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Decision and Game Theory for Security

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Preface

Securing complex and networked systems has become increasingly important as these systems play an indispensable role in all aspects of modern life. Security, trust, authentication, and privacy of communications, data, and computing are critical for many applications and infrastructures, and their analysis and establishment pose novel and difficult challenges. These challenges are further exacerbated by the heterogeneity of communication networks, and by their distributed and asynchronous operation. Human, social, and economic factors play an important role in security and performance of such networked systems, and pose additional challenges that require innovative methodologies and at the same time challenge the foundations of conventional methods in computer science, mathematics, economics, and sociology. The investigation of security, trust, and privacy in such systems involves inference and decision making at multiple levels and time scales, given the limited and time-varying resources available to both malicious attackers and administrators defending these complex networked systems. Decision and game theory — in a broad sense — provides a rich and increasingly expanding arsenal of methods, approaches, and algorithms with which to address the novel resource allocation, inference, and decision-making problems arising in security, trust, and privacy of networked systems.

GameSec 2011, the Second Conference on Decision and Game Theory for Security, took place on the campus of the University of Maryland, College Park, during November 14–15, 2011, under the sponsorships of the Maryland Cybersecurity Center (MC^2) and other technical sponsors. GameSec brings together researchers who aim to establish a theoretical foundation for making resource-allocation decisions that balance available capabilities and perceived security risks in a principled manner. The conference focuses on analytical models based on game, information, communication, optimization, decision, and control theories that are applied to diverse security topics. At the same time, the connections between theoretical models and real-world security problems are emphasized to establish the important feedback loop between theory and practice. Given the scarcity of venues for researchers who try to develop a deeper theoretical understanding of the underlying incentive and resource allocation issues in security, GameSec aims to fill an important void and to serve as a distinguished forum.

This edited volume contains the summaries of the two plenary keynote addresses, and the 16 contributed full papers, presented at GameSec 2011. These 18 articles are categorized into the following seven sessions:

– "Plenary Keynotes" contains summaries of the two plenary keynote addresses, which present inspiring, visionary, and innovative ideas in game theory and its interplay with social and economic considerations within the context of security and trust in complex networked systems.

- "Attacks, Adversaries, and Game Theory" has two articles discussing game-theoretic approaches to intrusion-detection systems and the role of adversaries' risk profiles.
- "Wireless Adhoc and Sensor Networks" contains three articles, which investigate attacks and defense in infrastructureless wireless communication and sensor networks.
- "Network Games" has three articles focusing on analytical investigations of games related to security problems in networks.
- "Security Insurance" contains two articles on the new field of economic insurance considered as a component of the overall security infrastructure for complex networks and systems.
- "Security and Trust in Social Networks" has four articles investigating, analytically and experimentally, game-theoretic methods in the important area of social networks.
- "Security Investments" contains two articles investigating the value and effectiveness of investments for security mechanisms in the Internet.

Considering that inference and decision making for human–machine networked systems is still an emerging research area, we believe that this edited volume as well as the GameSec conferences will be of interest to both researchers and students who work in this challenging and multidisciplinary area.

November 2011

John Baras
Jonathan Katz
Eitan Altman

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