Hi! I'm Arjun

PhD Student @ MIT | Advisor: Krishna Rajagopal

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On the Menu Today: The Original Soup (Quark-Gluon Plasma)

The Original Soup: Quark-Gluon Plasma

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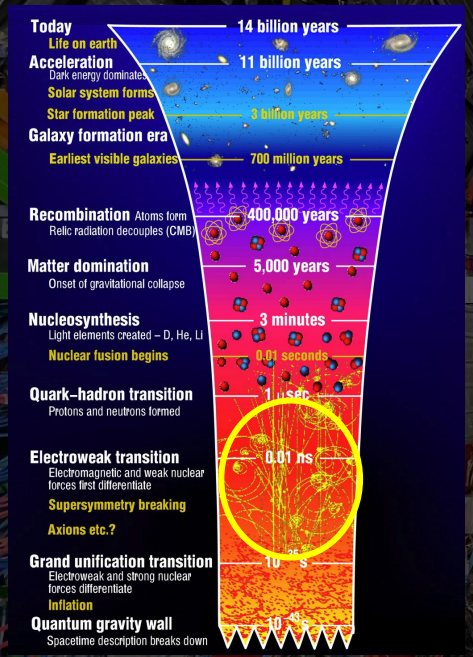

Image from: Centre for Theoretical Cosmology, Cambridge University

In ultrarelativistic heavy ion collisions (e.g. Pb–Pb), a strongly coupled liquid, called quark-gluon plasma (QGP), is formed

- The first liquid to exist
- At a few trillion degrees, the hottest liquid that has ever existed
- The most liquid liquid to exist
- Quarks are deconfined, yet strongly interacting

A Taste Test using Jets

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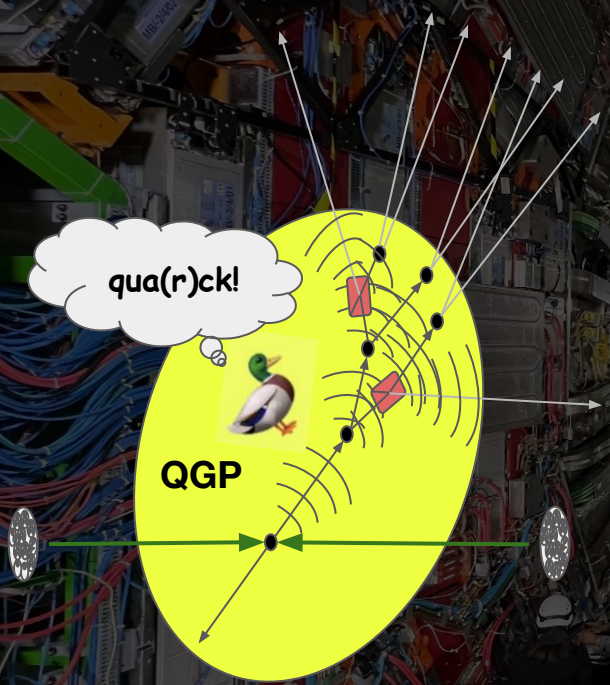

What are the properties and microscopic structure of quark gluon plasma?

- Jets are collimated showers of high energy quarks and gluons that result from a hard scattering
- Hard partons in jets traverse and interact with the QGP droplet. These interactions are imprinted onto the final measured state
- I study jet substructure observables like energy correlators, jet shapes, Soft Drop angles, etc. to probe the physics of hot-QCD

Reconstructing the Recipe using Energy-Correlators

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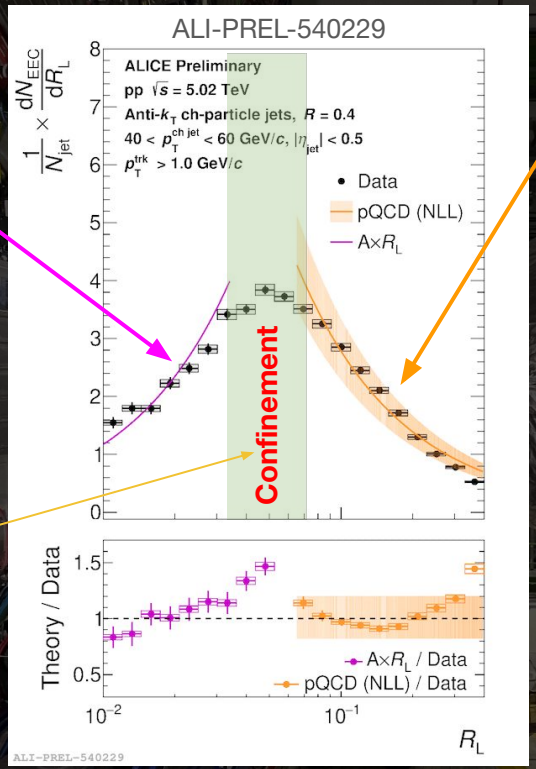
Evolution of non-interacting hadrons (at late times)

Perturbative QCD evolution of quarks and gluons (at early times)



$$R_L \sim \Lambda_{\mathrm{QCD}}/p_T$$

Energy Correlators can be used to

- Image QCD at different scales
  arXiv:2409.12687 [ALICE]
- Extract α_s using ratios of energy-correlators
  arXiv:2402.13864 [CMS]
- Image and find evidence for jet-induced wakes and elastic scatterings in QGP
  arXiv:2503.19993 [CMS]
  ALI-PREL-604453 [ALICE]