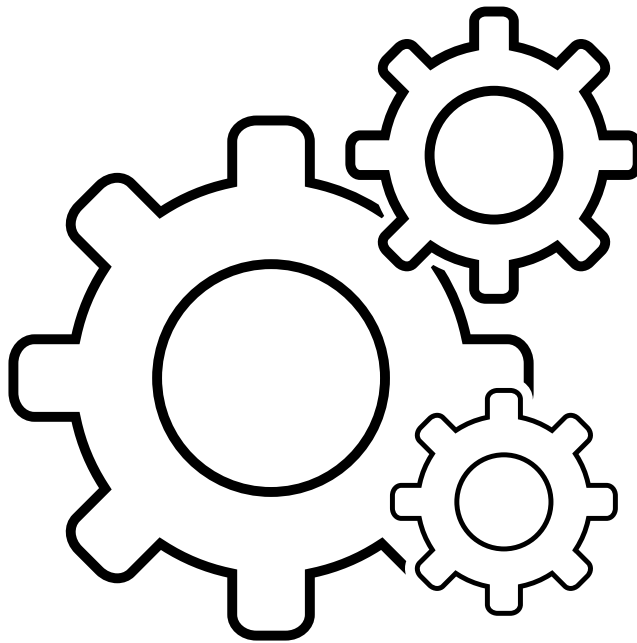


The Architecture of Huddle's Same Game Parlay Product

How we utilised an OLAP database in order to implement our Single Game Parlay (SGP) product by capturing the data features in our Monte Carlo simulations.



At Huddle, we're very proud of our SGP product because it's what we call the true SGP, in the sense that everything that we're able to price as a straight market, we're able to combine.

The ultimate goal for any SGP product is to have - The Full SGP Product. Where any market available on site can seamlessly integrate into the SGP, enabling live bets with cash-out options throughout the duration of the bet.

We wrote a lot about Huddle's SGP key features, such as market coverage, tailor margins, unparalleled uptime.

Today we want to dive into the core architecture of our SGP product: How we utilised an OLAP database in order to implement our Single Game Parlay (SGP) product by capturing the data features in our Monte Carlo simulations.

Implementing Single Game Parlay (SGP) using Monte Carlo Simulations and OLAP at Huddle

Monte Carlo simulations serve as indispensable tools in various industries, offering insights into complex systems through repeated random sampling. In sports betting, particularly, Monte Carlo simulations enable the estimation of probabilities for various game outcomes.

Problem:

Capturing all correlated probabilities on a single game efficiently still poses a significant technical challenge and makes it difficult to run at scale and combine with existing betting offerings.

Solution

Here, we delve into how we utilised an OLAP database in order to implement our Single Game Parlay (SGP) product by capturing the data features in our Monte Carlo simulations, and ensuring the comprehensive capture of correlated probabilities needed to implement an Full SGP product usable in sports betting.

Integrating Same Game Parlay with Monte Carlo Simulations

Market Correlations

When looking at the design space, we've observed various approaches that exist in our industry, using graphs to navigate the simulation space and in-memory search of the simulation space seemed to be the most common ones.

For our simulators searching the simulation space seemed like a natural fit, however the approach presented performance and implementation challenges. Looking at the simulation datasets we've made a hypothesis that we can encode the markets into the dataset as features and thus change the data processing problem into a data retrieval one. We could use SQL to restrict the number of selections in a composable and declarative manner. Therefore, the SGP functionality was implemented by mapping our markets into the simulation dataset as features and implementing an API layer that was able to translate user interaction with market selections into an SGP selection by expressing them as a set of conditions which, when applied onto the simulation space, are able to restrict the simulation space and thus telling us which are the real correlated probabilities. Being a real probability these markets are therefore combinable with other markets across our portfolio.

Data Storage and Retrieval

OLAP databases use a number of technical features which make them ideal to rapidly search over a large data set. Columnar storage architecture, in-memory data processing, vectorised data processing all provide an efficient framework for storing and retrieving vast amounts of our simulation data. By leveraging these analytical capabilities, we structured our database to accommodate the diverse range of features generated and captured during the Monte Carlo simulations. This allowed for seamless storage and retrieval of correlated probabilities associated with various game outcomes, enabling comprehensive analysis and decision-making. Furthermore we integrated object storage into the product that allowed us to easily load current and historical SGP data from long term storage. This is important to us considering the relatively large amount of data generated during each simulation and the requirements around pushed markets and cashout.

Scalability and Performance Optimisations

As the volume of simulation data grew, scalability and performance optimization became paramount. The main challenge for scaling an SGP designed in this way is its scaling linearly in memory as the number of games increases. Our lightweight yet powerful architecture ensured that our SGP-integrated Monte Carlo simulations remained scalable and performant even under increasing computational demands and it's embeddable nature allowed us to shard the load onto a horizontally distributed set of work managed by a sharding mechanism.

Case Study: Enhancing Betting Strategy with SGP-Integrated Monte Carlo Simulations

Let's consider a scenario where we applied SGP-integrated Monte Carlo simulations to optimise a trading strategy for an upcoming basketball match:

Data Collection: We collected historical data on player performances, team statistics, and game outcomes.

Monte Carlo Simulation: Using our pricing models and model parameters, we ran Monte Carlo simulations to estimate the probabilities of various game and market outcomes.

SGP Integration: Leveraging DuckDB's analytical capabilities and our SGP service, we captured correlated probabilities for all supported market types.

Real-time Adaptation: Throughout the match, we continuously updated our betting strategy and model parameters based on real-time game data, insights from traders and bets.

Conclusion

By integrating SGP functionality with an OLAP database, we were able to expose and enhance our Monte Carlo simulations used for sports betting, enabling a comprehensive SGP product capable for combining real probabilities across our market portfolio and supporting features like cashout and void markets. The synergy between our product design, quants, backend engineering and data engineering techniques empowered us to implement a flexible and scalable solution and thus substantially bolster our product portfolio. As the sports betting landscape continues to evolve, SGP services remain a powerful tool for gaining a competitive edge in the industry.