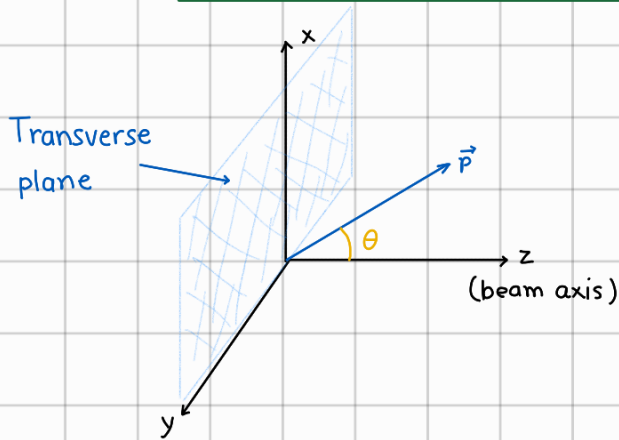
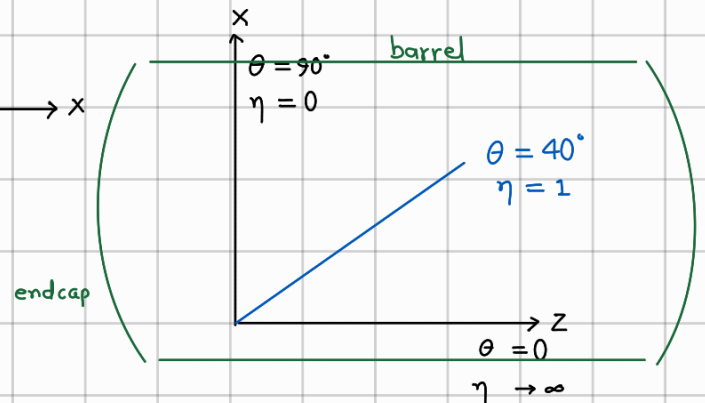
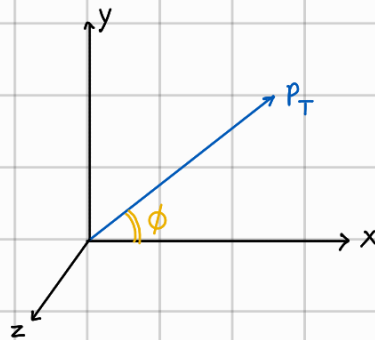
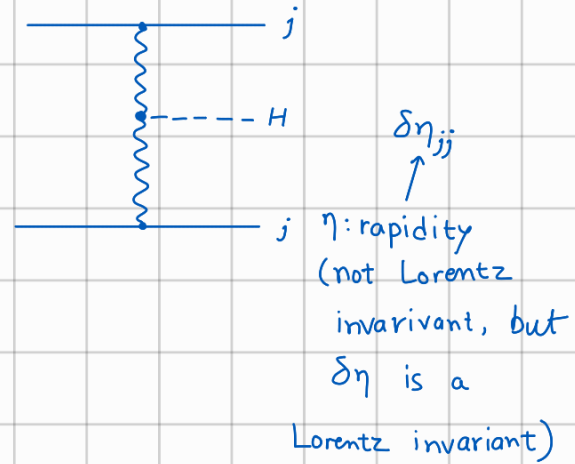


Machine Learning in Particle Physics



$$y = \frac{1}{2} \ln \left(\frac{E + p_z}{E - p_z} \right)$$

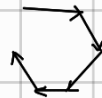
for almost massless particles, $\eta = -\ln \left(\tan \frac{\theta}{2} \right)$



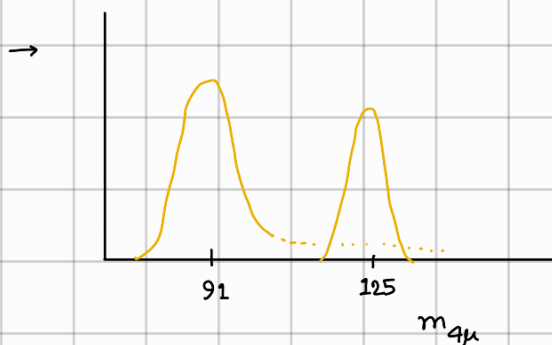
for final state particles

$$\sum p_t^f = 0$$

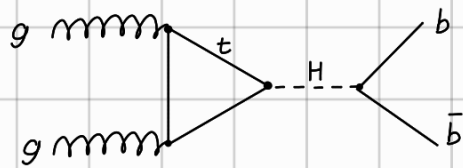
(since $\sum p_T^i = 0$ too)
(for initial state particles)



VBF: $H \rightarrow ZZ \rightarrow 4\mu$



Higgs via gluon fusion:



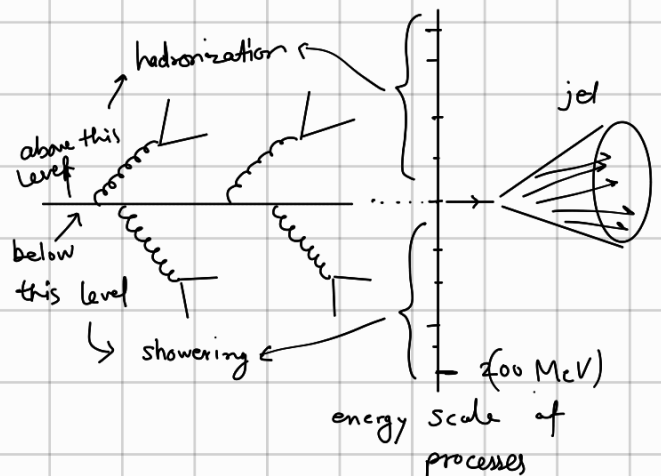
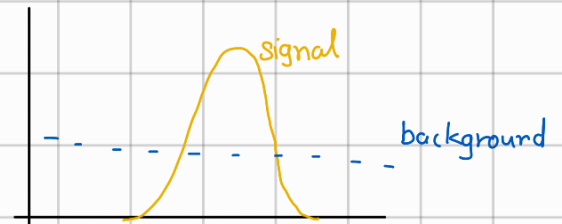
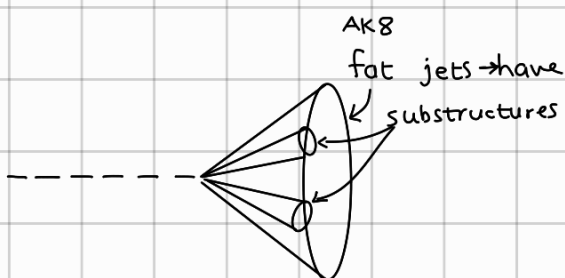
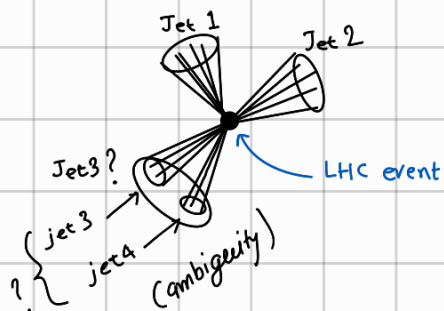
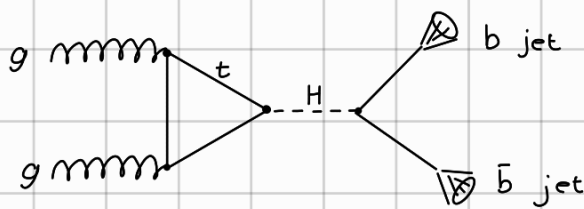
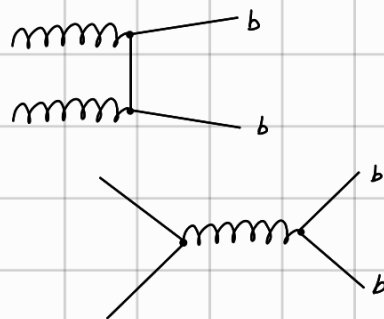
$$H \rightarrow b\bar{b} \quad (58\%)$$

$$H \rightarrow \gamma\gamma \quad (0.2\%)$$

$$H \rightarrow ZZ \quad (2.6\%)$$

$$H \rightarrow W^+W^- \quad (22\%)$$

in QCD background



Sterman & Weinberg - PRL 39, 1436 (1977)

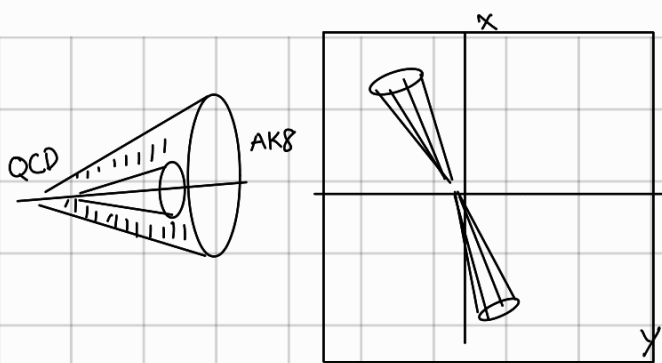
$$\Delta R \quad p_i^T p_j^T$$

$$\Delta R > x$$

K_T & anti- K_T algorithm

Cambridge algorithm (C/A)

AK4 jets
 \downarrow ($R=0.4$)
 (anti K_T)



$$p_T(H) = 0$$

$$p_T^H > 0$$

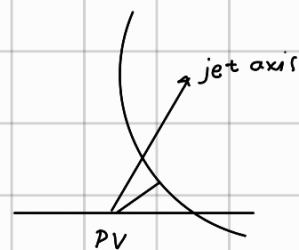
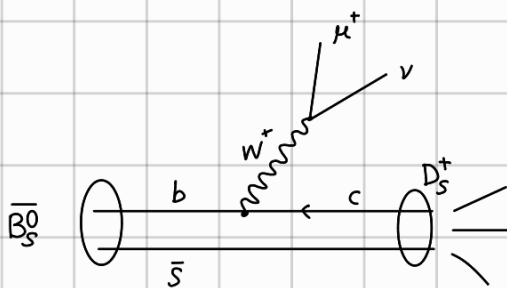
B-hadrons lifetime, SV (secondary vertices) n_{track}

gen. \rightarrow

1	2	3
u	c	t
d	s	b

of tracks inside the jet.

[3rd gen. $\xrightarrow{\text{decay}}$ 2nd gen. $\xrightarrow{\text{decay}}$ 1st gen.]



Impact parameter $\rightarrow \frac{\int p}{\sigma}$