Scattering Amplitudes: LHC

Feynman Diagrams

Theories: strong interactions
- gluons, quarks
- gluons: N=4 SYM
- Qu: Other theories, particles?

Parke-Taylor formula

On-shell diagrams (planar graphs)
- Constructed from fundamental 3pt amplitudes
- Simple amps:
  \[ [ab] \]
  \[ [12][23][31] \]
- Permutations/Plabic graphs
  - (1,2,3)\(\rightarrow\)(2,3,1)
  - (1,2,3)\(\rightarrow\)(3,1,2)

Parke-Taylor formula: Single on-shell diag.
- Parameterization: \(n = \#\)external lines
- \(k = \)helicity count
- \(n=3,k=3\): 3 on-shell diags.

Qu: Nonplanar on-shell diags?

Amplitude hexagon
- \(Gr(n,k)\)

Cluster algebras

Positive Grassmannians
- \(Gr((4,n))\)
- faces, edges
- \[ C = \begin{pmatrix} 1 & 0 & * & * \\ 0 & 1 & * & * \end{pmatrix} \]
  - \(C_{ab} = -\sum f_j \sum a_i\)
