Final Exam Computational Economics

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Objective

Predict choice behavior using a dataset of choice problems, applying neural network modeling and integrating risk preference and attention-related covariates.

Data Overview

- **Source**: Data from the Choice Prediction Competition (CPC18), available at
  - `https://cpc-18.com/`.
  - You can use both the aggregate or individual data just be clear which one you use. Individual data may be easier due to the next tasks.
- **Participants**: 240 in Experiment 1, with diverse demographics and experimental settings.
- **Choice Problems**: Each problem experienced for 25 trials, with the initial 5 without feedback and the rest with full feedback. Compensation was based on a randomly selected choice.
- **Data Variables**: Include key variables like Option A and B payouts, probabilities, and attributes; participant responses and demographics. Additional descriptions are available in the provided dictionary file.

Tasks

Model Building Using Feedforward Neural Network

- **Input Features**: Incorporate both raw and engineered features that capture latent variables such as risk preference and attention.
- **Network Architecture**: Employ a feedforward neural net architecture with multiple layers, using the Flux library in Julia.
- **Training**: Implement cross-validation using training, validation and testing splits to evaluate model performance.

Incorporating Covariates for Risk Preference

- **Feature Engineering**: Develop features indicative of risk behaviors, like variance and skewness of distributions or disparities in expected values.
- **Analysis**: Analyze these features' correlation with choice behaviors to validate their inclusion in the model.

Incorporating Covariates Relevant to Choice Context Focused on Attention

- **Feature Engineering**: Create features based on the order and timing of choices, potentially capturing attentional shifts and influences.
- **Hypothesis**: Explore how attention might affect choice, particularly after feedback or during initial trials.
- **Model Comparison**: Conduct a comparative analysis of models with and without attention features to evaluate their relative importance in predicting choice behavior.

Documentation in a Mini-Paper

- **Overview**: Summarize the dataset and its origins.
- **Methodology**: Detail the data preparation, feature engineering, and model configuration processes.
- **Feature Analysis**: Discuss the selection and performance impact of new features, particularly those related to attention.
- **Results and Discussion**: Present model outcomes and discuss the implications of findings on risk preference and attention in choice behavior.
- **Format**: Ensure the paper is concise, organized, and within a five-page limit.

Additional Discussion (one more page on top of the mini paper)

- **Comparison with Structural Models**: Compare the neural network model's effectiveness and insights against structural models like the demand component of the BLP model. This should include a discussion on differences in assumptions and what each model reveals about consumer choice behavior. This comparison in theoretical only.
- **Literature Features**: Students are encouraged to use existing features from the literature to enrich their models. However, they must cite all sources appropriately to acknowledge the original research.
- **Software and Tools**: Produce a Github repo so I can verify your use of use of Julia for this project, specifically utilizing the Flux.jl library for neural network construction (DataFrames.jl for data manipulation, and StatsBase.jl for statistical analysis are recommended but not required you can use other softwares here like R or Stata).