Anomaly Detection in Triggers

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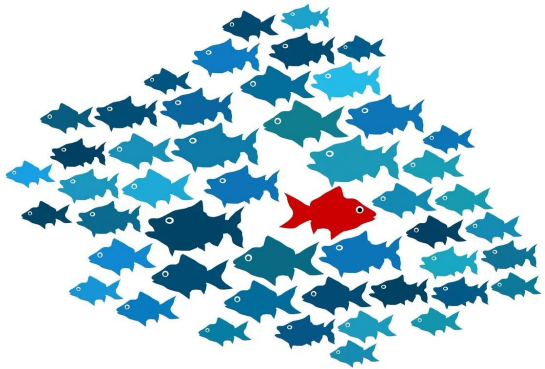
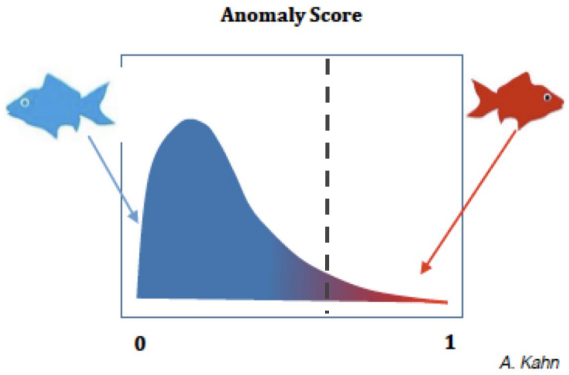
Anomaly Detection

Are we looking in the **right places** for discovering New Physics?

What if we do not know **how New Physics looks like**?

Unsupervised ML - **Anomaly Detection**, **agnostic** to specific theoretical signal models.

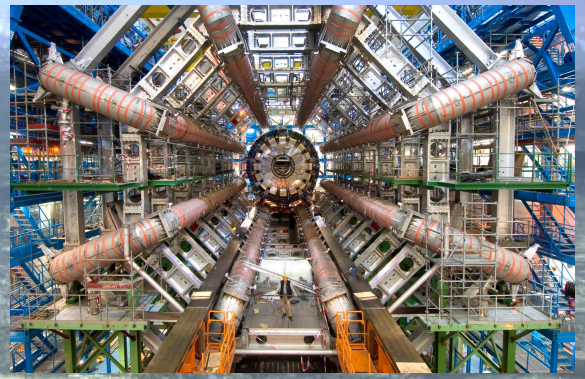


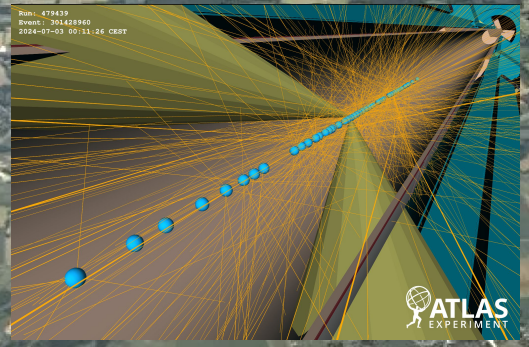


The Large Hadron Collider

Protons collide at an energy of 6.8 TeV at the 4 detector locations, every 25 ns
~ huge amount of data!

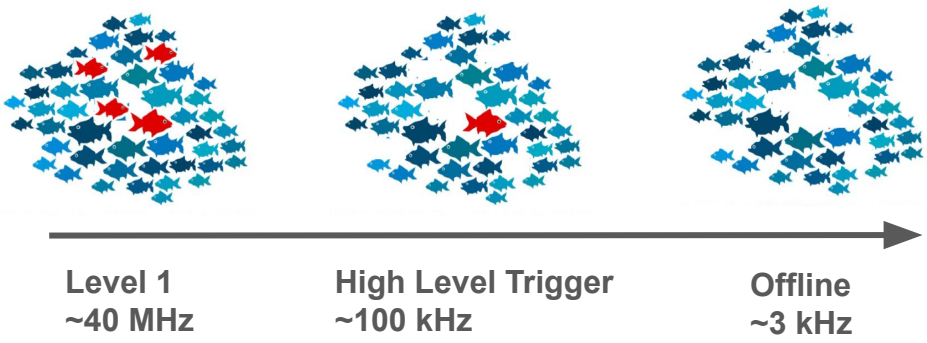
Need a trigger to filter events





AD Trigger

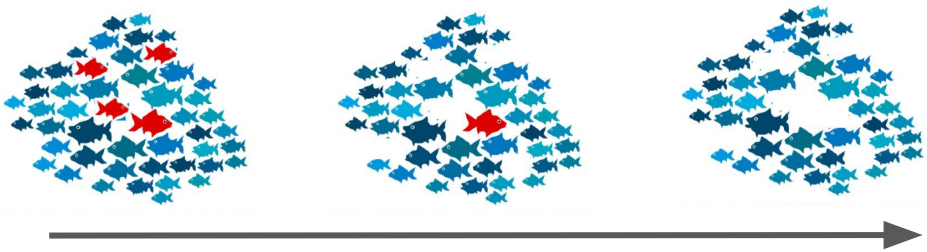
What if?



- Traditional triggers focus on ”well-known” physics signatures, targeting high transverse momentum physics objects.
- **AD trigger** is not based on pre-defined signatures → Increase **sensitivity to discover new physics** at low energies.

AD Trigger

What if?



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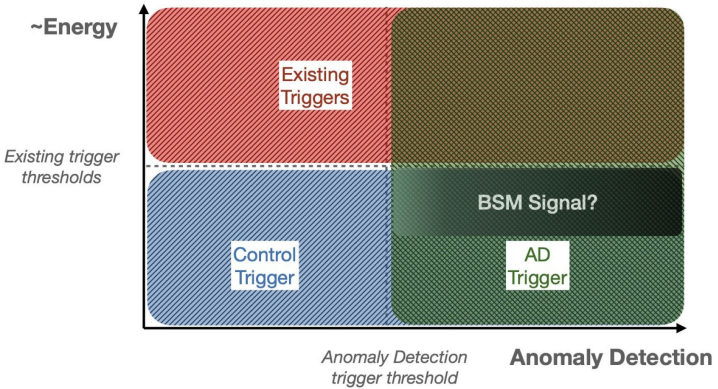
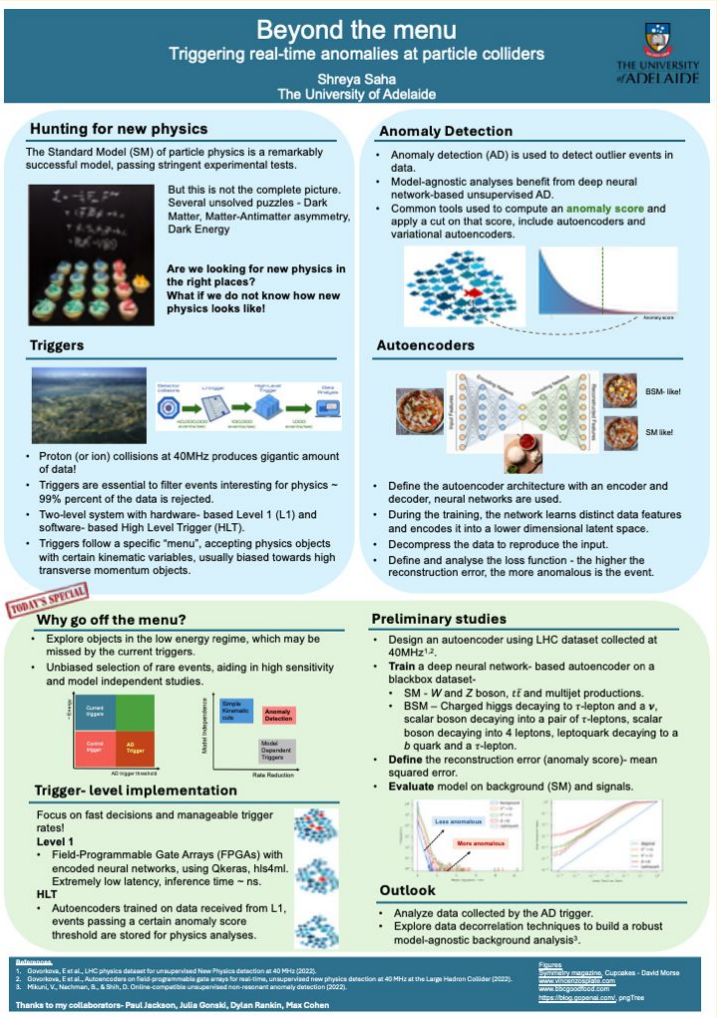
Level 1 AD Trigger

- Incorporate autoencoders in Field Programmable Gate Arrays (FPGAs).

High Level AD Trigger

- Train on events passing L1 AD trigger
- Anomaly score = reconstruction loss





Visit the poster for a fun discussion!

Thank you!

Thanks to my collaborators at The University of Adelaide, UPenn, Stanford University.