Input parameters

- Experimental jets
  - initial 4-vectors $p_j^m = \left(E_j^m, \vec{p}_j^m\right) \quad j = 0,1...5$
  - we set $m_j^m \equiv 0$
    - should not do this when considering merged partons
  - each jet therefore characterized by the triplet

$$\left(E_j^m, \eta_j^m, \varphi_j^m\right) \qquad \left|\vec{p}_j^m\right| = E_j^m$$

  - for now assume no b-jet tagging

Input parameters

- Truth partons
  - initial 4-vectors $p_j = \left(E_j, \vec{p}_j\right) \quad j = 0,1...5$
  - characterized by

    $\left(m_j,\ E_j,\ \eta_j,\ \varphi_j\right) \qquad E_j^2 = \left|\vec{p}_j\right|^2 + m_j^2$
  - we adopt the labelling
    - (0, 1, 2, 3, 4, 5) = (u, dbar, ubar, d, b, bbar)

Jet uncertainties

- Consider jets with 1-to-1 jet-parton matching
  - for example use matching search with $\Delta R < 0.2$
  - study the quantities

$$\Delta E \equiv E^m - E \qquad \Delta\eta \equiv \eta^m - \eta \qquad \Delta\varphi \equiv \varphi^m - \varphi$$

    - obtain averages $\langle \Delta E \rangle$, $\langle \Delta\eta \rangle$, $\langle \Delta\varphi \rangle$
    - obtain rms $\sigma_E \equiv \mathrm{rms}(\Delta E)$, $\sigma_\eta \equiv \mathrm{rms}(\Delta\eta)$, $\sigma_\varphi \equiv \mathrm{rms}(\Delta\varphi)$
    - for now as a function of E^m, η^m
    - for now, ignore possible correlations between these quantities
    - need to verify if they follow a Gaussian distribution or not for a given E^m, η^m

Jet uncertainties

- for now, only consider uncertainties in E^m
  - only need σ_E as a function of E^m, η^m
    - ideally, one should consider as a function of E, η
  - ignore biases (non zero averages) for now
  - assume Gaussian distribution

Fully hadronic decay kinematic fit

- For now, consider a simple chi2 fit
  - assume jet direction exact
  - constraint both W masses
  - demand that both top have the same mass
  - consider Gaussian, not Breit-Wigner, for W and top masses
  - for a given jet hypothesis consider the chi2

$$\chi^2 = \sum_{j=0}^{5} \left(\frac{E_j^m - E'_j}{\sigma_{Ej}} \right)^2 + \left(\frac{M'_{W^+} - M_W}{\Gamma_W} \right)^2 + \left(\frac{M'_{W^-} - M_W}{\Gamma_W} \right)^2 + \left(\frac{M'_t - M'_{tbar}}{\sqrt{2}\Gamma_t} \right)^2$$

    - minimize this chi2
    - the free parameters are the six fit jet energies E'_j

Fully hadronic decay kinematic fit

- start each fit with $E'_j = E^m_j$
- in the fit use

$$p'_j = \left(E'_j,\ E'_j \hat{p}^m_j\right)$$

$$M'_{\mathrm{W}^+} = \sqrt{\left(p'_0 + p'_1\right)^2} \qquad M'_{\mathrm{W}^-} = \sqrt{\left(p'_2 + p'_3\right)^2}$$

$$M'_{\mathrm{t}} = \sqrt{\left(p'_0 + p'_1 + p'_4\right)^2} \qquad M'_{\mathrm{tbar}} = \sqrt{\left(p'_2 + p'_3 + p'_5\right)^2}$$

- use the same values as used in the generation for $M_{\mathrm{W}},\ \Gamma_{\mathrm{W}},\ \Gamma_{\mathrm{t}}$