THE MASS-IVE ISSUE: ANOMALY DETECTION IN JETS

Goal: 1) Learn Standard Model Physics with NN.
2) Detect Anomalies – New Physics!

- Potential new Physics phase space – Huge!!
- Need Model Independent methods – look at physics objects – Jets!
- QCD jets – Parton initiated
- Dominant background!
- Learn QCD – tag jets unlike QCD – enhance signal!
- Test sample – Top, Stealth Boson

What happens when we cut on metrics?

- METRICS SHOW HEAVY SCULPTING.
- Background tends to look like Signals at tight cuts!

Sculpting vs Signal efficiency for all metrics studied – WITH HIGHER REJECTION COMES HIGHER SCULPTING!

• Bump hunt to find new physics – Mass is key!
• Model able to reconstruct QCD mass well, reasonably captures Top+StealthBoson masses!
• Use learnt representation of QCD – Define anomaly metrics – Apply cuts – Tag anomalies!
• Metrics computed in – Observation space, Latent Space, + Discriminator loss

Are we detecting anomalies? Or just picking up on mass?

- Train with Top (massive compared to QCD) – QCD still nominal!
- Similar trend in all metrics

- New Physics can be anywhere! – Need to be sensitive to a range of signals + performance decorrelated with mass.
- Similar checks required when considering new Anomaly Detection methods!

Reconstruction Performance

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