

# The Perfect Bet

by Adam Kucharski



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It is common opinion that gambling and science are antipodal realms. But there are deep, though partly hidden, relationships between them. Thus the title of this book is both provocative and intriguing.

The word “bet” is related to luck or chance. Predicting the outcome of a sports event, for instance, is often considered nothing more than guessing. On the other hand, everyone knows that well-informed bets might have better chances of success. While gathering data means obtaining information, a mathematical approach to betting can make a real difference.

In poker, for instance, players should consider how many card combinations are worth more than theirs, whereas in soccer, the performance record of every team provides relevant information, and so on. Wise management of available information is the true key to a gambler's success. And wisdom, in this context, means applying a mathematically based approach in placing a bet. No rules of thumb, no amulets, no superstitious beliefs, just math.

The author uses short narratives to strengthen this idea in the reader's mind. Thus *The Perfect Bet*, chapter by chapter, almost appears to unveil the well-guarded secret that mathematics can make gambling profitable, turning it into a real profession of a kind.

On the other hand, such a professional secret comes with a cold warning: while exploiting math in gambling may sometimes lead to huge profits, the path to becoming a successful gambler is difficult.

As history teaches us, and as is nicely described in this book, gambling has been interwoven with mathematics since its origins. The eminent scientists Galileo, Kepler, and Cardano, to name a few, spent considerable time studying aspects of gambling. A number of interesting questions arise from that observation. One may wonder, for instance, who really has benefited from such interactions. On the one hand, successful gamblers always have found a way to exploit math for increasing their profits. On the other hand, curiosity about the dynamics of some simple and popular games, such as card games and roulette, has inspired mathematical investigation, especially in probability.

*The Perfect Bet* collects and merges a series of narratives across different periods of history, aiming to illustrate the benefits of the relationship between math and gambling. To this end, the author traces a path that follows only in part the historical development of the topic. The story evolves from simple examples to more sophisticated ones. Fascinating biographical sketches of scientists, as well as strategies and technologies used by professional gamblers, including dubious tricks and fraudulent schemes to

increase gambling profits, such as the implementation of bots, are discussed.

The author then approaches a central question: can one actually exploit scientific knowledge for success in gambling? The answer depends on the game in question, of course, but if the answer is yes, the edge between gambling and games of pure skill, such as chess, grows thinner [1].

The book has eight chapters. Chapter 1 focuses on roulette, the most famous casino game, including its chaos theory aspects. Poincaré reported early insights on the sensitivity of roulette outcomes to initial conditions, such as the initial position and speed of the ball.

Chapter 2 discusses the historical role of lotteries as an alternative to taxes for raising funds from the populace. Both brute-force approaches and more mathematically based strategies are discussed.

Chapter 3 moves on to games like blackjack, in which math certainly can be exploited. We learn of Bill Benter, a successful gambler whose path was marked by Edward O. Thorp's book on blackjack [2]. A famous computational method in physics, the Monte Carlo method, gets mentioned.

In Chapter 4, “Pundits with PhDs,” the author highlights the emergence of new figures, so-called sports quantitative analysts, in the betting market. British universities organize career days for them, so that the betting market begins to resemble a financial market.

Chapter 5 introduces notions of complex systems involving large numbers of people in different roles (gamblers, bookmakers, opinion makers) who interact via social networks and other technologies. Twitter by now has become a rich source of data for predicting the trend of stock markets. This inevitably leads to the development of artificial intelligence (AI) tools, such as (ro)bots and other machines that are able to make decisions based on algorithms, both in financial markets and in betting platforms.

Chapter 6 focuses on poker, one of the most popular and fascinating card games, which still represents an open challenge despite numerous new strategies based on AI, game theory, and artificial neural networks.

Chapter 7 deserves particular attention. It deals with a phenomenon we are experiencing right now, the pervasive intrusion of AI systems into a wide range of new fields, from health care to finance, from e-commerce to home automation. Buzzwords like machine learning, deep learning, neural-based systems, and so on, are becoming household concepts even among the uninitiated. Happily enough, this chapter offers a short and accessible description of what an artificial neural network is. A simple diagram composed of blocks and arrows is presented, in which the concept of connection is central. All the “intelligence” of the system depends on the way its elements are connected. Any variation in its topology (or architecture) may lead the machine to “think” differently. Neural networks can combine myriads of tweets or stock values, yielding as an output, for instance, a FTSE 100 market index value. Whether this constitutes intelligence is a philosophical question, but from a mundane point of view, an artificial neural network is nothing but a (complicated) mathematical function, with an input and an output.

Chapter 8 concludes the book with a discussion of the relationship between gambling and science.

*The Perfect Bet* is recommended reading for anyone wondering about how to “gamble if you must.” In particular, the style adopted by the author makes the book accessible to almost every reader, and even sophisticated concepts are presented in a way that requires only a basic background in math to be appreciated. To conclude, we might mention some other interesting essays in this field, such as that of Joseph Mazur [3], that of Joe Peta [4], and the recent book [5] by the anthropologist Natasha Dow Schüll.

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