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Pulsar timing and glitch detection with a hidden Markov model

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We present a new, complementary method of pulsar timing, which explicitly tracks the evolution of the pulse frequency and frequency derivative using a hidden Markov model (HMM). The HMM incorporates both stochastic spin wandering (timing noise) and glitches.
We describe how this framework can be used to detect glitches through Bayesian model selection with minimal human intervention and low computational cost, and how this allows for characterisation of the detector through synthetic data tests.
We also present early results of HMM-based analyses of real timing data, demonstrating the utility of this approach in two realistic contexts: searches for undetected glitches in archival data, and low-latency detection of glitches in freshly acquired data.

Primary authors: DUNN, Liam (University of Melbourne); Dr SUVOROVA, Sofia (University of Melbourne); MELATOS, Andrew (University of Melbourne); Prof. EVANS, Robin (University of Melbourne); Prof. MORAN, William (University of Melbourne)

Presenter: DUNN, Liam (University of Melbourne)

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