From vacuum decay to jet substructure

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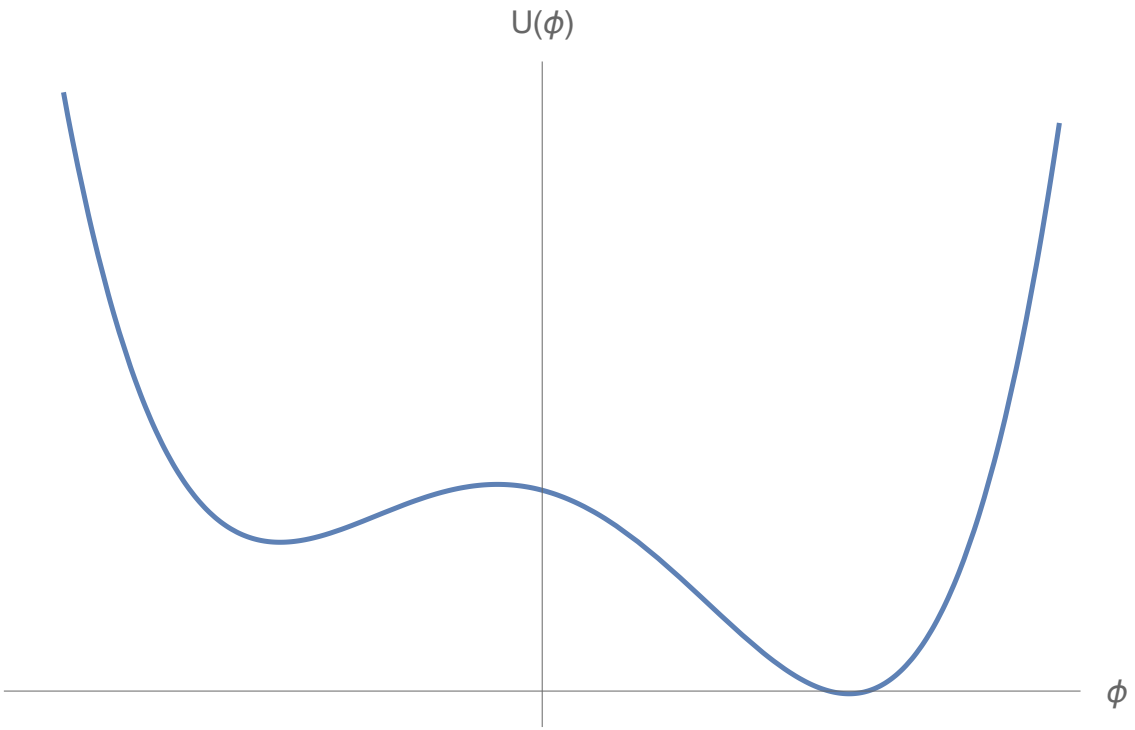
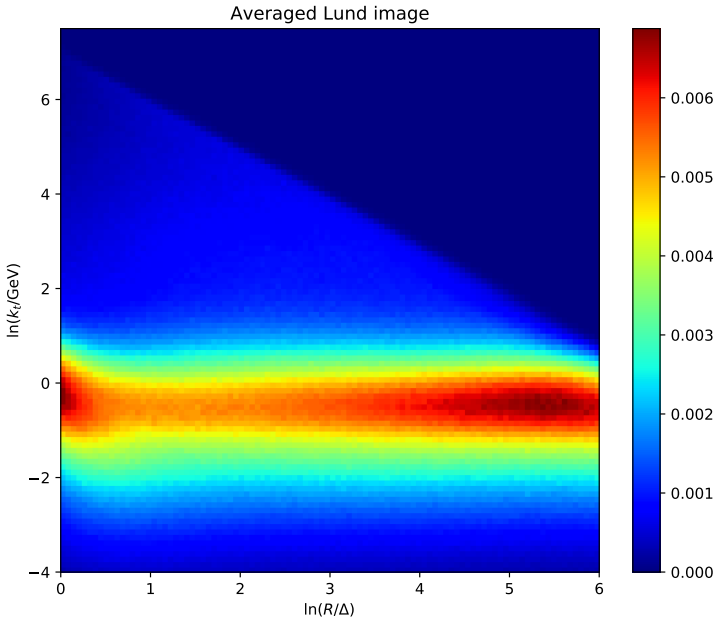
Quantum corrections to the decay rate of metastable vacua.

$$\mathcal{L} = \frac{1}{2}\partial_\mu \phi \partial^\mu \phi - U(\phi), \tag{1}$$

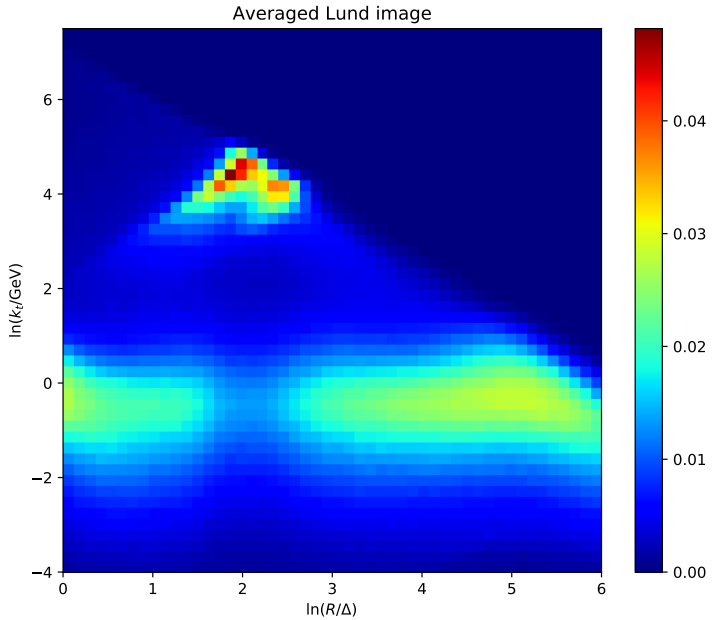


Summer

Methods For Tagging boosted top quarks based on jet substructure.



(a) Averaged Primary Lund Plane of light quark jets generated using Pythia with a minimum transverse momenta of 2 TeV.



(b) Averaged Primary Lund Plane of top quark jets generated using Pythia with a minimum transverse momenta of 2 TeV.

Figure: Plots generated using a fastjet contrib based on arXiv:1807.04758

Resummation

τ_{32} is a jet shape variable designed to differentiate between jets with three hard prongs and jets with less hard prongs (arXiv:1108.2701).

$$\tau_N = \sum_{i \in J} z_i min(\theta_{i1}^2, \theta_{i2}^2, ...\theta_{iN}^2) \tag{2}$$

$$\tau_{32} = \frac{\tau_3}{\tau_2} \tag{3}$$

Started work on calculating the resummed τ_{32} distribution with the additional veto that the jet also passes the Y-Splitter top tagging algorithm.

So what next?

- Resummed distributions for cuts on variables designed to identify boosted tops.
- Compare with machine learning and other top top tagging methods.
- Hopefully find a nice combination of cuts to identify boosted tops, which can be understood using perturbative QCD.

The sketchiest thing I've done this year

(and it's not the analytic continuation in my Mphys report)

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