Preface

Game theory is the mathematical study of strategic interaction: situations in which the outcome for each participant depends not only on their own decisions but also on the decisions of others. Born in the 1940s from the collaboration of John von Neumann and Oskar Morgenstern, and transformed by John Nash's equilibrium concept in 1950, game theory has become one of the most influential analytical frameworks of the modern era. It underpins large parts of economics, is central to political science and evolutionary biology, and—through auction design, market design, and algorithmic game theory—now shapes the infrastructure of the internet economy.

How this book is organized

This book is a self-contained learning path organized in three parts of increasing sophistication.

Part I: Beginner. No prior exposure is assumed. We build the vocabulary of games—players, strategies, payoffs—and develop the central solution concepts: dominance, Nash equilibrium (pure and mixed), and backward induction in dynamic games. Every concept is introduced through classic examples such as the Prisoner's Dilemma, the Battle of the Sexes, and Matching Pennies.

Part II: Intermediate. We apply the theory to economics (oligopoly, public goods), then extend it in three major directions: *time* (repeated games and the Folk Theorem, bargaining), *information* (Bayesian games, auctions, signaling, cheap talk), and *conflict* (zero-sum games and the Minimax Theorem).

Part III: Advanced. We treat the theory rigorously and broadly: existence proofs via fixed-point theorems, equilibrium refinements, mechanism design and auction theory (the Revelation Principle, VCG, Myerson's optimal auction), cooperative game theory (the core, the Shapley value, matching markets), evolutionary game theory, and algorithmic game theory (complexity of equilibria, price of anarchy, learning dynamics), closing with a tour of current research frontiers.

Appendix A reviews the mathematical background (sets, probability, optimization, fixed points). Appendix B contains full solutions to the end-of-chapter exercises.

How to use this book

- **If you are new to the subject**, read Part I linearly. Do the exercises: game theory is learned by solving games, not by reading about them.
- **If you know the basics**, skim Part I for notation and start with Part II.
- **If you are preparing for graduate study or research**, Part III together with the cited literature (Fudenberg–Tirole, Osborne–Rubinstein, Myerson, Maschler–Solan–Zamir) forms a solid core.

Throughout, boxed **Definitions**, **Theorems**, **Examples**, and **Key Ideas** mark the essential material, while *Historical Notes* place the ideas in context. A guide to further reading concludes the book.