## Data Analysis and Gravitational Waves Jeffrey S. Hazboun

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## Battleship!



- You set up your ships, without seeing the other player's.
- Guess where the other player's ships are by calling out coordinates.
- Mark hits with red markers. Sink all the other player's ships!



#### 1-dimensional Battleship board



- A 1-dimensional board is simple enough to do all of the counting.
- There are only 7 configurations (×2 if you allow flipping the battleship)

Various Configurations of the Battleship on a 1-dimensional board 2 3 4 4 4 4 З 2 = 28pdf space





Various Configurations of the Battleship on a 1-dimensional board





Various Configurations of the Battleship on a 1-dimensional board







#### Various Configurations of the Battleship on a 1-dimensional board



Jeffrey Hazboun (IPTA 2018)

#### Bayesian Gravitational Wave Analysis

### 1-Dimensional game of Battleship Battleship Odds Website

Various Configurations of the Battleship on a 1-dimensional board



Various Configurations of the Battleship on a 1-dimensional board



#### **Corner Plots and Covariances**



Jeffrey Hazboun (IPTA 2018)

Bayesian Gravitational Wave Analysis

#### **Upper Limits**



# Uninformative Priors, Informative Data & the Savage-Dickey Approximation

- Often start with uninformative priors (least biased).

- Uniform vs Log-Uniform priors.
- Choose the prior dependent on the statistic.
- Data is "informative" when it drastically reduces the parameter space.



Jeffrey Hazboun (IPTA 2018)

Bayesian Gravitational Wave Analysis

- git pull the ipta-2018-workshop GitHub repo if you haven't in the last few days.
- Start up your docker image
- Navigate to the gw\_detection directory.
- Start with the cw\_exercises.ipynb notebook.
- Look at single\_pulsar\_noise.ipynb and then stochastic\_gwb\_analysis.ipynb.
- If you need more I have more !!