GRASP24
ADVERTISEMENT SESSION II

OCTOBER 24TH

LOW-F GRAVITATIONAL WAVES

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- Are VERY tough to detect, even by GW standards.
- Need to use Galactic Pulsar Timing Arrays, and not GW Detectors.
- Finally observed last year from slowly orbiting Black Hole binary. Other source types?
- I shall describe a general and systematic framework for **understanding** Low-Frequency sources in a Schwarzschild background field!

Direct Current Memory contributions in EOB waveform model

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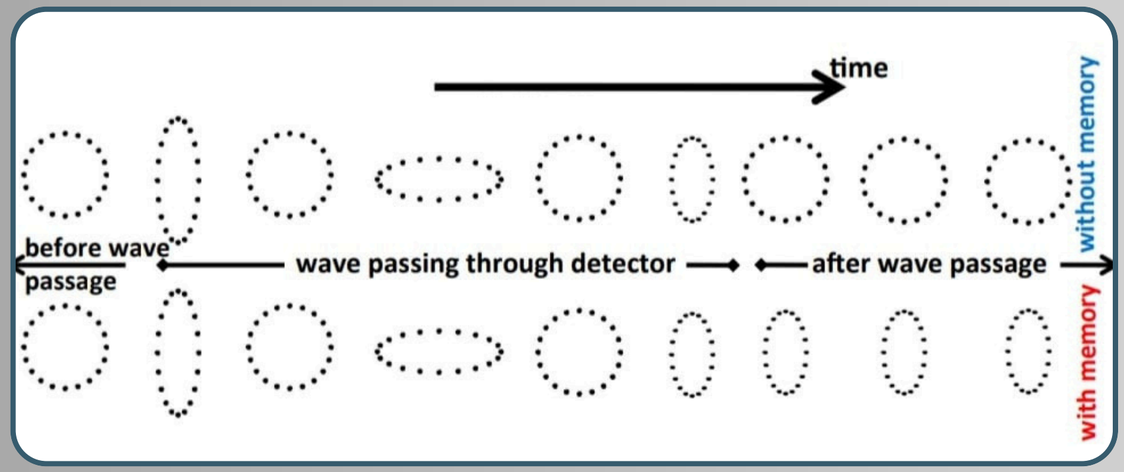
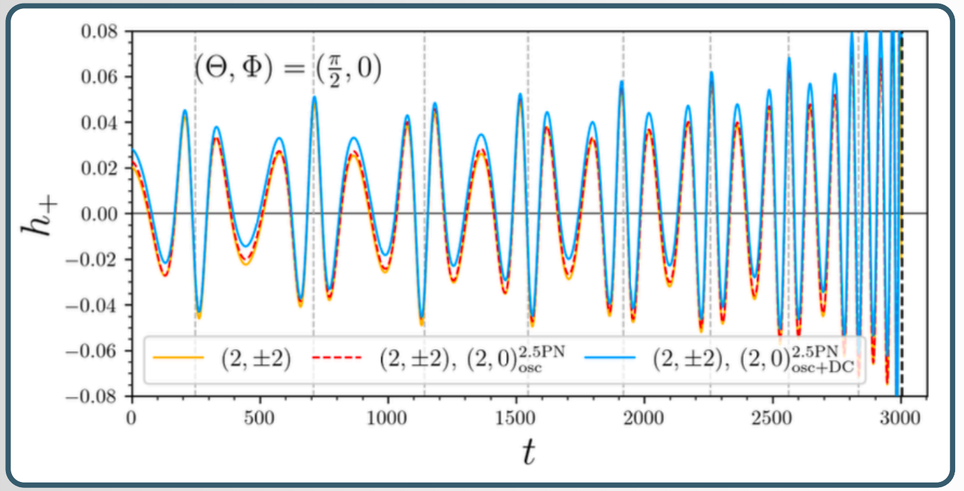
What is the memory effect?



Why use the EOB model?



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HYPERION:
a Normalizing Flow based pipeline for the rapid parameter estimation of eccentric Close Encounters

Federico De Santi[1,2,*], Massimiliano Razzano[1,2], Francesco Fidecaro[1,2], Luca Muccillo[1,2], Lucia Papalini[1,2], Barbara Patricelli[1,2]
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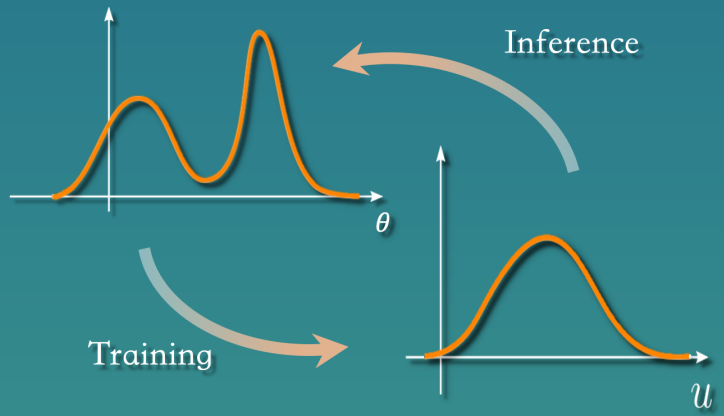
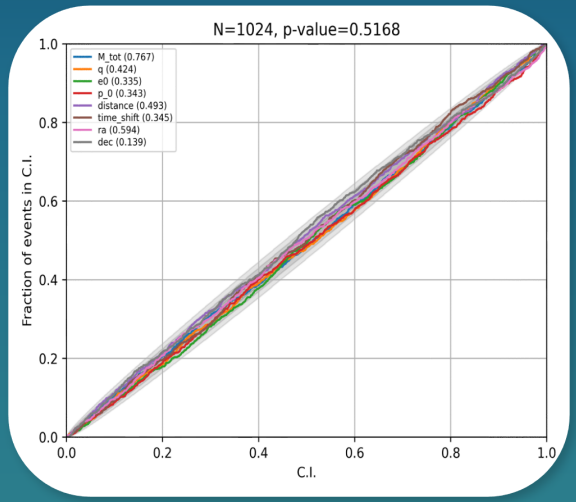
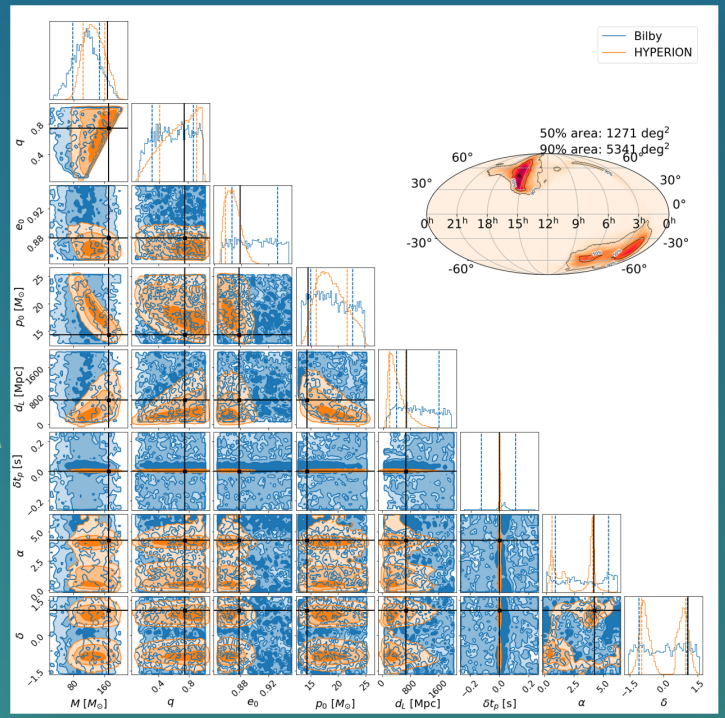
- Eccentric Close Encounters ($e \sim 1$):
  - Dynamical Origin
  - Repeated Bursts
  - Multimessenger & Astrophysics studies
- PE challenges:
  - Low SNR
  - Short duration bursts
- Proposed Solution:
  - Probabilistic ML ⇒ Normalizing Flows





5×10^4 samples in 0.5s !

De Santi et al., Phys. Rev. D 109, 102004 (2024)



Inferring astrophysics and cosmology with individual compact binary coalescences and their gravitational-wave stochastic background

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Individual BBH detections

BBH events

Likelihood on BBH and cosmology parameters (e.g., masses and H_0)

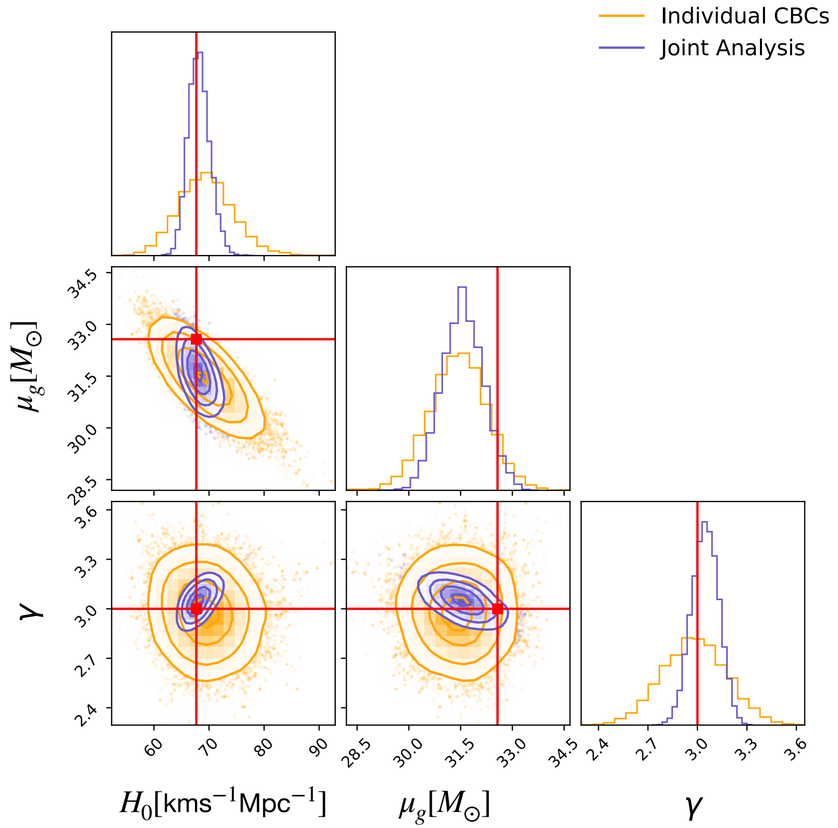
Stochastic Backgrounds

GW data from multiple detectors

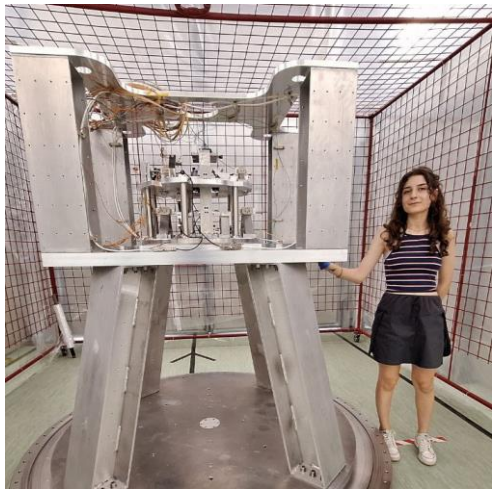
Optimal estimator for $\hat{C}$ GWB spectrum $\Omega_{\rm GW}(f)$

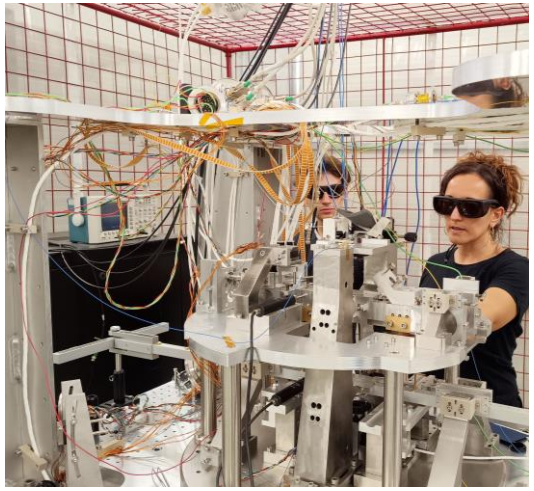
$$\mathscr{L}(d_i, \hat{C} \,|\, \Lambda) = \mathscr{L}_{\rm BBH}(d_i \,|\, \Lambda)\mathscr{L}_{\rm GWB}(\hat{C} \,|\, \Lambda)$$

We want to infer hyperparameters Λ consistent with the individual BBH events and the measurements on the GWB



Adding SGWB data can **improve** knowledge of H_0 and of the population parameters





Archimedes Experiment: the weight of quantum vacuum

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Does gravity interact with quantum vacuum?

Exploring a modern physics riddle using High-T_C superconductors and the Casimir effect

Identifying and Mitigating Biases in Machine Learning for the Gravitational Wave Detection Problem

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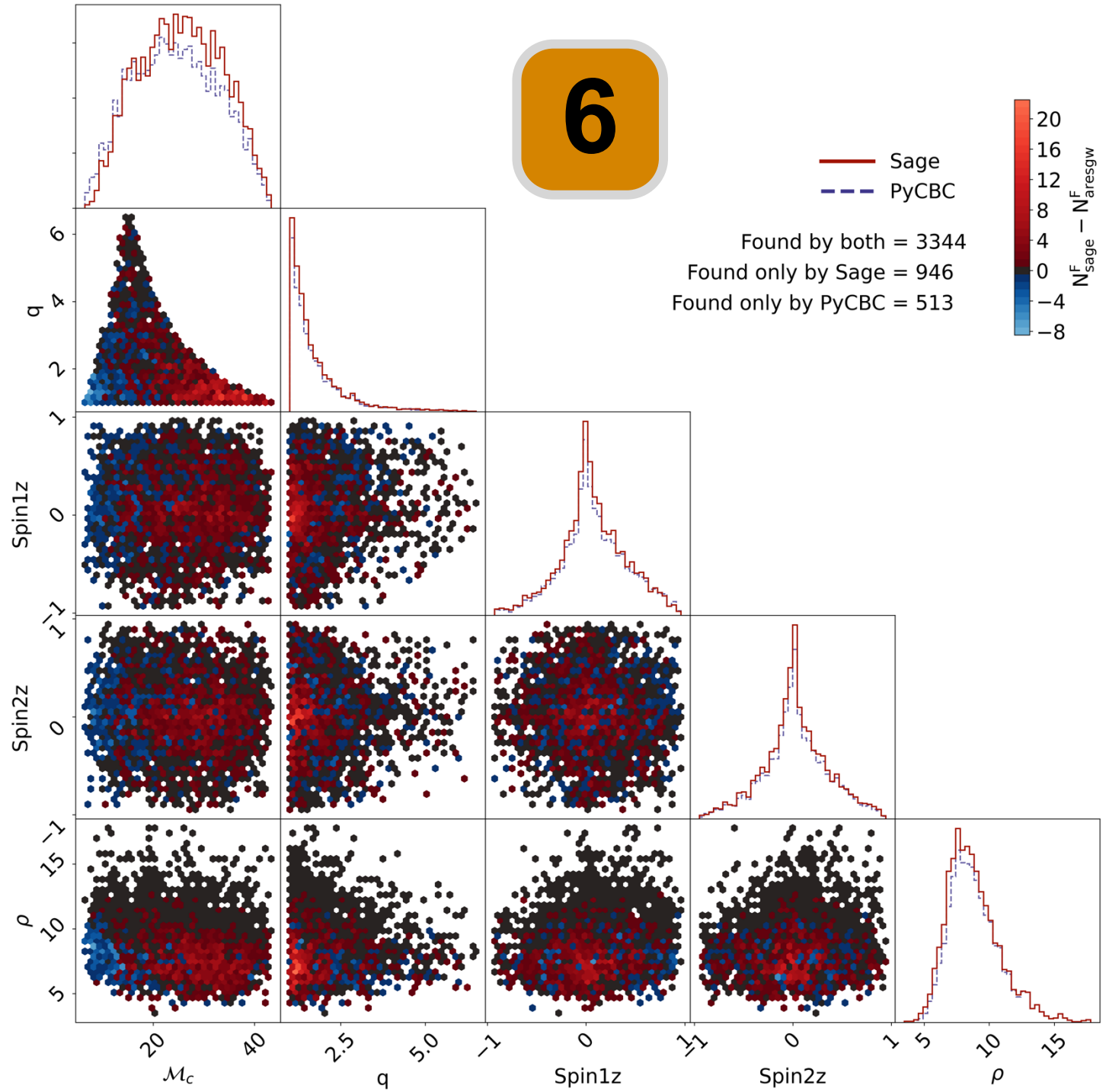

Tidal contributions to the gravitational waveform amplitude to the 2.5PN order

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