POSTER SPARKLERS

BritGrav26
10/04/2026

Training neural networks with few simulations via multifidelity method

Cecilia Maria Fabbri, Stephen Green, Laura Sberna

Data analysis with simulation-based inference (SBI) ⟶ **no likelihood evaluation** ⟶ **inference with real noise, simulators**

we need enough training data and simulations can be expensive

↓

Multifidelity:

Ref. arXiv:2502.08416

low-fidelity model

less accurate
cheap

high-fidelity model

more accurate
expensive

Pablo Picasso's self-portraits

The University of Nottingham

Accelerating Gravitational Wave Cosmology with `unimpeded`: A Public Grid of Nested Sampling Chains for Cosmological Model Comparison and Tension Analysis

Dily Ong & Will Handley · University of Cambridge

The Problem & Our Solution

Analysing GW data and cosmological data requires the calculation of Bayesian evidence via nested sampling, which is **computationally prohibitive**.

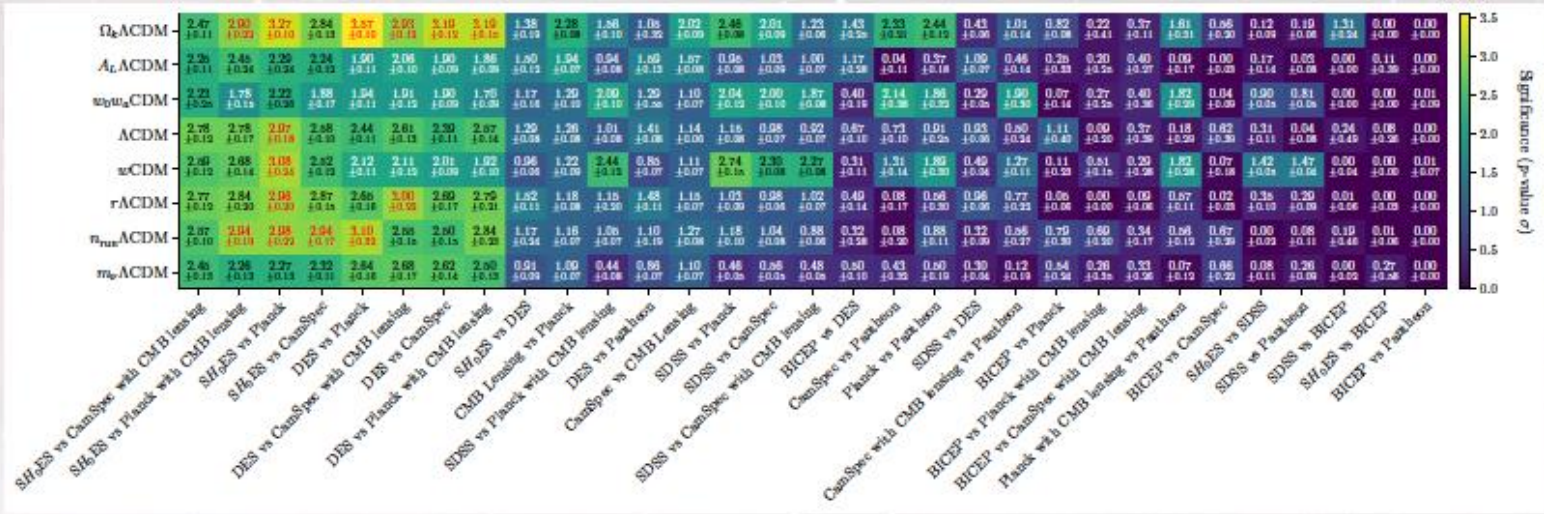
`unimpeded` is a public grid of pre-computed nested sampling chains. Analogous to the Gravitational-Wave Open Science Center (GWOSC).

- 8 models × 13 surveys (CMB, BAO, SNe, WL)
- Normalised posteriors & Bayesian evidences
- Months of HPC → seconds on a laptop

`pip install unimpeded`

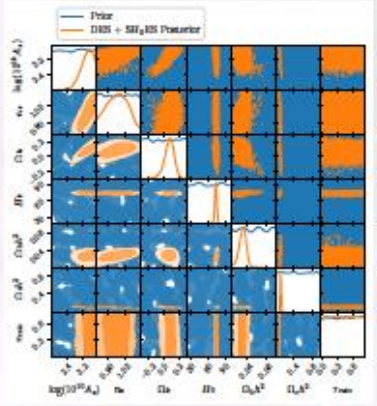
`unimpeded` GitHub
arXiv:2511.04661
arXiv:2511.05470

A Global View of Cosmological Tensions



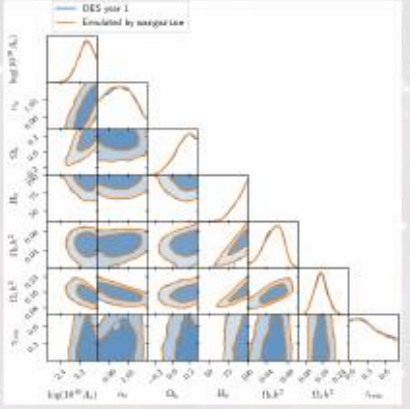
Nested Sampling Posteriors

- Bayesian evidence from nested sampling chains
- Prior (blue) vs posterior (orange)



Emulators

- Piecewise normalising flows
- Nuisance-free likelihoods



Gravitational Waves from Black Hole-Boson Star Binaries

Gareth Marks, with Seppe J. Staelens and Ulrich Sperhake

Long-term goal: GW template banks appropriate for exotic compact object searches

Key Questions:

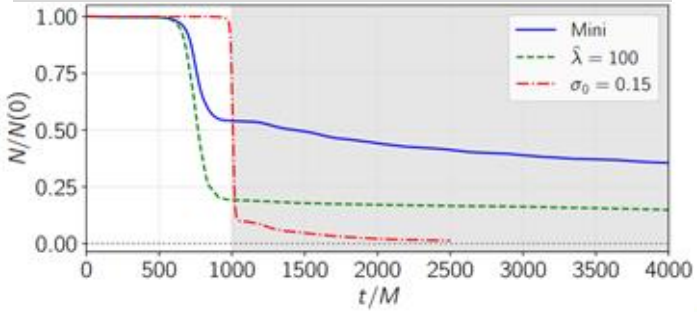
1. Do BS-BH binaries give **model-agnostic** templates?
2. Are signals from **ultracompact objects** distinguishable from those with only BHs?
3. What are the key features of **BS-BH inspirals?**

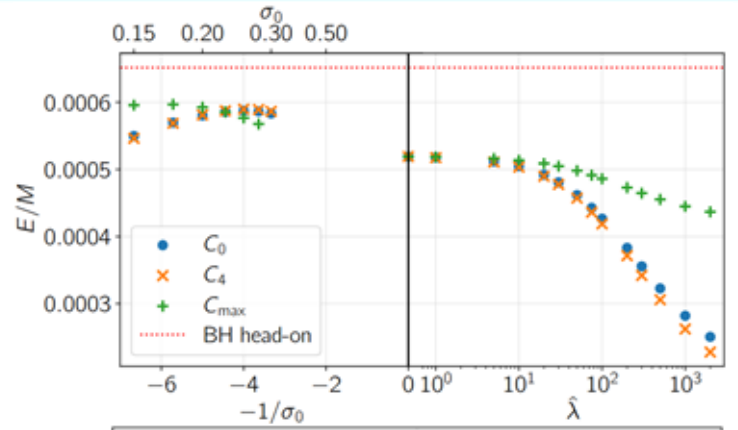
Our nonlinear evolutions suggest…

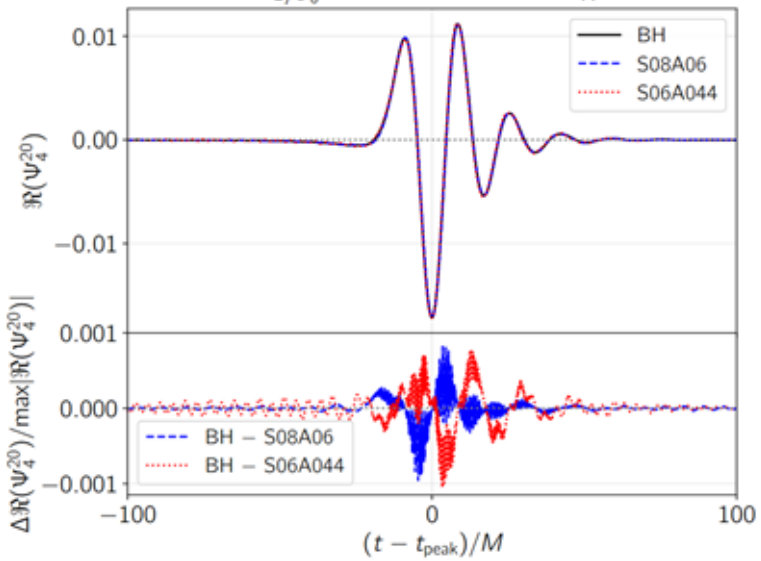
1. No! Even for head-on BS-BH collisions at fixed compactness, **potential has large effect…**

2. No! Such signals are **indistinguishable from BH-BH**

3. Leave **gravitational atom** configurations upon tidally disrupted, which scalar interaction can suppress







Constraints from gravitational waves on Ricci-scalar-Einstein-Gauss-Bonnet gravity

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

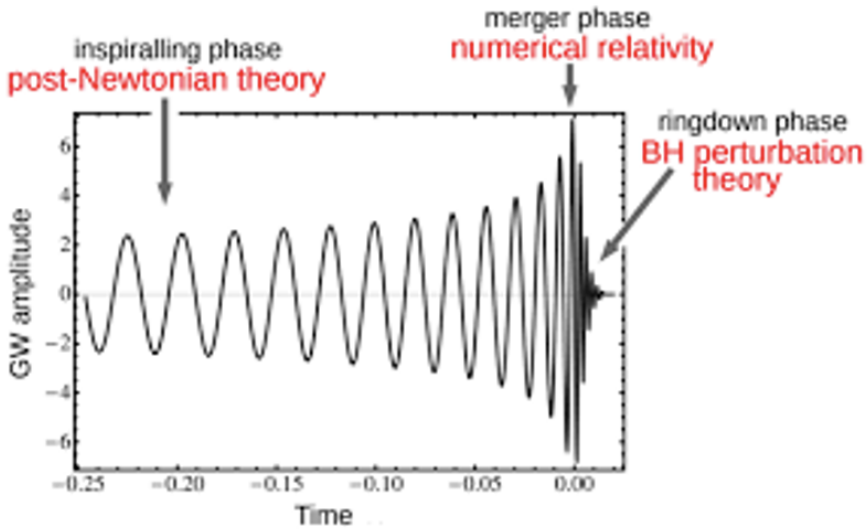
Herry F. Lalus *(Nottingham), David Trestini (Southampton), Thomas Sotiriou (Nottingham), Leonardo Gualtieri (Pissa), and Giulia Ventagli (Czechia)*

$$S = \frac{1}{2\kappa}\int \mathrm{d}^4x\sqrt{-g}\left[R - \frac{1}{2}g^{\mu\nu}\partial_\mu\phi\partial_\nu\phi - \frac{\beta}{2}h(\phi)R + \alpha f(\phi)\mathscr{G}\right]$$

PN framework

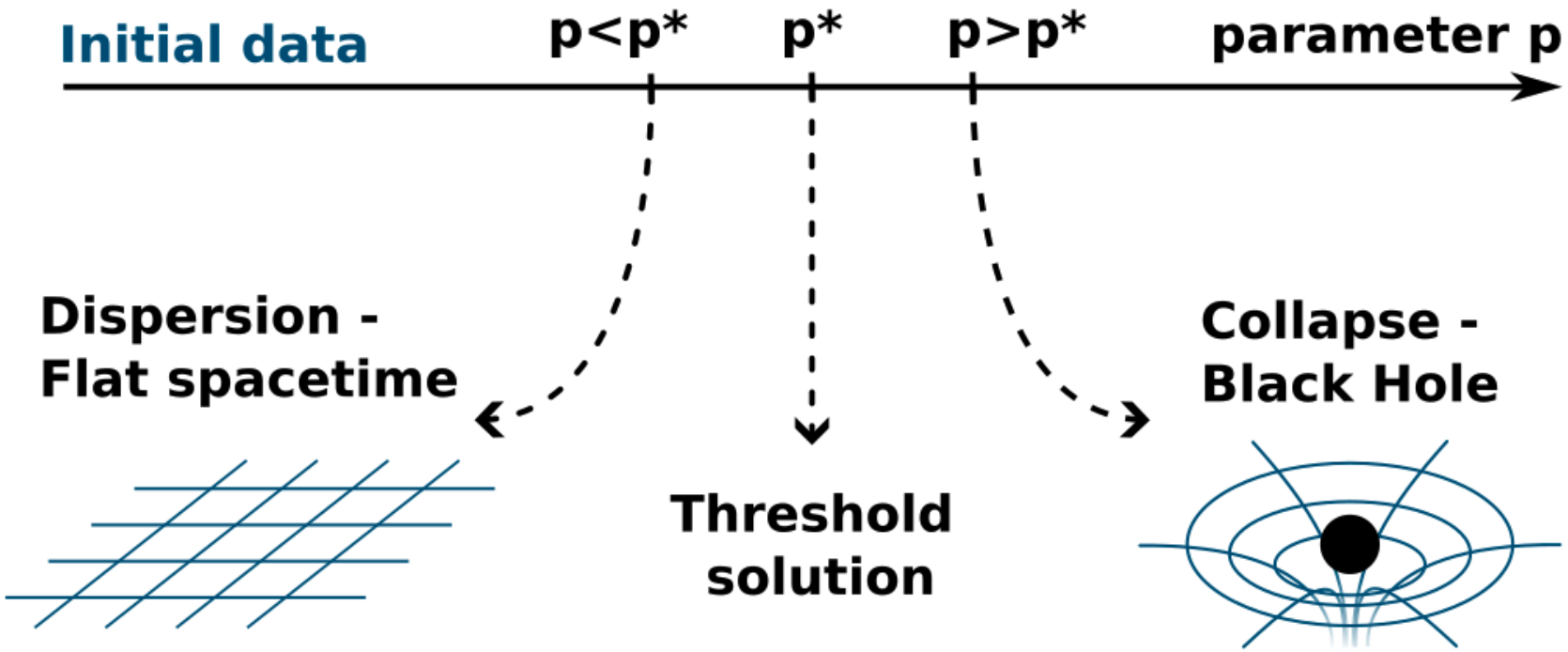
Phasing

Constraint the parameters



(Figure from *A. Susobhanan thesis*)

Exploration of charged critical collapse with a null coordinate code



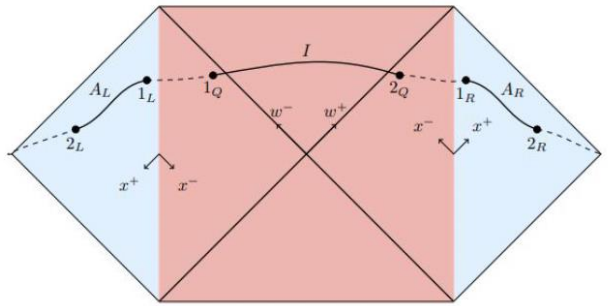
Laetitia Martel - University of Southampton

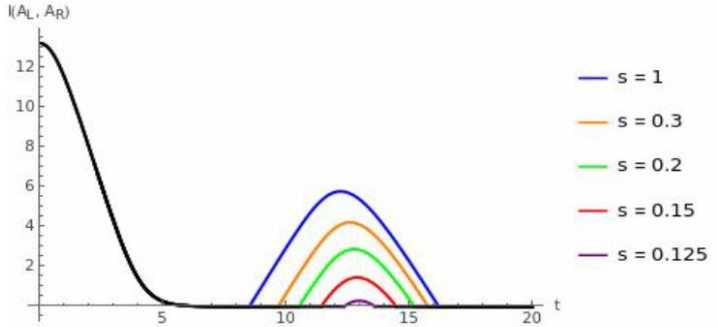
Entanglement revivals and scrambling for evaporating black holes

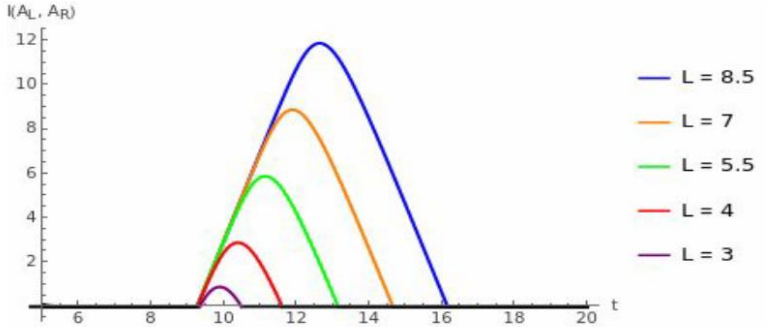
Levy B. N. Batista, Nicolò Bragagnolo, S. Prem Kumar

- How BH scrambling affects the entanglement dynamics of two finite, widely separate radiation intervals in thermal 2d CFTs?

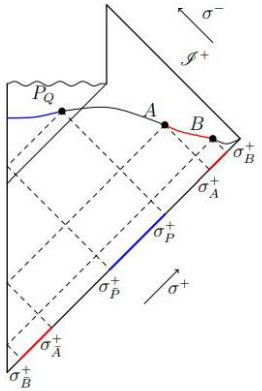
- JT gravity + Minkowski radiation baths

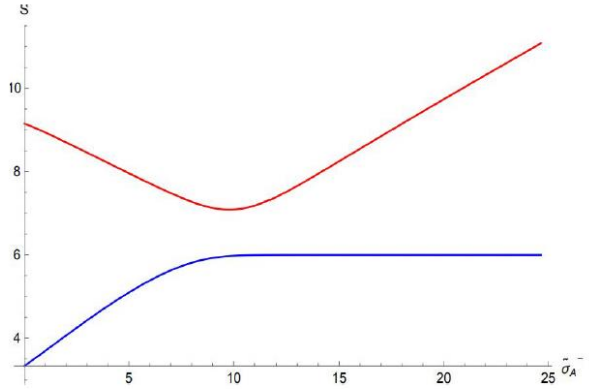


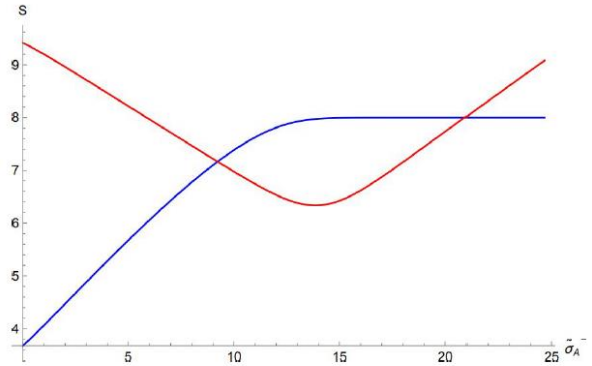




- RST model



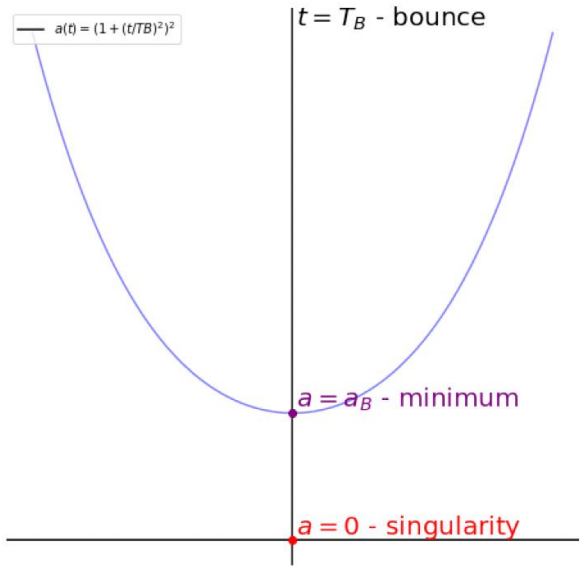




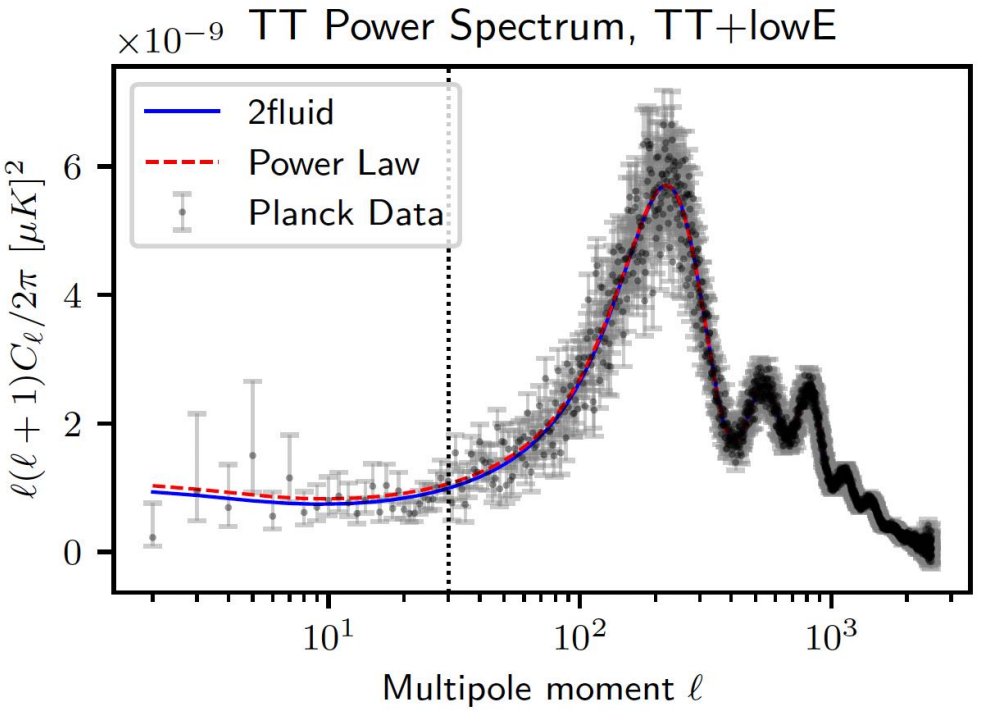
Based on our results, we **propose**: $L_C = c(\beta/2\pi)\exp(2\pi t_{scr}/\beta) + O(t_{scr}, \beta)$

Two Fluid Quantum Bouncing Cosmology: A Non-Singular, Observation Consistent Model

- bounce implemented through **Wheeler-De Witt equation**;



Bouncing Scale Factor



- best fit: $H_0 = 69.56 \text{km s}^{-1}\text{Mpc}^{-1}$;
- the model does not present a singularity, and is **not excluded by observations**, while also **alleviating the Hubble tension** ;

Charged black holes in conformal gravity

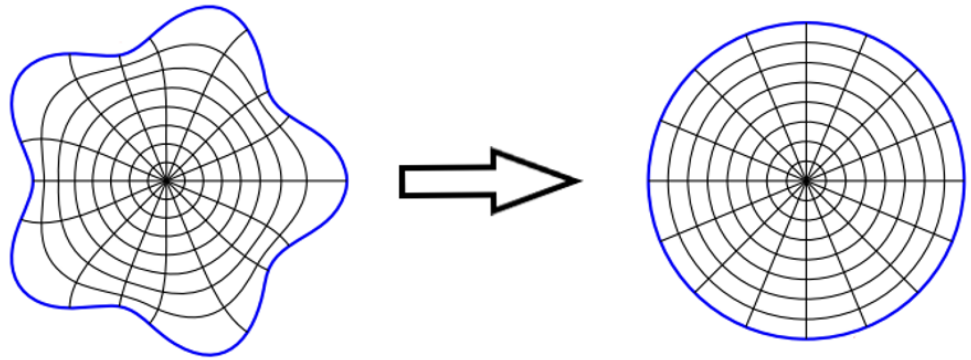
Reinosuke Kusano (St Andrews)
Miguel Yulo Asuncion (Nottingham)
Keith Horne (St Andrews)

University of St Andrews

Class. Quantum Grav. **43** 035008 (2026)

$$g_{\mu\nu}(x) \to \Omega^2(x) g_{\mu\nu}(x)$$

$$\mathcal{L}_{\rm grav} = -\alpha_{\rm g} C_{\lambda\mu\nu\kappa} C^{\lambda\mu\nu\kappa}$$



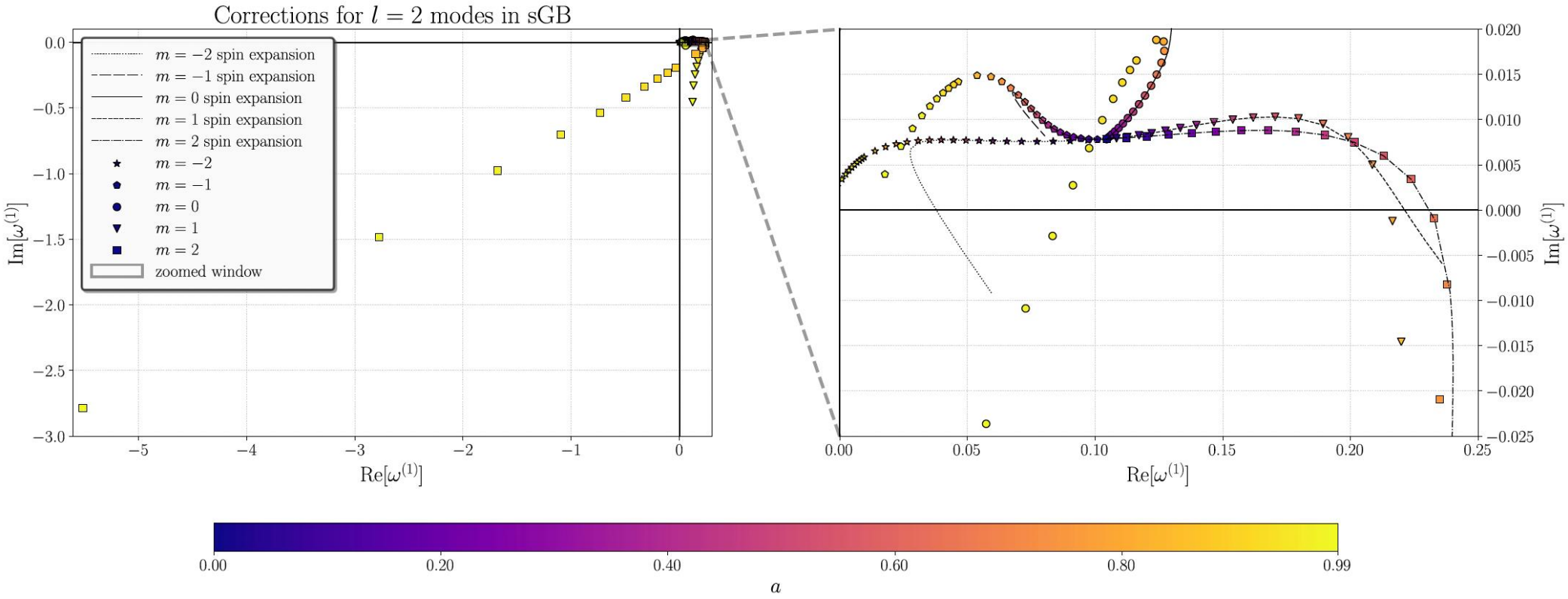
- Conformally invariant gravity theory
- Electrovacuum solutions possible
- 20+ spacetimes in charged black hole solution

Read our paper!

SCAN ME

Quasinormal modes of rapidly rotating black holes in EFT of gravity

- Calculated ringdown for arbitrary spin in different beyond GR scenarios
- Breaking of lowest order approximation



Thomas Chehab

Variation of Planck's quantum of action near compact objects

Entangled Relativity →

- **Modified Gravity** theory without free parameter
- **Recovers General Relativity**
- **Has one parameter less**
- **Predicts variation** of Planck's constant

Variation is **sourced** by **pressure** →

- Study of **compact objects**
- **Numerical evaluation of the variation**

Come to see me (and my poster) to have more informations !

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UNIVERSITÉ CÔTE D'AZUR
ARTEMIS

Quantum fields in boson star spacetime

Paul Saffin and **Qi-Xin Xie** (Nottingham)

Star made of bosons

$$G_{\mu\nu} = \kappa\, T^{(c)}_{\mu\nu}(\phi)$$

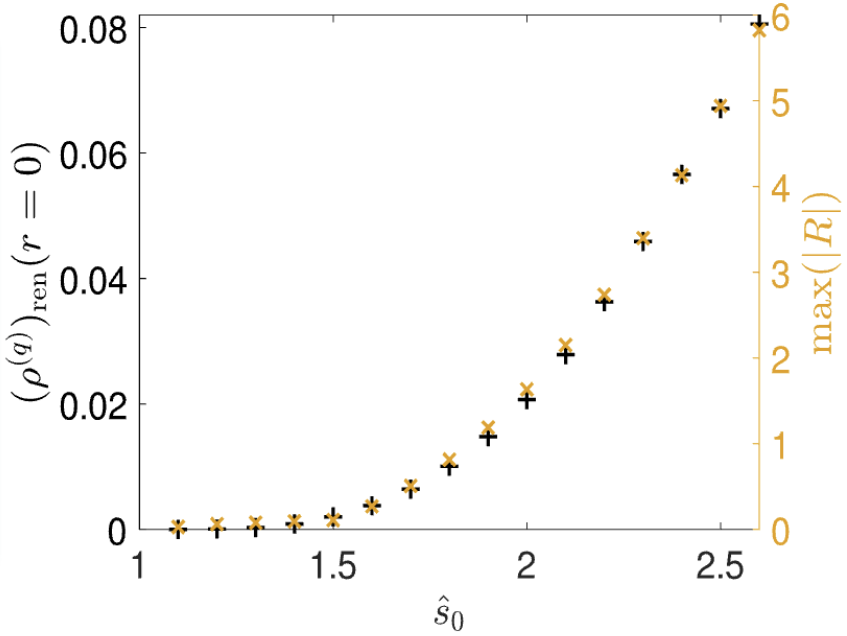
→ Classical metric regular everywhere but mimicking black holes

→ Quantum matter

$$\phi \to \hat{\phi}$$

Findings:

- Positive quantum energy density, negative pressure, localized near the star
- Quantum effects grow with spacetime curvature



Quantum effects affect the equilibrium structure of boson stars

arXiv: 2601.05129

Read the paper here!