Statistical Modeling of Simulated Gaming Methodology

Overview:

Our projects include topics ranging from: high level analysis of gambling utilizing hypothesis testing tools, probabilistic calculations and monte-carlo simulation (with Java vs. Python programming), to: strategic leadership development through quantification of troop strength in the Empire 4 Kingdoms video game. These projects carefully consider decision-making scenarios and the behaviors that drive them, which are fundamental to domains of cognitive psychology and consciousness. The tools and strategies used in these projects can facilitate the creation of user-interfaces that incorporate statistics and psychology for more informative user decision-making, for example, in minimizing players' risk of compulsive gambling disorder. The first three projects are about the game of poker, and use eigenvector plots, probability, and neural network-esque Monte Carlo Simulations to model gambling disorders through a game consisting of AKQJ cards. Offering a subtle analytical approach to gambling, capitalizing on the economic drawbacks are explained through multi-step realistic statistical modeling methods. The fourth project is about Empire strategy games and uses clustering algorithms and principal component analysis to optimize a troop with the highest stats and lowest resource use. This is important in managing teams and organizations.

Potential Presentation Speakers and Topics:

First Presentation: Saloni Patel -- Simplify Poker Game for Predicting the Winning Probability Based on Risk Management

The authors have used combination formulas and derive the general formulas of matching probability for each matching pattern. With this creative AKQJ game, the winning patterns are reduced to "Four of a Kind", "Full House", "Three of a Kind", and "Two Pairs".Through such

Statistical and Psychological Poker AKQJ game, player data were simulated based on the worst-case probability algorithm. Worst-case algorithm could shorten the probability calculation time in real Poker betting situations. Through playing this AKQJ game, most poker players may make more informed (rational/probabilistic) in-game choices which subvert the compulsive (irrational/ emotional) decision-making characteristic of gambling disorder sickness.

Second Presentation: Siddhant Karmali -- Optimizing the AKQJ Poker Game for Realistic Poker Situations to Model Player's Psychology Characters

Poker is a popular gambling game, but most players lose money because they appear to make bets emotionally rather than rationally. The purpose of this presentation is to study poker probability using an AKQJ partial deck for realistic poker gaming situations. This partial poker game and the results can characterize the choices that spur irrational gambling disorder through exploration of fundamental probability scenarios in poker under the AKQJ model.

Third Presentation: Arhan Surapaneni-- Utilizing Monte Carlo Simulations with Python and Java in Analysis of Poker and Gambling.

Python programming language was used to generate a powerful, efficient Monte Carlo Simulation to play a customized game of poker that uses 6-players with a 16-card partial deck consisting only of face cards(A,K,Q,J); this custom AKQJ poker game counts only the full house, 3-of-a -kind, pair, and high cards for winning combinations to maximize the data significance. In this game, these characters have different thresholds in categories like checking, folding, and even betting, which is edited using specific variables and wagers applied through a complex yet flexible percent confidence-level-interface that leverages Python programming to

model real-world human behavior (psychology) under a specific, well-defined custom gaming framework.

Fourth Presentation: Logeshwari Chandramohan -- Develop Troop Strength Metric of Playing Empire 4 Kingdoms Video Game

The purpose of this presentation is to use different Clustering Algorithms - both supervised and unsupervised methods - to build a powerful troop army in the strategy game "Empire: 4 Kingdoms;" one which can both attack and defend well, as well as having good looting capacity, and speed for efficient travel. Having an optimized troop army is critical to ensure more wins with fewer in-game resources. Clustering in supervised learning is first informed by similar troop rating profiles and by pre-specifying the desired number of clusters. Clustering in unsupervised learning is deployed in JMP software after selecting the pre-set number of clusters, and using Hierarchical Clustering Analysis (Ward and Fast-Ward algorithms).

Intended audience:

These projects are geared towards populations in the following departments: beginners in statistics, teachers, students, and gamers/strategists. It may also be beneficial to those struggling with disorders related to compulsive gambling or an Internet gaming addiction.

Key takeaways:

1. Gambling and statistics are very complicated, so you need to understand statistics to gamble well.

2. Gambling disorder may be mitigated if players can understand basic statistical calculations and use them in their games.
3. Empire is a strategic video game (leader points): a good leader must have a good strategic strength/skill in order to understand or manage a team, organization, or country.

These presentations can be applied in a number of different ways because of their broad range of algorithms with particular emphasis on the practical application of statistical tools (highlighting real-world benefits or limitations as appropriate).. Some of these applications include betting on the outcomes of sports matches, or using similar algorithms in predicting the value of stocks or other investments such as real estate. Another application could be towards leadership of a company or organization. Any leader who needs to implement a strategy around a vision/ long-term plan can benefit from the use the type of statistical modeling described.

Statistical Methods and Data Analysis:

The presenters here used JMP 16 statistical software with its powerful graphical visualization capabilities to conduct data collection and data analysis for their projects. In particular, they used correlation and regression models, power indices, Z-transformations, clustering algorithms, eigenvector plots, probability calculations, and principal component analysis (PCA) to analyze the data collected to draw practical conclusions using real-world analysis applied to various far-reaching issues and problem statements.