The quest for primordial non-Gaussianity: Opportunities and Challenges

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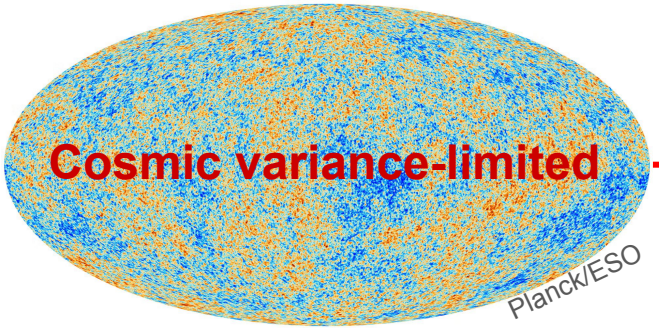
DYNAVERSE

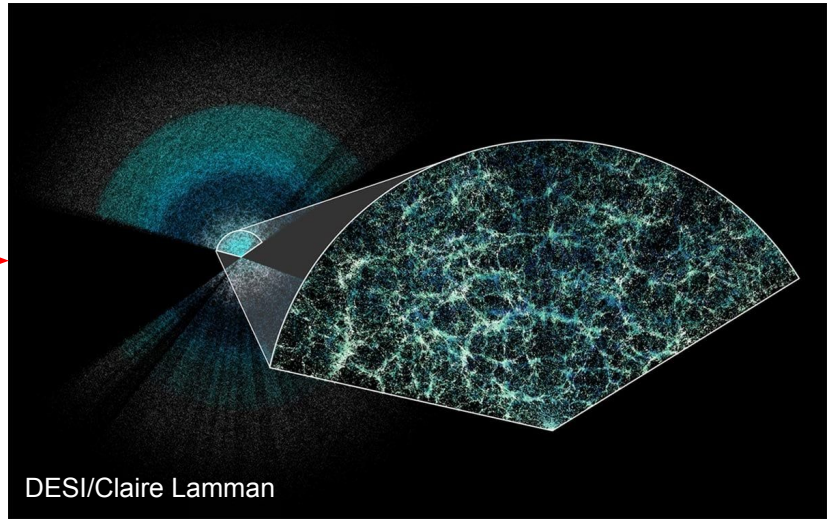
PNG - punching through the CMB ceiling

Primordial density fluctuations



$$f_{\rm NL} = -0.9 \pm 5.1$$

The third dimension: a whole new universe



Single-field inflation: Gaussian

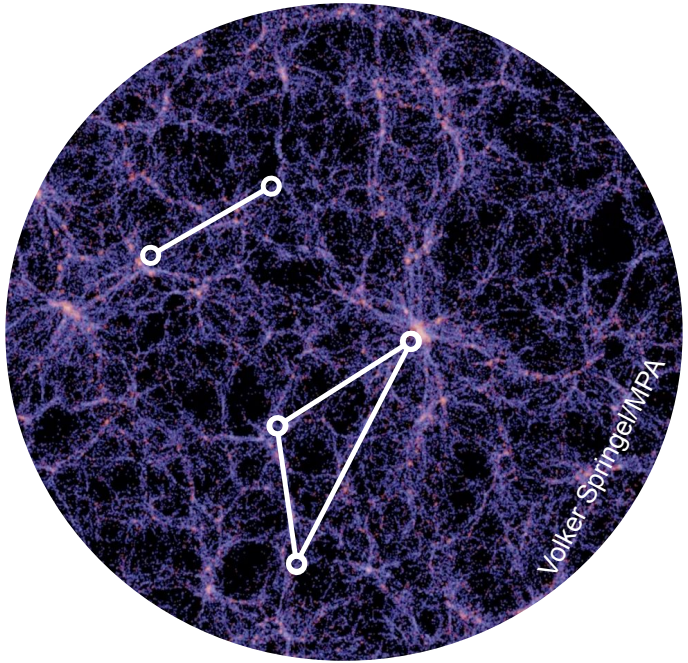
Multi-field inflation: Not

The modelling trap

Galaxy *n*-point correlations contain a wealth of information on PNG

Issues:

- The curse of dimensionality.
- Too many non-cosmological parameters.



Possible solution (?)

1. Direct simulations
2. New, LSS representations (e.g. with NNs).
3. Simulation-based inference (SBI)

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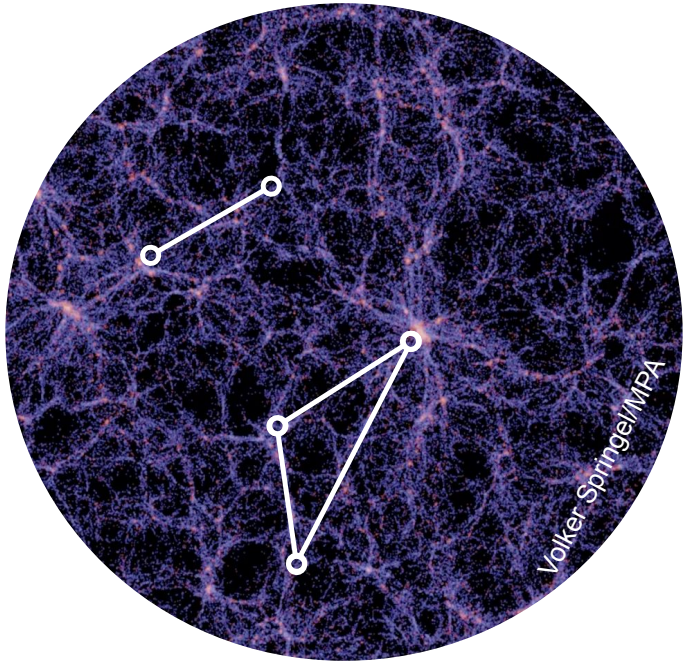

Possible solution (?)

1. Direct simulations (Accuracy is v. hard)
2. New, LSS representations (e.g. with NNs). (difficult to interpret)
3. Simulation-based inference (SBI) (v. sensitive to noise)

Three paths forward

1. Accurate forward-models for: baryonic physics, survey systematics, etc. → Better simulations.

2. More robust SBI (methods + diagnostics).

3. More interpretable, low-dimensional LSS representations (the holy grail of cosmology?)

(check out how I contribute! - tokaalokda.github.io)