Ioannis Panageas ipanagea@ics.uci.edu Website: https://panageas.github.io

GOOGLE SCHOLAR *https://scholar.google.com.sg/citations?user=5NiFWuwAAAAJ&hl=en&oi=ao*

POSITIONS

University of California, Irvine, USA
Fall 2020 - Present

Assistant Professor, Department of Computer Science

Archimedes Research Unit
January 2022 - Present

Lead Researcher

Singapore University of Technology and Design (SUTD), Singapore
Fall 2018 - Fall 2020

Assistant Professor, Information Systems Technology and Design Pillar

POSTDOC

Massachusetts Institute of Technology, Cambridge, MA, USA
Fall 2017 - Fall 2018

Postdoctoral researcher
Mentor: Constantinos Daskalakis

Singapore University of Technology and Design (SUTD), Singapore
Fall 2016 - Summer 2017

Postdoctoral researcher

VISITING RESEARCHER

Simons Institute, UC Berkeley
Learning and Games: January-March 2022.

EDUCATION

Georgia Institute of Technology, Atlanta, GA, USA
August 2011 - 5th August 2016

- PhD in Algorithms Combinatorics and Optimization (ACO)
  Dissertation Title: Evolutionary Markov Chains, Potential Games and Optimization Under the Lens of Dynamical Systems.
  Advisor: Prasad Tetali
- Master of Sciences in Mathematics

University of Athens, Athens, Greece
Fall 2010 - Fall 2011

- Master of Sciences in Logic, Algorithms & Computation

National Technical University of Athens, Athens, Greece
October 2005 - November 2010

- Diploma, Electrical and Computer Engineering (GPA: 9.54/10)
  Major: Computer Science, Minor: Mathematics, Networks

Research Interests

Theory of computation, machine learning and its interface with multi-agent Reinforcement Learning and game theory, optimization, dynamical systems, probability and statistics.

Academic Service

Area Chair for ICLR 2024, 2025, ICML 2024, 2025, NeurIPS 2024, 2025, AISTATS 2024, 2025.
Senior Committee Member for EC 2025, AAAI 2025 and FOCS 2024. Committee Member for EC 2019-2023, WINE 2021, 2023, 2024.
Organiser of EC 2023 and 2024 Mentoring Workshop.

Accepted Publications

1. *Convergence to Equilibrium of No-regret Dynamics in Congestion Games.* Volkan Cevher et al. Conference on Web and Internet Economics (**WINE**) 2024.

2. *Time-Efficient Algorithms for Nash-Bargaining-Based Matching Market Models.* with Thorben Trobst and Vijay Vazirani. Conference on Web and Internet Economics (**WINE**) 2024.

3. *Learning Equilibria in Adversarial Team Markov Games: A Nonconvex-Hidden-Concave Min-Max Optimization Problem.* with Fivos Kalogiannis and Jingming Yan. Conference on Neural Information Processing Systems (**NeurIPS**) 2024.

4. *The Computational Complexity of Finding Second-Order Stationary Points.*
with Andreas Kontogiannis, Vasilis Pollatos, Sotiris Kanellopoulos, Panayotis Mertikopoulos and Aris Pagourtzis.
International Conference on Machine Learning (**ICML**) 2024.

5. *Last-iterate Convergence Separation between Extra-gradient and Optimism in Constrained Periodic Games.*
with Yi Feng, Ping Li and Xiao Wang.
Conference on Uncertainty in Artificial Intelligence (**UAI**) 2024.

6. *Learning Nash equilibria in Rank-1 games: Going beyond the Minty Property.*
with Nikolas Patris.
International conference on learning representations (**ICLR**) 2024.

7. *Beating Price of Anarchy and Gradient Descent without Regret in Potential Games.*
with Iosif Sakos, Stefanos Leonardos, Stelios Stavroulakis, Will Overman and Georgios Piliouras.
International conference on learning representations (**ICLR**) 2024.

8. *Optimistic Policy Gradient in Multi-Player Markov Games with a Single Controller: Convergence Beyond the Minty Property.*
with Ioannis Anagnostides, Gabriele Farina and Tuomas Sandholm.
Conference on Artificial Intelligence (**AAAI**) 2024.

9. *Computing Nash Equilibria in Potential Games with Private Uncoupled Constraints,* with Nikolas Patris, Stelios Stavroulakis, Fivos Kalogiannis and Rose Zhang. Conference on Artificial Intelligence (**AAAI**) 2024.

10. *Exponential Lower Bounds for Fictitious Play in Potential Games.*
with Nikolas Patris, Stratis Skoulakis and Volkan Cevher.
Conference on Neural Information Processing Systems (**NeurIPS**) 2023.

11. *Zero-sum Polymatrix Markov Games: Equilibrium Collapse and Efficient Computation of Nash Equilibria,* with Fivos Kalogiannis.
Conference on Neural Information Processing Systems (**NeurIPS**) 2023.

12. *On the Last-iterate Convergence in Time-varying Zero-sum Games: Extra Gradient Succeeds where Optimism Fails.*
with Yi Feng, Hu Fu, Qun Hu, Ping Li, Bo Peng and Xiao Wang.
Conference on Neural Information Processing Systems (**NeurIPS**) 2023.

13. *On the Convergence of No-Regret Learning Dynamics in Time-Varying Games.*
with Ioannis Anagnostides, Gabriel Farina and Tuomas Sandholm.
Conference on Neural Information Processing Systems (**NeurIPS**) 2023.

14. *Algorithms and Complexity for Computing Nash Equilibria in Adversarial Team Games,* with I. Anagnostides, F. Kalogiannis, M. Vlatakis and S. McAleer.
In Conference on Economics and Computation (**EC**) 2023.

15. *Semi Bandit dynamics in Congestion Games: Convergence to Nash Equilibrium and No-Regret Guarantees.*
with Stratis Skoulakis, Luca Viano, Xiao Wang and Volkan Cevher.
International Conference on Machine Learning (**ICML**) 2023, **oral**.

16. *Efficiently Computing Nash Equilibria in Adversarial Team Markov Games.*
with Fivos Kalogiannis, Ioannis Anagnostides, Manolis Vlatakis, Vaggos Chatziafratis and Stelios Stavroulakis.
International conference on learning representations (**ICLR**) 2023, **oral**.

17. *Towards convergence to Nash equilibria in two-team zero-sum games.*
with Fivos Kalogiannis and Manolis Vlatakis.
International conference on learning representations (**ICLR**) 2023.

18. *Mean estimation of truncated mixtures of two Gaussians: A gradient based approach,* with Sai Ganesh Nagarajan, Gerasimos Palaiopanos, Tushar Vaidya and Samson Yu. Conference on Artificial Intelligence (**AAAI**) 2023.

19. *On Scrambling Phenomena for Randomly Initialized Recurrent Networks* with Vaggos Chatziafratis, Clayton Sanford and Stelios Stavroulakis.
Conference on Neural Information Processing Systems (**NeurIPS**) 2022.

20. *Optimistic Mirror Descent Either Converges to Nash or to Strong Coarse Correlated Equilibria in Bimatrix Games* with Ioannis Anagnostides, Gabriele Farina and Tuomas Sandholm.
Conference on Neural Information Processing Systems (**NeurIPS**) 2022.

21. *On Last-Iterate Convergence Beyond Zero-Sum Games.*
with Ioannis Anagnostides, Gabriel Farina and Tuomas Sandholm.
International Conference on Machine Learning (**ICML**) 2022.

22. *Global Convergence of Multi-Agent Policy Gradient in Markov Potential Games.*
with S. Leonardos, W. Overman and G. Piliouras.
International conference on learning representations (**ICLR**) 2022.

23. *Accelerated Multiplicative Weights Update Avoids Saddle Points almost always.*
with Yi Feng and Xiao Wang.
International Joint Conference on Artificial Intelligence (**IJCAI**) 2022.

24. *Independent Natural Policy Gradient Always Converges in Markov Potential Games.*
with Roy Fox, Stephen McAleer and Will Overman.
International Conference on Artificial Intelligence and Statistics (**AISTATS**) 2022.

25. *Frequency-Domain Representation of First-Order Methods: A Simple and Robust Framework of Analysis,* with Ioannis Anagnostides.
Symposium on Simplicity in Algorithms (**SOSA**) 2022.

26. *Last Iterate Convergence in No-regret Learning: Constrained Min-max Optimization for Convex-concave Landscapes.*
with Qi Lei, Sai Ganesh Nagarajan and Xiao Wang.
International Conference on Artificial Intelligence and Statistics (**AISTATS**) 2021.

27. *Efficient Statistics for Sparse Graphical Models from Truncated Samples.*
with Arnab Bhattacharyya, Rathin Desai and Sai Ganesh Nagarajan.
International Conference on Artificial Intelligence and Statistics (**AISTATS**) 2021.

28. *Fast Convergence of Langevin Dynamics on Manifold: Geodesics meet Log-Sobolev.*
with Qi Lei and Xiao Wang.
Conference on Neural Information Processing Systems (**NeurIPS**) 2020.

29. *Better Depth-Width Trade-offs for Neural Networks through the lens of Dynamical Systems,* with Vaggos Chatziafratis and Sai Ganesh Nagarajan.
International Conference on Machine Learning (**ICML**) 2020.

30. *Logistic regression with group effects via inference in higher order Ising models.*
with Costis Daskalakis and Nishanth Dikkala.
International Conference on Artificial Intelligence and Statistics (**AISTATS**) 2020.

31. *Depth-Width Trade-offs for ReLU Networks via Sharkovsky's Theorem.*
with Vaggos Chatziafratis, Sai Ganesh Nagarajan and Xiao Wang.
International conference on learning representations (**ICLR**) 2020, **spotlight**.

32. *On the Analysis of EM for truncated mixtures of two Gaussians.*
with Sai Ganesh Nagarajan.
International Conference on Algorithmic Learning Theory (**ALT**) 2020.

33. *First-order methods Almost Always Avoid Saddle Points: The case of Vanishing Step-sizes,* with Xiao Wang and Georgios Piliouras.
Conference on Neural Information Processing Systems (**NeurIPS**) 2019.

34. *Multiplicative Weights Updates as a distributed constrained optimization algorithm: Convergence to second-order stationary points almost always.*
with Georgios Piliouras and Xiao Wang.
International Conference on Machine Learning (**ICML**) 2019.

35. *Regression from Dependent Observations.*
with Constantinos Daskalakis and Nishanth Dikkala.
51st ACM Symposium on Theory of Computing (**STOC**) 2019.

36. *First-order Methods Almost Surely Avoid Saddle-points.*
with Jason D. Lee, Georgios Piliouras, Max Simchowitz, Michael I. Jordan and Benjamin Recht. **Math. Programming** 2019, **special issue**.

37. *Last-Iterate Convergence: Zero-Sum Games, Constrained Min-Max Optimization.*
with Constantinos Daskalakis.
In the 10th Innovations in Theoretical Computer Science (**ITCS**) 2019.

38. *The Limit Points of (Optimistic) Gradient Descent in Min-Max Optimization.*
with Constantinos Daskalakis.
Conference on Neural Information Processing Systems (**NeurIPS**) 2018.

39. *Multiplicative Weights Update with Constant Step-Size in Congestion Games: Convergence, Limit Cycles and Chaos.* with G. Palaiopanos and G. Piliouras.
Neural Information Processing Systems (**NeurIPS**) 2017, **spotlight**.

40. *Opinion Dynamics in Networks: Convergence, Stability and Lack of Explosion.*
with Tung Mai and Vijay V. Vazirani.
In International Colloquium on Automata, Languages and Programming (**ICALP**) 2017.

41. *Rock-Paper-Scissors, Differential Games and Biological Diversity.*
with Tung Mai, Will Ratcliff, Vijay V. Vazirani and Peter Yunker.
In Conference on Economics and Computation (**EC**) 2018.

42. *Gradient Descent Converges to Minimizers: Non-Isolated Critical Points and Invariant Regions,* with Georgios Piliouras.
In Innovations in Theoretical Computer Science (**ITCS**) 2017.

43. *Mutation, Sexual Reproduction and Survival in Dynamic Environments.*
with Ruta Mehta, Georgios Piliouras, Prasad Tetali and Vijay Vazirani.
In Innovations in Theoretical Computer Science (**ITCS**) 2017.

44. *The Computational Complexity of Genetic Diversity.*
with Ruta Mehta, Georgios Piliouras and Sadra Yazdanbod.
In European Symposia on Algorithms (**ESA**) 2016.

45. *Average Case Performance of Replicator Dynamics in Potential Games via Computing Regions of Attraction,* with Georgios Piliouras.
In Conference on Economics and Computation (**EC**) 2016.

46. *Mixing time of markov chains, dynamical systems and evolution.*
with Nisheeth K. Vishnoi.
In International Colloquium on Automata, Languages and Programming (**ICALP**) 2016

47. *Evolutionary Dynamics in finite populations mix rapidly.*
with Piyush Srivastava and Nisheeth K. Vishnoi.
In Symposium on Discrete Algorithms (**SODA**) 2016.

48. *Natural Selection as an Inhibitor of Genetic Diversity: Multiplicative Weights Updates Algorithm and a Conjecture of Haploid Genetics.*
with Ruta Mehta and Georgios Piliouras.
In Innovations in Theoretical Computer Science (**ITCS**) 2015.

49. *Support-theoretic subgraph preconditioners for large-scale SLAM.*
with Yong-Dian Jian, Doru Balcan, Prasad Tetali and Frank Dalleart.
In International Conference on Intelligent Robots and Systems (**IROS**) 2013.

Teaching

- "Introduction to Algorithmic Game Theory", Fall 2021 - 2024.
`https://panageas.github.io/agt2024.html`
- "Design and Analysis of Algorithms", Spring 2022 - 2024.
`https://panageas.github.io/algo2024.html`
- "Optimization for Machine Learning", Spring 2020, 2021.
`https://panageas.github.io/optml2021/`

Students and Postdocs

PhD student Nikolas Patris (2022-Present)
PhD student Stelios Stavroulakis (2022-Present)
PhD student Jingming Yan (2023-Present)
PhD student Rohan Chauhan (2024-Present)

PhD student Parnian Shahkar (2022-Present)
PhD student Andreas Kontogiannis (2023-Present, co-advised with A. Pagourtzis)
PhD student Vasilis Pollatos (2023-Present, co-advised with Panagiotis Mertikopoulos)
PhD student Sai Ganesh Nagarajan (Graduated in 2021)
MS student Will Overman (Graduated in 2022)
MS student Foivos Kalogiannis (Graduated in 2024)
Postdoc Xiao Wang (2019-2020)

Selected Recent Invited Talks

- Talk at ALGA workshop, Sardinia, June 2025
- Talk, SIAM Conference on Applications of Dynamical Systems, Denver, May 2025
- Talk at Learning Theory workshop, NTU, Singapore, April 2025
- Talk at UC Santa Cruz, March 2025
- Talk at Chinese Academy of sciences, February 2025
- EPFL-ETHZ Multi-agent RL workshop, EPFL, July 2024
- GAIMSS workshop, Metz, France, June 2024
- IOS in INFORMS 2024, Rice, TX, March 2024
- Simons Laufer Mathematical Sciences Institute, November 2023
- INFORMS at Phoenix, AZ, October 2023
- EPFL, Lions group, September 2023
- Mini-Symposium on Algorithmic Game Theory at CanaDAM, June 2023
- SIAM Conf on Optimization, June 2023
- Workshop on learning in games at NUS, Singapore, April 2023
- Simons Institute, UC Berkeley, talk in Learning and Games, May 2022
- Purdue CS theory seminar, March 2022
- UC Santa Barbara, CS theory seminar, November 2021
- USC CS Colloquium, March 2020
- MIFODS workshop, MIT, January 2020
- UCL, Dynamical Systems workshop, February 2019

Selected Honors and Awards

- 400K USD, NSF grant from AF, CCF.
- 2 Million USD NRF fellowship for AI (2019-2020) while in SUTD.
- MIT-SUTD Postdoc Fellowship (2016-2018).
- ARC fellowship (2013-2014).
- Onassis fellowship (2011).