1. IPTA conference
2. Manuscript updates
3. Identifiability analysis and frequency-space formulation from EE

IPTA conference

- IPTA conference last week
- ~~Many results currently under embargo~~
- The NANOGrav 15 yr Data Set: Evidence for a Gravitational-wave Background
- More papers to come c.f. single source. TK to sync with EE to discuss results and methods

Manuscript updates

- Plan for papers is as follows:
    1. Single source. Earth terms + nested sampling (Bilby)
    2. Single source. Pulsar terms, Earth terms + other likelihood inference methods (e.g. Bilby vs other nested sampling libs, MCMC, EM)
    3. Multiple sources (i.e. stochastic background, Hellings Downs)
- P1 manuscript currently being written up. Can be found at github/StateSpacePTA.jl
- Majority of work for P1 is done - just a question of writing up
- Exception: comparison with existing approaches (e.g. NANOGrav 6 year, NANOGrav 11 year, NANOGrav 12.5, NANOGrav15). To discuss (next slide)
- Completing P1 manuscript will be main focus over next few weeks, then back to a "research focus" re P2/P3

How to compare against existing methods?

Todo: comparison with existing approaches (e.g. NANOGrav 6 year, NANOGrav 11 year, NANOGrav 12.5, NANOGrav15).

Existing methods:

1. Take some timing residuals "observations" δt, (i.e. TOAs - expected TOAs from timing model $M\epsilon$)

2. Define a GW model for timing residuals $s(\theta_{\mathrm{gw}})$.

3. Define a noise model $n(\theta_{\mathrm{n}})$

4. Define a likelihood $\mathcal{L}(\delta t|\epsilon, \theta_{\mathrm{gw}}, \theta_{\mathrm{n}})$

5. Two approaches
   5.1 Frequentist. Define an F-statistic from $\mathcal{L}$ (now disfavoured?)
   5.2 Bayesian. MCMC over parameters

How to compare? Do we need to compare for P1?

Identifiability and frequency-space

- Rob + Bill presented frequency-space formulation of problem
- Interesting/useful for identifiability analysis + potentially as an alternative inference/detection method