# TABLE OF CONTENTS

## SESSION 1A – INNOVATIVE APPLICATIONS

**PROTECT: A Deployed Game Theoretic System to Protect the Ports of the United States**

Eric Shieh, Bo An, Rong Yang, Milind Tambe, Craig Baldwin, Joseph Direnzo, Ben Maule, Garrett Meyer

**SAVES: A Sustainable Multiagent Application to Conserve Building Energy Considering Occupants**

Jan-Young Kwak, Pradeep Varakantham, Rajiv Maheswaran, Milind Tambe, Farrokh Jazizadeh, Geoffrey Kavulya, Laura Klein, Burcin Becerik-Gerber, Timothy Hayes, Wendy Wood

**Active Malware Analysis using Stochastic Games**

Simon Williamson, Pradeep Varakantham, Debin Gao, Ong Chen Hui

**Agents vs. Pirates: Multi-agent Simulation and Optimization to Fight Maritime Piracy**

Michal Jakob, Ondrej Vanek, Ondrej Hrstka, Michal Pechoucek

**Improving Building Energy Efficiency with a Network of Sensing, Learning and Prediction Agents**

Sunil Mamidi, Yu-Han Chang, Rajiv Maheswaran

## SESSION 1B – TEAMWORK I

**Coordination Guided Reinforcement Learning**

Qiangfeng Peter Lau, Mong Li Lee, Wynne Hsu

**On Coalition Formation with Sparse Synergies**

Thomas Voice, Sarvapali Ramchurn, Nick Jennings

**Decentralised Channel Allocation and Information Sharing for Teams of Cooperative Agents**

Sebastian Stein, Simon Williamson, Nick Jennings

**A New Approach to Betweenness Centrality Based on the Shapley Value**

Piotr Szczepanski, Tomasz Michalak, Talal Rahwan

**Maintaining Team Coherence under the Velocity Obstacle Framework**

Andrew Kimmel, Andrew Dobson, Kostas Bekris

## SESSION 1C – LEARNING I

**V-MAX: Tempered Optimism for Better PAC Reinforcement Learning**

Karun Rao, Shimon Whiteson

**Reinforcement Learning Transfer via Sparse Coding**

Haitham Bou Ammar, Karl Tayls, Matthew Taylor, Kurt Driessen, Gerhard Weiss

**Learning in a Small World**

Arun Tejasvi Chaganty, Prateek Gaur, Balaraman Ravindran

**Just Add Pepper: Extending Learning Algorithms for Repeated Matrix Games to Repeated Markov Games**

Jacob Crandall

**Strong Mitigation: Nesting Search for Good Policies Within Search for Good Reward**

Jeshua Bratman, Satinder Singh, Richard Lewis, Jonathan Sorg

## SESSION 1D – SOCIAL CHOICE I

**Strategyproof Approximations of Distance Rationalizable Voting Rules**

Travis Service, Julie Adams

**Campaigns for Lazy Voters: Truncated Ballots**

Dorothea Baumeister, Piotr Faliszewski, Jérôme Lang, Jörg Rothe

**Possible and Necessary Winners of Partial Tournaments**

Haris Aziz, Markus Brill, Felix Fischer, Paul Harrenstein, Jérôme Lang, Hans Georg Seedig

**Communication Complexity of Approximating Voting Rules**

Travis Service, Julie Adams
SESSION 1E – GAME THEORY I

Existence of Stability in Hedonic Coalition Formation Games
Haris Aziz, Florian Brandl .......................................................... 152

Stability Scores: Measuring Coalitional Stability
Michal Feldman, Reshef Meir, Moshe Tennenholtz ............. 160

Coalitional Stability in Structured Environments
Georgios Chalkiadakis, Vangelis Markakis, Nick Jennings .... 168

Overlapping Coalition Formation Games: Charting the Tractability Frontier
Yair Zick, Georgios Chalkiadakis, Edith Elkind ................. 176

Handling Negative Value Rules in MC-net-based Coalition Structure Generation
Suguru Ueda, Takato Hasegawa, Naoyuki Hashimoto, Naoki Ohta, Atsushi Iwasaki, Makoto Yokoo .. 184

SESSION 1F – PLANNING

Probabilistic Planning with Non-Linear Utility Functions and Worst-Case Guarantees
Stefano Ermon, Carla Gomes, Bart Selman, Alexander Vladimirsky .......................................................... 192

Heuristic Search of Multiagent Influence Space
Stefan Witwicki, Frans Oliehoek, Leslie Kaelbling ............. 200

A Hierarchical Goal-Based Formalism and Algorithm for Single-Agent Planning
Vikas Shivashankar, Ugar Kuter, Dana Nau, Ron Alford .... 208

DiscoverHistory: Understanding the Past in Planning and Execution
Matthew Molineaux, Ugar Kuter, Matthew Klenk ............. 216

Time Bounded Adaptive A*
Carlos Hernández, Jorge Baier, Tansel Uras, Sven Koenig .. 224

SESSION 2A – VIRTUAL AGENTS

Bayesian Model of the Social Effects of Emotion in Decision-Making in Multiagent Systems
Celso De Melo, Peter Carnevale, Stephen Read, Dimitrios Antonis, Jonathan Gratch ........................................ 232

Towards Building a Virtual Counselor: Modeling Nonverbal Behavior during Intimate Self-Disclosure
Sin-Hwa Kang, Jonathan Gratch, Candy Sidner, Ron Artstein, Lixing Huang, Louis-Philippe Morency ................. 240

A Sequential Recommendation Approach for Interactive Personalized Story Generation
Hong Yu, Mark Riedl ................................................................. 248

Evaluating the Models & Behaviour of 3D Intelligent Virtual Animals in a Predator-Prey Relationship
Deborah Richards, Michael J. Jacobson, John Porte, Charlotte Taylor, Meredith Taylor, Anne Newstead, Iwan Kelaliah, Nader Hanna ................................................................. 256

Model of the Perception of Smiling Virtual Character
Magalie Ochs, Catherine Pelachaud ........................................ 264

SESSION 2B – DISTRIBUTED PROBLEM SOLVING

Stochastic Dominance in Stochastic DCOPs for Risk Sensitive Applications
Duc Thien Nguyen, William Yeoh, Hoong Chuan Lau ........ 272

Max/Min-sum Distributed Constraint Optimization through Value Propagation on an Alternating DAG
Roie Zivan, Hilla Peled ............................................................... 280

Improving BnB-ADOPT+AC
Patricia Gutierrez, Pedro Meseguer ......................................... 288

Optimal Decentralised Dispatch of Embedded Generation in the Smart Grid
Sam Miller, Savapalli Ramchurn, Alex Rogers ....................... 296

DCOPs and Bandits: Exploration and Exploitation in Decentralised Coordination
Ruben Stranders, Long Tran-Thanh, Francesco Maria Delle Fave, Alex Rogers, Nick Jennings ............... 304
SESSION 2C – LEARNING II

Decentralized Bayesian Reinforcement Learning for Online Agent Collaboration .................................................. 312
Luke Teacy, Georgios Chalkiadakis, Alessandro Farinelli, Alex Rogers, Nick Jennings, Sally McClean, Gerard Parr

Shaping Fitness Functions for Coevolving Cooperative Multiagent Systems .......................................................... 320
Mitchell Colby, Kagan Tumer

Dynamic Potential-Based Reward Shaping .................................................................................................................. 328
Sam Devlin, Daniel Kudenko

Learning and Predicting Dynamic Networked Behavior with Graphical Multiagent Models ................................... 336
Quang Duong, Michael Wellman, Satinder Singh, Michael Kearns

SESSION 2D – SOCIAL CHOICE II

Lot-based Voting Rules .................................................................................................................................................. 344
Toby Walsh, Lirong Xia

Convergence of Iterative Voting ................................................................................................................................. 352
Omer Lev, Jeffrey Rosenschein

Optimal Manipulation of Voting Rules ....................................................................................................................... 360
Svetlana Obraztsova, Edith Elkind

Manipulation Under Voting Rule Uncertainty ............................................................................................................ 368
Edith Elkind, Gábor Erdélyi

Voter Response to Iterated Poll Information .............................................................................................................. 376
Annemieke Reijngoud, Ulle Endriss

SESSION 2E – GAME THEORY II

Short Sight in Extensive Games ................................................................................................................................. 384
Davide Grossi, Paolo Turrini

New Results on the Verification of Nash Refinements for Extensive-Form Games ..................................................... 392
Nicola Gatti, Fabio Panozzo

Playing Repeated Stackelberg Games with Unknown Opponents .................................................................................. 400
Janusz Marecki, Gerry Tesauro, Richard Segal

Repeated Zero-Sum Games with Budget ...................................................................................................................... 408
Troels Sørensen

Efficient Nash Equilibrium Approximation through Monte Carlo Counterfactual Regret Minimization .................. 416
Michael Johanson, Nolan Bard, Marc Lanctot, Richard Gibson, Michael Bowling

SESSION 2F – KNOWLEDGE REPRESENTATION & REASONING

Memory Formation, Consolidation, and Forgetting in Learning Agents .................................................................. 424
Budhitama Subagdja, Wenwen Wang, Ah-Hwee Tan, Yuan-Sin Tan, Loo-Nin Teow

Improved Use of Partial Policies for Identifying Behavioral Equivalence ................................................................. 432
Yifeng Zeng, Yinghui Pan, Hua Mao, Jian Luo

Learning and Reasoning about Norms using Neural-Symbolic Systems ................................................................. 440
Guido Boella, Silvano Colombo Tosatto, Artur D’Avila Garcez, Valerio Genovese, Perotti Alan, Leendert Van Der Torre

On Supervising Agents in Situation-Determined ConGolog ....................................................................................... 448
Giuseppe De Giacomo, Yves Lespérance, Christian Muise

Generalized and Bounded Policy Iteration for Finitely-Nested Interactive POMDPs: Scaling Up ......................... 456
Ekklas Somu, Prashant Doshi

SESSION 3A – ROBOTICS I

Supervised Morphogenesis - Morphology Control of Ground-based Self-Assembling Robots by Aerial Robots ....... 464
Nithin Mathews, Alessandro Stranieri, Alexander Scheidler, Marco Dorigo
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decentralized Active Robotic Exploration and Mapping for Probabilistic Field Classification in Environmental Sensing</td>
<td>472</td>
</tr>
<tr>
<td>Kian Hsiang Low, Jie Chen, John Dolan, Steve Chien, David Thompson</td>
<td></td>
</tr>
<tr>
<td>Robot Exploration with Fast Frontier Detection: Theory and Experiments</td>
<td>480</td>
</tr>
<tr>
<td>Matan Keidar, Gal Kaminka</td>
<td></td>
</tr>
<tr>
<td>Dynamic Reconfiguration in Modular Robots using Graph Partitioning-based Coalitions</td>
<td>488</td>
</tr>
<tr>
<td>Prithviraj Dasgupta, Vladimir Ufimtsev, Carl Nelson, S. G. M. Hossain</td>
<td></td>
</tr>
<tr>
<td>UT Austin Villa 2011: A Champion Agent in the RoboCup 3D Soccer Simulation Competition</td>
<td>496</td>
</tr>
<tr>
<td>Patrick Macalpine, Daniel Urieli, Samuel Barrett, Shivaram Kalyanakrishnan, Francisco Barrera, Adrian Lopez-Mobilia, Niclae Stiurca, Victor Vu, Peter Stone</td>
<td></td>
</tr>
<tr>
<td>SESSION 3C – HUMAN-AGENT INTERACTION</td>
<td></td>
</tr>
<tr>
<td>A Cultural Sensitive Agent for Human-Computer Negotiation</td>
<td>504</td>
</tr>
<tr>
<td>Galit Haim, Ya’akov (Kobi) Gal, Sarit Kraus, Michele Gelfand</td>
<td></td>
</tr>
<tr>
<td>Giving Advice to People in Path Selection Problems</td>
<td>512</td>
</tr>
<tr>
<td>Amos Azaria, Zinovi Rabinovich, Sarit Kraus, Claudia Goldman, Omer Tsimhoni</td>
<td></td>
</tr>
<tr>
<td>Combining Human and Machine Intelligence in Large-scale Crowdsourcing</td>
<td>520</td>
</tr>
<tr>
<td>Ece Kamar, Severin Hacker, Eric Horvitz</td>
<td></td>
</tr>
<tr>
<td>Reinforcement Learning from Simultaneous Human and MDP Reward</td>
<td>528</td>
</tr>
<tr>
<td>W. Bradley Knox, Peter Stone</td>
<td></td>
</tr>
<tr>
<td>Automatic Task Decomposition and State Abstraction from Demonstration</td>
<td>536</td>
</tr>
<tr>
<td>Luis C. Cobo, Charles L. Isbell Jr., Andrea Thomaz</td>
<td></td>
</tr>
<tr>
<td>SESSION 3D – ECONOMIES &amp; MARKETS I</td>
<td></td>
</tr>
<tr>
<td>Rational Market Making with Probabilistic Knowledge</td>
<td>544</td>
</tr>
<tr>
<td>Abraham Othman, Tuomas Sandholm</td>
<td></td>
</tr>
<tr>
<td>Can a Zero-Intelligence Plus Model Explain the Stylized Facts of Financial Time Series Data?</td>
<td>552</td>
</tr>
<tr>
<td>Imon Palit, Steve Phelps, Wing Lon Ng</td>
<td></td>
</tr>
<tr>
<td>A Scoring Rule-based Mechanism for Aggregate Demand Prediction in the Smart Grid</td>
<td>560</td>
</tr>
<tr>
<td>Harry Rose, Alex Rogers, Enrico Gerding</td>
<td></td>
</tr>
<tr>
<td>A Model-Based Online Mechanism with Pre-Commitment and its Application to Electric Vehicle</td>
<td>568</td>
</tr>
<tr>
<td>Sebastian Stein, Enrico Gerding, Valentiu Robu, Nick Jennings</td>
<td></td>
</tr>
<tr>
<td>Efficient Crowdsourcing Contests</td>
<td>576</td>
</tr>
<tr>
<td>Ruggiero Cavallo, Shaili Jain</td>
<td></td>
</tr>
<tr>
<td>SESSION 3E – GAME THEORY III</td>
<td></td>
</tr>
<tr>
<td>Computing Optimal Strategy against Quantal Response in Security Games</td>
<td>584</td>
</tr>
<tr>
<td>Rong Yang, Fernando Ordóñez, Milind Tambe</td>
<td></td>
</tr>
<tr>
<td>A Unified Method for Handling Discrete and Continuous Uncertainty in Bayesian Stackelberg Games</td>
<td>592</td>
</tr>
<tr>
<td>Zhengyu Yin, Milind Tambe</td>
<td></td>
</tr>
<tr>
<td>Multi-Objective Optimization for Security Games</td>
<td>600</td>
</tr>
<tr>
<td>Matthew Brown, Bo An, Christopher Kiekintveld, Fernando Ordóñez, Milind Tambe</td>
<td></td>
</tr>
<tr>
<td>Strategy Purification and Thresholding: Effective Non-Equilibrium Approaches for Playing Large Games</td>
<td>608</td>
</tr>
<tr>
<td>Sam Ganzfried, Tuomas Sandholm, Kevin Waugh</td>
<td></td>
</tr>
<tr>
<td>Solving Non-Zero Sum Multiagent Network Flow Security Games with Attack Costs</td>
<td>616</td>
</tr>
<tr>
<td>Steven Okamoto, Noam Hazon, Katrina Sycara</td>
<td></td>
</tr>
<tr>
<td>SESSION 3F – AGENT-BASED SOFTWARE DEVELOPMENT</td>
<td></td>
</tr>
<tr>
<td>Measuring Plan Coverage and Overlap for Agent Reasoning</td>
<td>624</td>
</tr>
<tr>
<td>John Thangarajah, Sebastian Sardina, Liu Padgham</td>
<td></td>
</tr>
</tbody>
</table>
Programming Norm-Aware Agents
Natasha Alechina, Mehdi Dastani, Brian Logan

Metamodel-Based Metrics for Agent-Oriented Methodologies
Noëlle Bonjean, Antonio Chella, Massimo Consentino, Marie-Pierre Glez, Frédéric Migeon, Valeria Seidita

Comma: A Commitment-Based Business Modeling Methodology and Its Empirical Evaluation
Pankaj Telang, Munindar Singh

Revising Conflicting Intention Sets in BDI Agents
Steven Shapiro, Sebastian Sardina, John Thangarajah, Lawrence Cavedon, Lin Padgham

SESSION 4A – ROBOTICS II

Property-driven Design for Swarm Robotics
Manuele Brambilla, Carlo Pinciroli, Mauro Birattari, Marco Dorigo

Multi-robot Collision Avoidance with Localization Uncertainty
Daniel Hennes, Daniel Claes, Win Meeussen, Karl Tuyls

Decision-Theoretic Approach to Maximizing Observation of Multiple Targets in Multi-Camera Surveillance
Prabhu Narayan, Trong Nghia Hoang, Kian Hsiang Low, Mohan Kankanhalli

Segregation in Swarms of e-puck Robots Based On the Brazil Nut Effect
Jianing Chen, Melvin Gauci, Michael J. Price, Roderich Groß

Model-Driven Behavior Specification for Robotic Teams
Alexandros Paraschos, Nikolaos Spanoudakis, Michail Lagoudakis

SESSION 4B – AGENT SOCIETIES

A Multiagent Evolutionary Framework based on Trust for Multiobjective Optimization
Siwei Jiang, Jie Zhang, Yew-Soon Ong

A Qualitative Reputation System for Multiagent Systems with Protocol-based Communication
Emilio Serrano, Michael Rovatsos, Juan Boia

PReP: A Probabilistic Reputation Model for Biased Societies
Yasaman Haghpanah, Marie Desjardins

A Decision-Theoretic Characterization of Organizational Influences
Jason Sleight, Ed Durfee

Reasoning under Compliance Assumptions in Normative Multiagent Systems
Max Knobbout, Mehdi Dastani

SESSION 4C – ARGUMENTATION & NEGOTIATION

Quantifying Disagreement in Argument-based Reasoning
Richard Booth, Martín Caminada, Mikolaj Mikolaj, Iyad Rahwan

Cooperative Dialogues with Conditional Arguments
Sagy Sá, João ALCântara

Defeasible Argumentation for Multi-Agent Planning in Ambient Intelligence Applications
Sergio Pajares Ferrando, Eva Onaindia

Personalizing Communication about Trust
Andrew Koster, Jordi Sabater-Mir, Marco Schorlemmer

From Axiomatic to Strategic Models of Bargaining with Logical Beliefs and Goals
Bao Vo, Minyi Li

SESSION 4D – ECONOMIES & MARKETS II

Identifying Influential Agents for Advertising in Multi-agent Markets
Maks Maghami, Gita Sukthankar

Predicting Your Own Effort
David F. Bacon, Yilin Chen, Ian Kash, David Parkes, Malvika Rao, Manu Sridharan

Optimal Incentive Timing Strategies for Product Marketing on Social Networks
Pankaj Dayama, Aditya Karnik, Yadati Narahari

Optimizing Kidney Exchange with Transplant Chains: Theory and Reality
John Dickerson, Ariel Procaccia, Tuomas Sandholm
SESSION 4E – GAME THEORY IV

Task Routing for Prediction Tasks ................................................................. 824
Haoqi Zhang, Eric Horvitz, Yiling Chen, David Parkes

Mastering Multi-player Games ............................................................... 832
Yossi Azar, Uriel Feige, Michal Feldman, Moshe Tennenholtz

Game-theoretic Resource Allocation for Malicious Packet Detection in Computer Networks .......................... 840
Ondrej Vanek, Zhengyu Yin, Manish Jain, Branislav Boškanský, Milind Tambe, Michal Pechoucek

Sustaining Cooperation on Networks: An Analytical Study based on Evolutionary Game Theory ............. 848
Raghunandan Ananthasayanam, Subramanian Chandrasekarapuram

Behavioral Game Theoretic Models: A Bayesian Framework For Parameter Analysis .......................... 856
James Wright, Kevin Leyton-Brown

SESSION 4F – LOGICS FOR AGENCY

Action Models for Knowledge and Awareness ........................................ 864
Hans Van Ditmarsch, Tim French, Fernando R. Velázquez-Quesada

Epistemic Coalition Logic: Completeness and Complexity ........................................ 872
Thomas Agotnes, Natasha Alechina

Group Synthesis for Parametric Temporal-Epistemic Logic .......................... 880
Andrew Jones, Michal Knapik, Alessio Lomuscio, Wojciech Penczek

A Logic of Revelation and Concealment ................................................... 888
Wiebe Van Der Hoek, Petar Iliev, Michael Wooldridge

State and Path Coalition Effectivity Models for Logics of Multi-Player Games .......................... 896
Valentin Goranko, Wojciech Jamroga

SESSION 5A – ROBOTICS III

Active Visual Sensing and Collaboration on Mobile Robots using Hierarchical POMDPs .......................... 904
Shiqi Zhang, Mohan Sridharan

What Am I Doing? Automatic Construction of an Agent's State-transition Diagram Through Introspection ......................................................... 912
Constantin Berzan, Matthias Scheutz

Learning from Demonstration with Swarm Hierarchies ......................................... 920
Keith Sullivan, Sean Luke

Autonomous Robot Dancing Driven by Beats and Emotions of Music .......................... 928
Guangyu Xia, Junyun Tay, Roger Dannenberg, Manuela Veloso

SESSION 5B – TEAMWORK II

Leading Ad Hoc Agents in Joint Action Settings with Multiple Teammates ........................................... 936
Noa Agmon, Peter Stone

Comparative Evaluation of MAL Algorithms in a Diverse Set of Ad Hoc Team Problems .......................... 944
Stefano Albrecht, Subramanian Ramamoorthy

An Analysis Framework for Ad Hoc Teamwork Tasks ........................................ 952
Samuel Barrett, Peter Stone

Modeling and Learning Synergy for Team Formation with Heterogeneous Agents .......................... 960
Somchaya Liemhetcharat, Manuela Veloso

SESSION 5C – EMERGENCE

Crowd IQ - Aggregating Opinions to Boost Performance ........................................ 968
Yoram Bachrach, Thore Graepel, Gjergji Kasneci, Michal Kosinski, Jurgen Van-Gael

Efficient Opinion Sharing in Large Decentralised Teams ........................................ 976
Oleksandr Pryymak, Alex Rogers, Nick Jennings
Agents of Influence in Social Networks ................................................................. 984
    Amer Ghanem, Srinivasa Vedanarayanan, Ali Minai

The Emergence of Commitments and Cooperation .............................................. 992
    The Anh Han, Luis Montez Pereira, Francisco C. Santos

SESSION 5D – AUCTION & MECHANISM DESIGN

Mixed-bundling Auctions with Reserve Prices .................................................. 1000
    Pingzhong Tang, Tuomas Sandholm

Eliciting Forecasts from Self-interested Experts: Scoring Rules for Decision Makers .................. 1008
    Craig Boutilier

Worst-Case Optimal Redistribution of VCG Payments in Heterogeneous-Item Auctions with Unit Demand .................................................. 1016
    Mingyu Guo

False-name-proofness in Online Mechanisms .................................................... 1024
    Taiki Todo, Takayuki Mouri, Atsushi Iwasaki, Makoto Yokoo

SESSION 5E – GAME & AGENT THEORIES

Scaling Simulation-Based Game Analysis through Deviation-Preserving Reduction .......... 1032
    Bryce Wiedenbeck, Michael Wellman

Towards Tractable Boolean Games ................................................................. 1040
    Paul Dunne, Michael Wooldridge

A Framework for Modeling Population Strategies by Depth of Reasoning ................. 1048
    Michael Wunder, Michael Kaisers, John Robert Yaros, Michael Littman

Detection of Suspicious Behavior from a Sparse Set of Multiagent Interactions .............. 1056
    Boštjan Kaluža, Gal Kaminka, Milind Tambe

SESSION 5F – LOGIC AND VERIFICATION

A Logic of Emotions: from Appraisal to Coping .............................................. 1064
    Mehdi Dastani, Emiliano Lorini

Automatic Verification of Epistemic Specifications under Convergent Equational Theories ........ 1072
    Ioana Boureanu, Andrew Jones, Alessio Lomuscio

Semantics and Verification of Information-Based Protocols .................................. 1080
    Munindar Singh

Author Index