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Twenty Lectures On Algorithmic Game Theory

TWENTY LECTURES

ON

ALGORITHMIC GAME THEORY

TIM ROUGHGARDEN
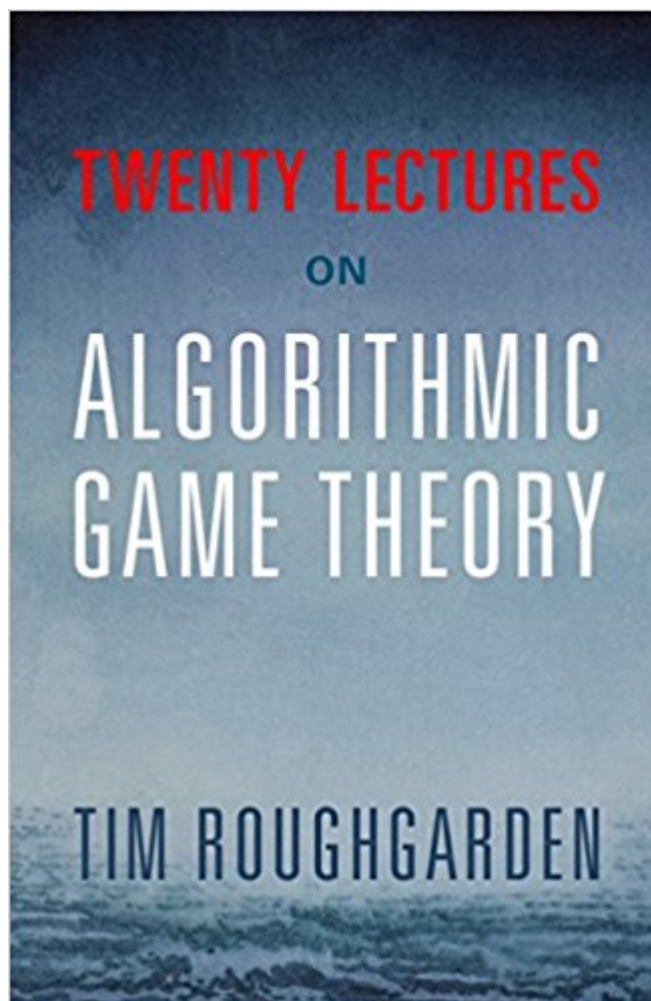
Synopsis

Computer science and economics have engaged in a lively interaction over the past fifteen years, resulting in the new field of algorithmic game theory. Many problems that are central to modern computer science, ranging from resource allocation in large networks to online advertising, involve interactions between multiple self-interested parties. Economics and game theory offer a host of useful models and definitions to reason about such problems. The flow of ideas also travels in the other direction, and concepts from computer science are increasingly important in economics. This book grew out of the author's Stanford University course on algorithmic game theory, and aims to give students and other newcomers a quick and accessible introduction to many of the most important concepts in the field. The book also includes case studies on online advertising, wireless spectrum auctions, kidney exchange, and network management.

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Customer Reviews

'There are several features of this book that make it very well suited both for the classroom and for self-study ... if your interest is in understanding how game theory, economics and computer science are cross-pollinating to address challenges of the design of online strategic interactions, this is the book to start with. It is clear, well-organized and makes a compelling introduction to a vibrant field.' David Burke, MAA Reviews

This book gives students a quick and accessible introduction to many of the most important concepts in the field of algorithmic game theory. It demonstrates these concepts through case

studies in online advertising, wireless spectrum auctions, kidney exchange, and network management.

I was expecting something different due to the title -- I presumed it would be a broad look at game theory and algorithms employed for solving game theory problems. I'm about halfway through the book so far and mostly the book focuses specifically on auctions, and how to design an auction mechanism that fulfills a variety of desirable criteria as well as being computationally tractable. So, for example, imagine you work at google and want to come up with a system for auctioning off ad space to advertisers to be paired with every person's search result. This is the material you'd want to understand in order to design a system that encourages honest bidding, maximizes revenue, and can be computed in real-time. The book is more about the math and the theory; algorithms mainly play a role in the abstract sense that we want to make sure it's not an NP-hard computation to determine the winner or pricing of an auction.Although the material is much more tightly focused than I expected, I am finding it very interesting. The treatment is fairly formal and dense with mathematics and proofs, so you have to like that sort of thing to get maximum enjoyment of the book, but the book summarizes the main bullet points in plain language which makes it possible to skim over some of the mathematical details and still get something out of it.Each chapter comes with exercises and problems that are very interesting and require originality and deep thinking to solve. Some of the problems have a few hints at the back of the book, but don't expect to find detailed solutions here. I would enjoy if the book had a forum where people could discuss the problems more in depth. I'm not taking this as part of a class and don't have any peers with whom to discuss the material, so I'm not getting as much out of the problems as I would like.The book doesn't assume a whole lot of prior knowledge about game theory. Some of the proofs require calculus to follow completely (e.g., as it relates to working with continuous probability distributions) but for the most part the proofs don't require a lot of specific, prior mathematical knowledge and the needed background is supplied by the book.

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