Project Proposal

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Responsibilities:
- Ethan: Train and test based on datasets and create a way to predict the next optimal move for the X player
- Ryan: Train the machine learning model based on the datasets. Create a working tic-tac-toe game where the player is also provided with predictions from the model to help them make their moves.

Real-World Task:
- The real-world task we plan to do our project over is the game Tic-Tac-Toe. More specifically, we plan to generate a machine-learning model that can make predictions for moves to make for player X to win.
- Tic-Tac-Toe is a game that almost everyone has played, especially at a young age. By creating a machine-learning model that predicts the best moves for player X to win, anyone who plays can compare their moves to what the model outputs. This could help children develop their spatial skills by encouraging logical thinking and pattern recognition within the game Tic-Tac-Toe.

Dataset:
- [Tic-Tac-Toe Endgame - UC Irvine Machine Learning Repository](#)
- This dataset contains all the possible board combinations and the resulting outcome (whether player X wins or not)

Approach:
- This program will assume that the X player makes the first move and the goal is to provide the X player with the most optimal move possible based on the current board. We will train the model based on the provided datasets. There are multiple ways we can approach this.
- In order to find the best decision that can be made for each board state, we plan to implement a minimum risk classifier. This will help make decisions about the next move based on the expected risk or cost associated with each possible move.
- We are also looking into implementing a way to analyze the current state of the board. To show who is currently winning, we would use a discriminant function. To predict the probability of either player winning, we can implement logistic regression and the Parzen window method.
- Additionally, we are looking into algorithms like the minimax algorithm which is a recursive algorithm that navigates through a tree starting at the top and evaluates each possible move until it reaches a terminal state. It will minimize the maximum loss for a worst-case scenario as the game goes on.

Procedure and Timeline:
- For this project, we plan to use Python to train our machine-learning model with the given dataset. We will also use Python to create the playable game and allow the user to view the predictions within the game.
- For the timeline, we plan to first focus on training the machine learning model. After our model is finished, we will begin creating the predictor algorithm to use with the game. Lastly, we will finish by creating the Tic-Tac-Toe game and integrating it with our predictor.