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Topic: Extension of the Number Game and Bayesian Modeling

Project Proposal: We will conduct our own number game experiment where we model the priors of the hypothesis set from empirical data.

Context: The original version of the number game assumes that the prior for each hypothesis in the mathematical group ("rule-based" hypothesis) were uniform[1]. We posit that in reality we cannot assume that the priors in the group of mathematical properties are distributed uniformly. We think that some priors will have higher probability given that there are some mathematical relationships that are easier for people to recall than others. Simpler hypothesis spaces like the space of even or odd numbers are likely to have a higher probability than more complex hypothesis spaces such as powers of 2, or cubed numbers.

We intend to test our hypothesis by conducting a survey of 20-30 people where we explain the background of the number game, provide different observations, ask participants to select numbers that they think match the unknown concept, and ultimately include the set of hypothesis spaces they thought of when making their selection.

We will conduct our survey using a Google Form, analyze our results in Python and deliver a report on our findings.

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[1] "The Bayesian model also requires a prior probability distribution over the hypothesis space. Rather than trying to assign prior probabilities to each of 5090 hypotheses individually, a hierarchical approach was adopted. First, the hypotheses were divided into two groups corresponding to mathematical and magnitude properties. A certain fraction < 1 of the probability was allocated to the mathematical properties as a group, leaving 1 for the magnitude properties. Within the group of mathematical properties, that probability mass was distributed uniformly (i.e. giving a constant probability to each hypothesis in this group" (pg. 212 Tenenbaum)