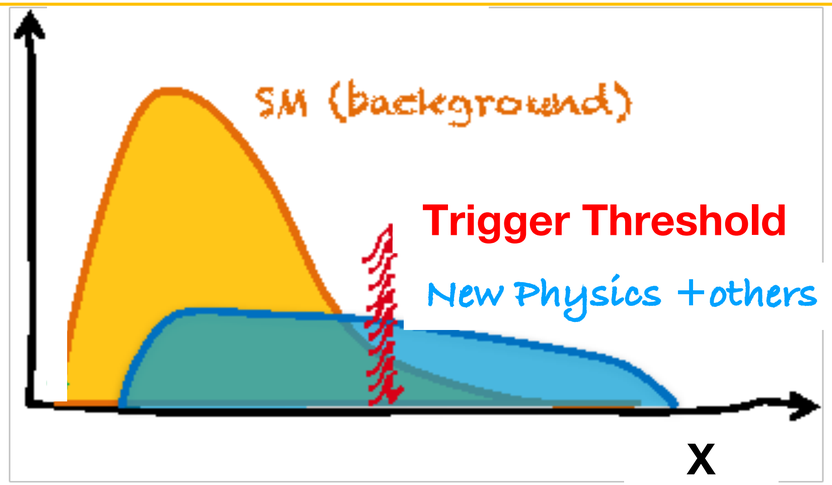
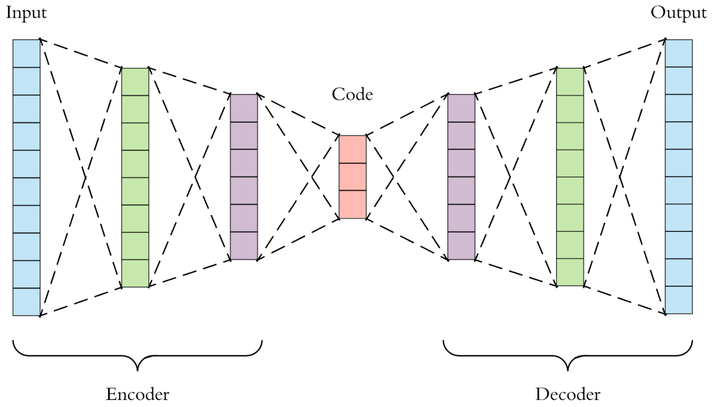
Detect New Physics with Deep Learning Trigger at the LHC

Zhenbin Wu on behalf of CMS Collaboration

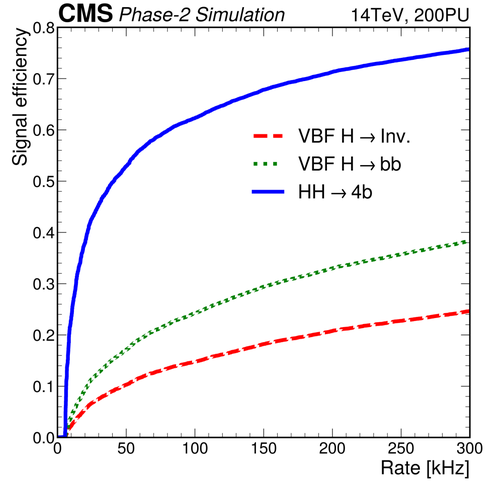


- Traditional searches relies on **hypothesis testing**
- A Model-Agnostic Trigger for anomaly events
- Deployment at Level-1 trigger to avoid bias from upstream



- Use **Autoencoder** (AE) for feature-learning of background data
- Anomaly events differ from background, manifest as large loss value

Loss = f(input – output)



- Simple 8 layer AE trained with CMS Level-1 inputs from background, **showed the separation power in inference**
- Within the resource and latency requirement of hardware

- Simple AE model can be implemented at the Level-1 trigger level as anomaly event trigger at 40MHz
- AE trigger rate can be stabilized to cope with noisy online condition
- Stay tune for the CMS Phase 2 Level-1 Trigger TDR