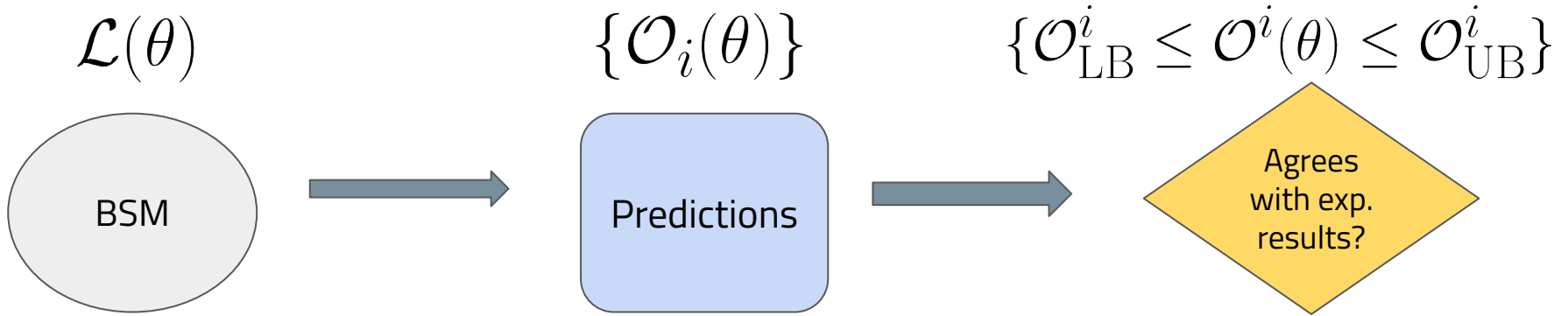


BSM Parameter Spaces Scans

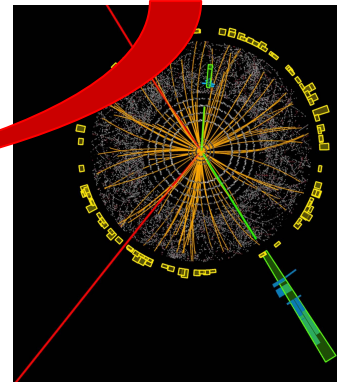


θ : Free parameters
 O : Observable

$$N(\theta) \sim 10^2$$

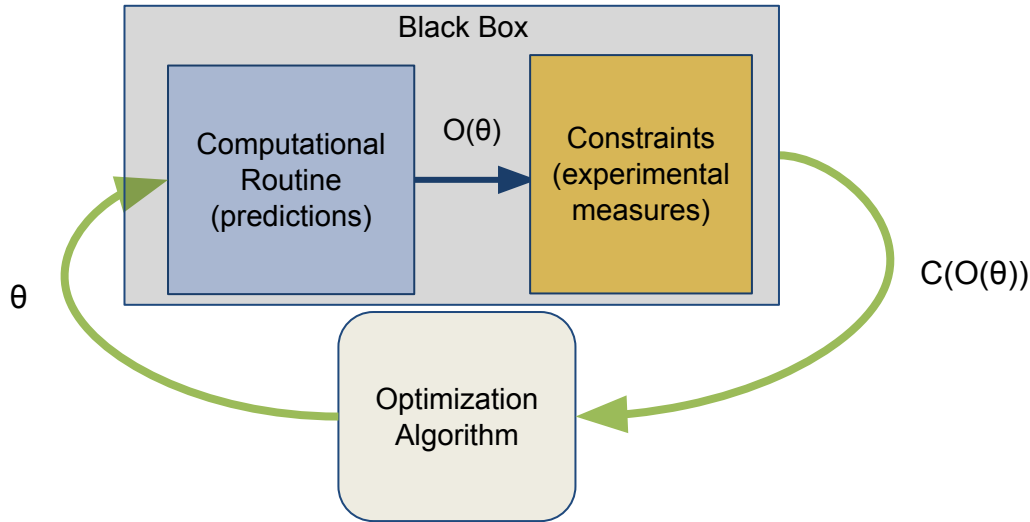
$N(O) \sim 10^2$

Curse of dimensionality!

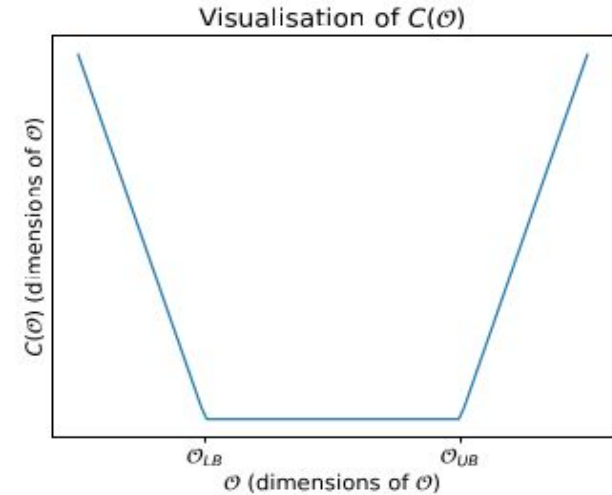


Parameter Spaces Scans

Black Box Optimization



θ : Sampled point in parameter space
 O : Observable
 C : Cost function



$$C(\mathcal{O}) = \max(0, -\mathcal{O} + \mathcal{O}_{LB}, \mathcal{O} - \mathcal{O}_{UB})$$

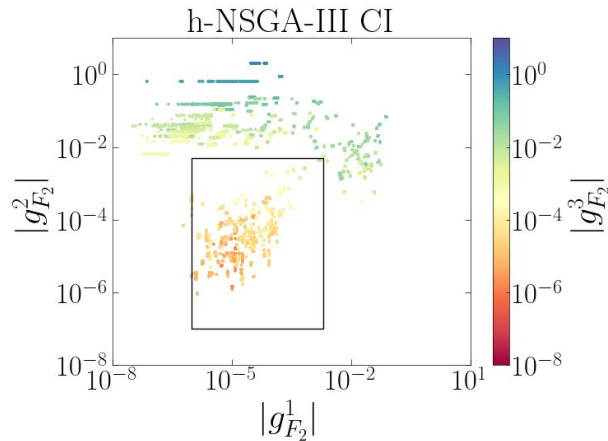
Point is valid when **$C(\mathbf{O}) = 0$**

No prior data required!

Parameter Spaces Scan Results

- Physics cases: **Scotogenic model**

- 46 free **parameters**
- 31 **constraints**



New phenomenology:

- **Axial dark matter**
- **Fermionic dark matter above neutrino floor**

Optimisation Algorithms

Single-objective: **CMA-ES** → **local** exploration
Multi-objective: **NSGA-III** → **global** exploration

