

# Joan Feigenbaum, AT&T Labs "Games, Complexity Classes, and Approximation Algorithms"

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Game theory provides a framework in which to model and analyze conflict and cooperation among independent decision makers. Many areas of computer science have benefitted from this framework, including artificial intelligence, distributed computing, security and privacy, and lower bounds. Games are particularly important in computational complexity, where they are used to characterize complexity classes, to understand the power and limitations of those classes, and to interpret the complete problems for those classes. In this talk, I will present game-theoretic characterizations of several standard complexity classes. I will then use these characterizations to show that certain natural maximization and minimization functions, drawn from domains such as boolean logic, graph searching, graph reliability, and stochastic optimization, are as hard to approximate closely as they are to compute exactly. These results demonstrate that modern complexity theorists' emphasis on interaction and randomness and modern algorithm designers' emphasis on approximation algorithms can benefit from a game-theoretic framework.

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