Boosted Decision Trees for Supersymmetry Searches
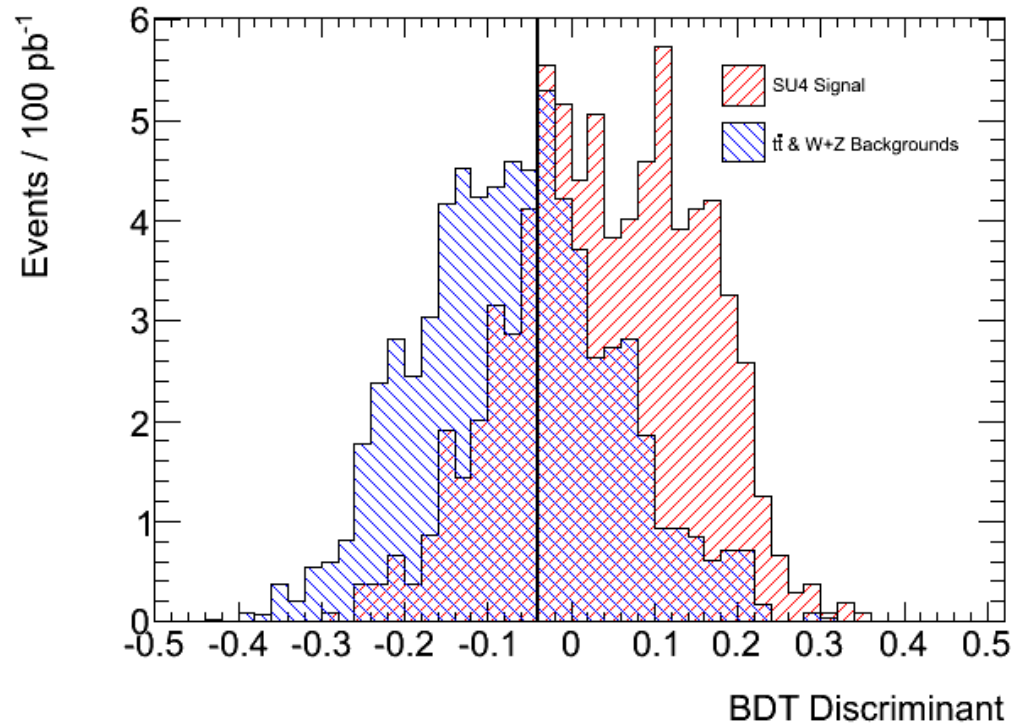
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Boosted Decision Tree Separation
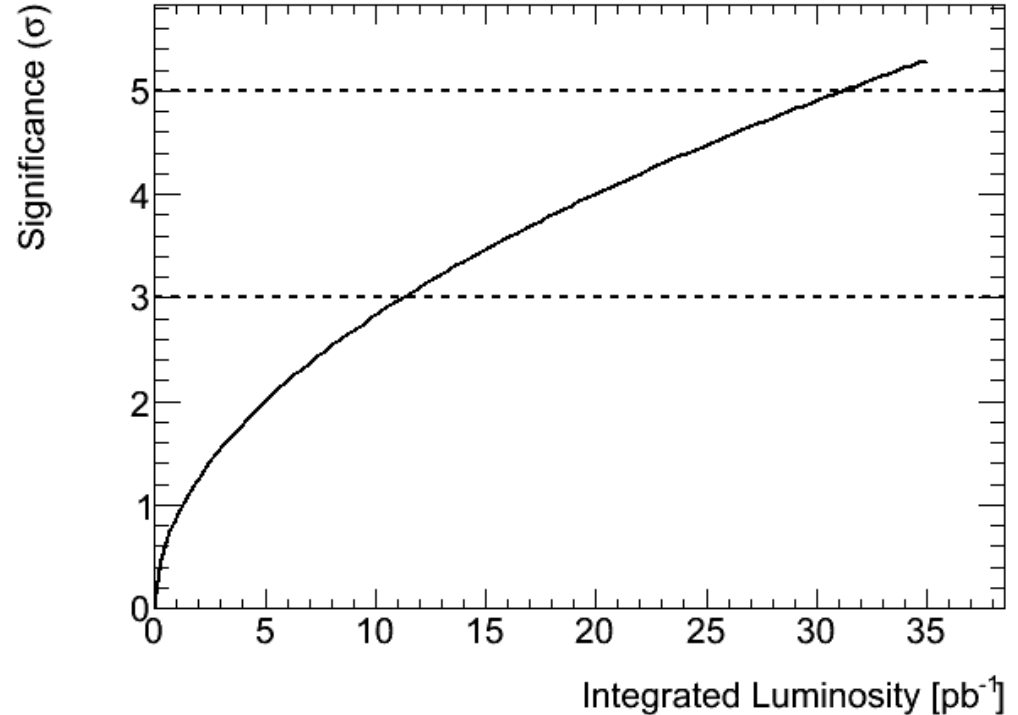
- SU4 mSUGRA Point

- Backgrounds considered:
  - Ttbar production
  - W+Z production

- Comparisons made to Multi-lepton cuts.

- Precut requires $N_{Leptons} >= 3$ $(l \in \{e, \mu\})$

- Trained on full MC sample (without cuts) to maximise training sample.

- 400 trees used here.
  - s = 63.4
  - b = 32.8
  - Z = 8.96

$$Z = \sqrt{\left(2(s+b) \operatorname{Log}\left(1 + \frac{s}{b} \right) - s \right)}$$

Boosted Decision Tree Significance

- 5 σ excess at 31.15 pb^{-1}

- Effect of over boosting investigated.

- Significance estimation needs to include background uncertainties.

- Need to move to Di-lepton + 4 jet analysis.

- Aim is to investigate if a BDT run on control and expected signal regions can extract the top component in the signal region.

- To recover higher statistics, channels with jet multiplicities lower than 4 will be investigated.

$$Z = \sqrt{\left(2(s+b)\operatorname{Log}\left(1 + \frac{s}{b}\right) - s \right)}$$