

# XVth Quark Confinement and the Hadron Spectrum



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## Sampling methods for high energy physics & particle astrophysics

Monday 19 August 2024 16:00 (20 minutes)

Numerical methods for exploring high-dimensional parameter spaces are crucial across a wide variety of scientific fields, including:

- global fitting particle physics models (Frequentist likelihoods)
- constraining cosmological parameters (Bayesian posteriors)
- folding proteins (free energy landscapes)
- phase diagrams in chemistry and lattice field theory (partition functions)
- exploring the loss landscape of neural networks (machine learning).

This pedagogical talk will discuss the theoretical challenges of exploring high-dimensional parameter spaces, a practical framework for assessing the performance of different sampling algorithms, and scientific case-studies from the fields above. We will focus the discussion around the ScannerBit module of the GAMBIT global fitting framework, which includes a variety of sampling algorithms for both Frequentist and Bayesian analyses. In particular we will highlight ScannerBit 2.0 which incorporates a python interface to state-of-the-art sampling algorithms alongside the tried-and-tested Differential evolution (Diver) and Nested sampling methods (MultiNest & PolyChord).

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