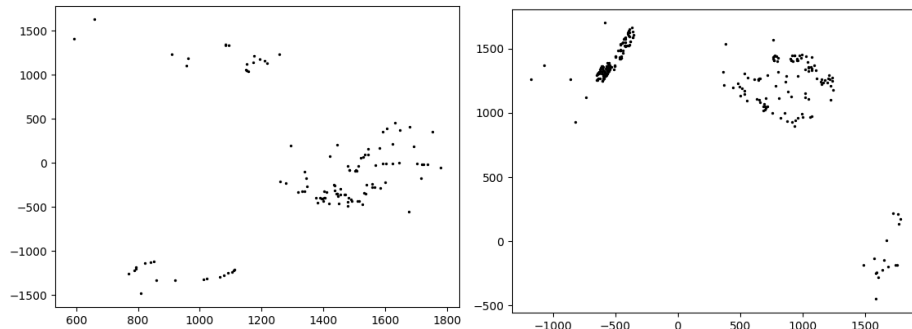
Particle	Events	Accuracy
Pion	9677	95.44%
Electron	8339	95.57%
Kaon	2635	76.81%
Proton	215	4.55%
Total	20866	93.82%

- Make sure that the model has enough data for each particle type.
- Use O-CNN package instead of MinkowskiEngine and deploy model in C++ interface for speed boost.
- Improve the accuracy even further and deploy the model in the facility.

Kaon events:



Proton events:



- Special acknowledgements to my supervisors, Dr. Wouter Deconinck (wouter.deconinck@umanitoba.ca) and Dr. Zhiyang Zhou (zhiyang.zhou@umanitoba.ca).
- You can reach me through my email address at hassano1@uvic.ca
- My code and thesis can be found at: <https://github.com/ohassn/Particle-Identification-Using-CNNs>