PERTURBATIVE QCD

! ← mathematically difficult
not possible to see all details

1) some history, basics, Lagrangian, colour algebra

2) radiative corrections : UV diverg.

! |
β- function
asymptotic freedom

← 1 loop corrections
running coupling
μ_R

3) $e^+ e^- \to$ hadrons : IR diverg

! |
cancellation of "real" / "virtual" diverg.

← higher order computations @ LHC

Soft limit of R and V

4) JETS in $e^+ e^-$ ← JETS @ LHC
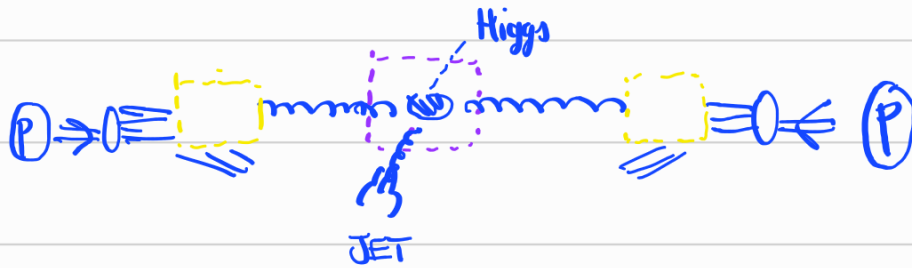
Deep Inelastic scattering and "naive" parton model

hadrons in initial state
PDF
master formula for $d\sigma$ @ LHC

5) Radiative corrections to parton model, DGLAP equations

"factorization", μ_F

GOAL: understand LHC collisions

EXAMPLE

TAKE HOME MESSAGES

⊛ $d\sigma = \sum_{ij} \int_0^1 dx_1 dx_2 \; f_i(x_1, \mu_F) \, f_j(x_2, \mu_F) \times d\hat{\sigma}_{ij}(x_1 P_1, x_2 P_2, \{k_i\}, \mu_R, \mu_F)$

⊛ Not all observables can be predicted
   with perturbative QCD

⊛ From partonic picture (quarks/gluons) to
   measured particles (hadrons) / event generators/parton showers
   $\cdots\to$ lecture on MC and tools