TO SPIN OR NOT TO SPIN

building astrophysically-motivated population models

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BACKGROUND

Gravitational waves from merging binaries encode information about the spins of the components; providing clues as to how the binary formed. Two scenarios are frequently invoked to explain the formation merging binary black holes: **Isolated** and **Dynamical**.

THE CONFLICTING PICTURE

Various population studies found conflicting conclusions about the population of binary black holes. Some found support for **both the isolated and dynamical channel** [1], others found the population could be explained **purely by the isolated channel** [2]. In [3,4] we aimed to resolve this issue with an updated model.

DEVELOPING POPULATION MODELS

There may be a non-spinning subpoulation of merging binary black holes from black holes born with χ~0 [5,6] resulting from assumption of efficient angular momentum transport in stars.

Spin magnitude model

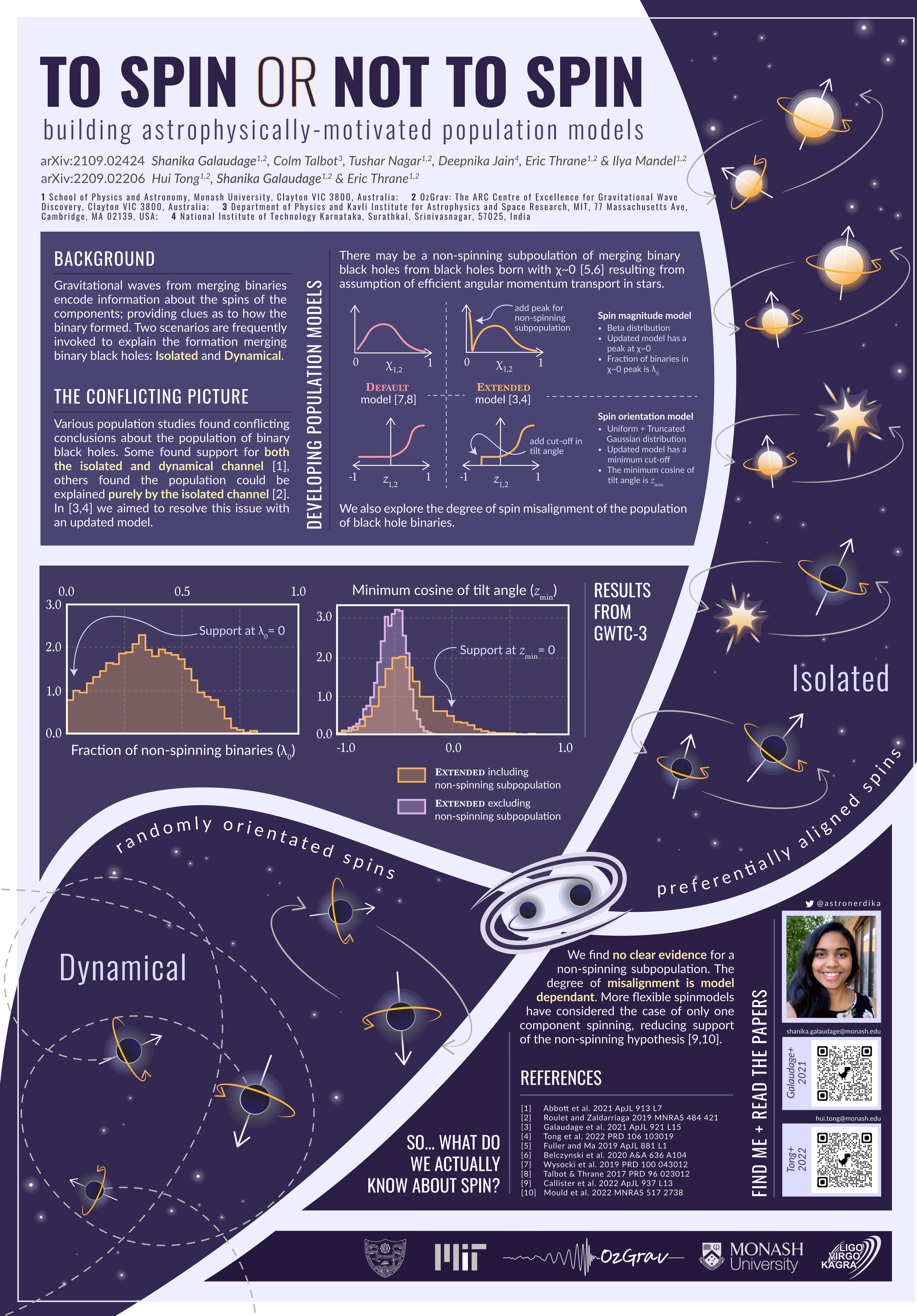
- Beta distribution
- Updated model has a peak at χ~0
- Fraction of binaries in χ~0 peak is λ_0

Spin orientation model

- Uniform + Truncated Gaussian distribution
- Updated model has a minimum cut-off
- The minimum cosine of tilt angle is z_{min}

We also explore the degree of spin misalignment of the population of black hole binaries.

RESULTS FROM GWTC-3



We find **no clear evidence** for a non-spinning subpopulation. The degree of **misalignment is model dependant**. More flexible spinmodels have considered the case of only one component spinning, reducing support of the non-spinning hypothesis [9,10].

SO... WHAT DO WE ACTUALLY KNOW ABOUT SPIN?

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