Higgs +1 Jet Study

Nicholas Mehrle
Affiliations
Activities

- 1 Jet Study
- 2 Jet Study
- Alignment
1 Jet Study

http://www-cdf.fnal.gov/physics/new/hdg/Results_files/results/ZZ4leptons_120307/analysis.html
Jets

Parton level

$p$, $q$, $g$

$\pi$, $K$, ...

Particle Jet

Energy depositions in calorimeters

Major Higgs Production Mechanisms

Vector Boson Fusion

http://www.t2.ucsd.edu/twiki2/bin/view/HEPProjects/HiggsToZZTo4l
Major Higgs Production Mechanisms

Vector Boson Fusion

Gluon Fusion

http://www.t2.ucsd.edu/twiki2/bin/view/HEPProjects/HiggsToZZTo4l
Major Higgs Production Mechanisms

Vector Boson Fusion
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Gluon Fusion
Fake Jet Construction

http://inspirehep.net/record/1294662/plots
Fake Jet Construction

Balance momentum in X-Y Plane

http://inspirehep.net/record/1294662/plots
Fake Jet Construction

Z momentum depends on $\eta$

http://inspirehep.net/record/1294662/plots
Discriminant

\[ \eta = 2.4 \]
Discriminant

\[ \eta = 2.4 \]

\[ \frac{P_{\nu bf}}{P_{\nu bf} + P_{HJ}} \]
$\eta = 2.4$

\[
\frac{P_{\nu bf}}{P_{\nu bf} + P_{HJ}}
\]
Discriminant

\[ \eta = 2.4 \]

\[ \frac{P_{\nu b f}}{P_{\nu b f} + P_{H J}} \]
Dependant on Fake Jet

\[ \eta = 0 \]
Dependant on Fake Jet

\[ \eta = 0 \quad P_z = 0 \]
Average

\[ \eta \in \{-5, -4.8, \ldots, 5\} \]

\( \theta \) from \( \sim 0.01 \) to \( \sim 3.13 \)
Average

\[ \eta \in \{-5, -4.8, \ldots, 5\} \]

\( \theta \) from \( \sim 0.01 \) to \( \sim 3.13 \)

\[ P_{vbf} = \frac{1}{N} \sum P_{vbf}(\eta) \]
Average

![Graph showing efficiency curves for different parameters: Eta = 2.4, Eta = 0, Pz = 0, and Averaging. The graph plots H_I efficiency against VBF efficiency.]
Integration

\[ P_z = 0 \]
Integration

\[ P_z = 0 \quad \eta \quad P_{\nu b f} \]
Integration

\[ P_z = 0 \quad \eta \quad P_{vbf} \]

\[ T(\eta = x) = \sum_{events} P_{vbf}(\eta = x) \]
Integration

Eta Dist

<table>
<thead>
<tr>
<th>etaDist</th>
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</thead>
<tbody>
<tr>
<td>Entries</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>RMS</td>
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</tbody>
</table>
Integration

\[ P_{\nu b f}^{int} = \frac{P_{\nu b f}}{\text{Entries}} \]

- Entries: 2053
- Mean: -0.01367
- RMS: 2.466
Integration

\[
P_{int}^{\nu b f} = \frac{P_{\nu b f}}{A_{dist}}
\]
Integration

\[ P_{\nu b f}^{int} = \frac{P_{\nu b f}}{A_{\text{dist}} \times A_{\text{bin}}} \]

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Integration
Acknowledgements

- Dr Andrei Gritsan, Dr Meng Xiao, Candice You
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- Dr Steven Goldfarb, Prof Jean Krisch, Prof Tom Schwarz, Prof Homer Neal
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Photos