# **Communications** in Computer and Information Science

1354

#### **Editorial Board Members**

Joaquim Filipe

Polytechnic Institute of Setúbal, Setúbal, Portugal

Ashish Ghosh

Polytechnic Institute of Setúbal, Setúbal, Portugal

Raquel Oliveira Prates

Federal University of Minas Gerais (UFMG), Belo Horizonte, Brazil

Lizhu Zhou

Tsinghua University, Beijing, China

More information about this series at http://www.springer.com/series/7899

Samson Lasaulce · Panayotis Mertikopoulos · Ariel Orda (Eds.)

# Network Games, Control and Optimization

10th International Conference, NetGCooP 2020 France, September 22–24, 2021 Proceedings



Editors Samson Lasaulce CRAN – CO2 Team ENSEM Vandoeuvre-lès-Nancy, France

Ariel Orda Technion – Israel Institute of Technology Haifa, Israel Panayotis Mertikopoulos CNRS Researcher Laboratoire d'Informatique de Grenoble (LIG) Saint-Martin d'Hères, France

ISSN 1865-0929 ISSN 1865-0937 (electronic) Communications in Computer and Information Science ISBN 978-3-030-87472-8 ISBN 978-3-030-87473-5 (eBook) https://doi.org/10.1007/978-3-030-87473-5

#### © Springer Nature Switzerland AG 2021

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

#### **Preface**

This volume in the Communications in Computer and Information Science series (CCIS, volume 1354) is a collection of the papers accepted for the 10th International Conference on NETwork Games, COntrol and OPtimization (NetGCooP 2020). The event was originally planned to take place in Cargèse, Corsica, France during March 18–20, 2020, but due to the recent COVID-19 pandemic the conference was postponed to September 22–24, 2021. Because of the exceptional circumstances, and to ensure timely dissemination of the contributions by the authors that would normally have been presented last March, we decided to publish the accepted papers before the event.

Networks form the backbone of many complex systems, ranging from the Internet to social interactions. The proper design and control of networks have been long-standing issues in various engineering and science disciplines. The vision of the conference is to provide a platform for researchers to share novel ideas and network applications in the areas of control and optimization. From an application point of view, the 2020 edition focused on resource allocation, energy markets, and opinion dynamics. And from a theoretical point of view, we received and accepted papers concerning learning in games, the value of information in games, and how to design robust defense strategies.

The program for NetGCooP 2020 comprised 14 papers (3 short papers and 11 regular papers) selected from submissions received through open calls, and an additional 15 papers selected from submissions received via invitation. We would like to thank the authors for having done their best to produce works of high quality and for having supported the difficult decisions that the organizers were forced to make because of the challenging situation. Moreover, we would like to thank the reviewers and the Technical Program Committee (TPC) members for providing reviews of quality in spite of the challenges created by the pandemic.

June 2021

Samson Lasaulce Panayotis Mertikopoulos Ariel Orda

### **Organization**

#### **General Co-chairs**

Tamer Basar University of Illinois Urbana-Champaign, USA

Merouane Debbah Huawei, France

Alexandre Reiffers IMT Atlantique, France

Corinne Touati Inria, France

#### **Technical Program Committee Co-chair**

Samson Lasaulce CRAN, CNRS, University of Lorraine, France Panayotis Mertikopoulos CNRS and Laboratoire d'Informatique de Grenoble,

France

Ariel Orda Technion, Israel

#### **Publication Chair**

Essaid Sabir ENSEM, Hassan II University of Casablanca, Morocco

#### **Technical Program Committee**

Samson Lasaulce CRAN, CNRS, University of Lorraine, France Panayotis Mertikopoulos CNRS and Laboratoire d'Informatique de Grenoble,

France

Alexandre Reiffers IMT Atlantique, France

Yezekael Hayel LIA, University of Avignon, France

K. Clay McKell California Polytechnic State University, USA

Eli Meirom Technion, Israel

Essaid Sabir ENSEM, Hassan II University of Casablanca, Morocco

Ramakrishnan Indian Institute of Technology, Madras, India

Ariel Orda Technion, Israel

E. Veronica Belmega ETIS, ENSEA, Université Cergy Pontoise, CNRS,

France

Balakrishna Prabhu LAAS-CNRS, France

Swapnil Dhamal Chalmers University of Technology, Sweden Vijay Kamble University of Illinois at Chicago, USA

Francesco De Pellegrini University of Avignon, France

Isabel Amigo IMT Atlantique, France

Salah Eddine Elayoubi CentraleSupélec, France

Bruno Gaujal Inria and Laboratoire d'Informatique de Grenoble,

France

viii Organization

Iriniel-Constantin CRAN, Université de Lorraine, France

Morarescu

Eitan Altman Inria, France

Romain Negrel ESIEE Paris and LIGM, France

## **Contents**

to Wireless Communication	
On the Existence and Uniqueness of Nash Equilibria in MIMO Communication Games with a Jammer	3
A Game-Theoretical Approach for Energy Efficiency in Multiuser  MIMO System	8
Derivative-Free Optimization over Multi-user MIMO Networks	17
A Friendly Interference Game in Wireless Secret  Communication Networks	25
Slow-Link Adaptation Algorithm for Multi-source Multi-relay Wireless Networks Using Best-Response Dynamics	38
Stochastic Models for Network Performance Analysis	
Vaccination in a Large Population: Mean Field Equilibrium Versus Social Optimum	51
Controlling Packet Drops to Improve Freshness of Information  Veeraruna Kavitha and Eitan Altman	60
Maximizing Amount of Transferred Traffic for Battery Powered Mobiles Eitan Altman, Ghilas Ferrat, and Mandar Datar	78
Game Theory in Mobile and Wireless Networks	
An Ascending Implementation of the Vickrey-Clarke-Groves Mechanism for the Licensed Shared Access	87

Resource Orchestration in Interference-Limited Small Cell Networks:	101
A Contract-Theoretic Approach.  Maria Diamanti, Georgios Fragkos, Eirini Eleni Tsiropoulou, and Symeon Papavassiliou	101
Unlicensed Spectrum for Ultra-Reliable Low-Latency Communication in Multi-tenant Environment	110
Spectrum Sharing Secondary Users in Presence of Multiple Adversaries Sayanta Seth, Debashri Roy, and Murat Yuksel	125
Scheduling and Resource Allocation Problems in Networks	
Dynamic Bus Dispatch Policies	139
Multi Objective Decision Making for Virtual Machine Placement in Cloud Computing	154
A Markovian Approach for Improving End-to-End Data Rates in the Internet	167
DNN Based Beam Selection in mmW Heterogeneous Networks	172
A Bilevel Model for Centralized Optimization of Charging Stops for EV on Highways	185
Coordinated Scheduling Based on Automatic Neighbor Beam Relation Marie Masson, Zwi Altman, and Eitan Altman	195
Advance in Game Theory	
Financial Replicator Dynamics: Emergence of Systemic-Risk-Averting Strategies	211
Impact of Private Observation in the Bayesian Persuasion Game	229

#### **Social Networks**

Optimal Campaign Strategy for Social Media Marketing with a	
Contrarian Population	241
A Dynamic Game Formulation for Control of Opinion Dynamics over Social Networks	252
Opinion Dynamics with Multi-body Interactions	261
Modeling Limited Attention in Opinion Dynamics by Topological Interactions	272
Electrical Networks	
Optimal Pricing Approach Based on Expected Utility Maximization with Partial Information	285
Price Formation and Optimal Trading in Intraday Electricity Markets Olivier Féron, Peter Tankov, and Laura Tinsi	294
Distributed Static State Feedback Control for DC Microgrids Sifeddine Benahmed, Pierre Riedinger, and Serge Pierfederici	306
Design of a Combinatorial Double Auction for Local Energy Markets  Diego Kiedanski, Daniel Kofman, and Ariel Orda	315
Author Index	321