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

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

Assistant Professor, Information Systems Technology and Design Pillar

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

  Major: Computer Science, Minor: Mathematics, Networks

RESEARCH INTERESTS

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

Academic Service

Committee Member for EC, 2019-2023, WINE 2019, 2021, AAAI 2020, NeurIPS 2019, ICML 2019.

Reviewer for
Conferences: ICALP, SODA, FOCS, STOC, AISTATS, ICLR, ICML, NeurIPS, COLT, NeurIPS, ICML, ICLR.
Journals: Mathematical Reviews (AMS), Games and Economic Behavior, IEEE Transactions on Information Theory, Math Programming, JACM.

Selected Publications

1. *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**.

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

3. *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.

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

5. *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.

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

7. *Global Convergence of Multi-Agent Policy Gradient in Markov Potential Games.*
with S. Leonardos, W. Overman and G. Piliouras. (**ICLR**) 2022.

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

9. *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.

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

11. *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.

12. *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.

13. *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.

14. *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.

15. *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.

16. *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**.

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

18. *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.

19. *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.

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

21. *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**.

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

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

24. *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**.

25. *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.

26. *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.

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

28. *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.

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

30. *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.

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

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

33. *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.

34. *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, Fall 2022.
`https://panageas.github.io/agt2022/`
- "Design and Analysis of Algorithms", Spring 2022.
`https://panageas.github.io/algo2022/`
- "Optimization for Machine Learning", Spring 2020, 2021.
`https://panageas.github.io/optml2021/`

Students and Postdocs

PhD student Foivos Kalogiannis (2022-Present)
PhD student Nikolas Patris (2022-Present)
PhD student Stelios Stavroulakis (2022-Present)
PhD student Sai Ganesh Nagarajan (Graduated in 2021)
Msc student Will Overman (Graduated in 2022)
Postdoc Xiao Wang (2019-2020)

Honors and Awards

- 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).
- Ranked $18^{\text{th}}, 17^{\text{th}}$ (top 25) in IEEE xtreme programming contest among 1000/700 teams, (2009/2010).
- Third Prize in IMC (2008).
- Silver Medal in SEEMOUS (2007).
- Papakyriakopoulos Award for excellence in Mathematics (GPA 10/10) (2006, 2007).
- Bronze medal in Balkan Olympiad in Informatics (2005).
- Participation in International Mathematical Olympiad (IMO) (2005).
- Participation in International Olympiad in Informatics (IOI) (2004, 2005).

Invited Talks

- Mini-Symposium on Algorithmic Game Theory at CanaDAM, June 2023
- SIAM Conf on Optimization, June 2023
- 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
- UCI AI/ML seminar series, March 2020
- MIFODS workshop, MIT, January 2020
- NUS theory group, Singapore, November 2019
- Simons Institute, UC Berkeley, talk in Deep Learning Workshop, May 2019
- UCL, Dynamical Systems workshop, February 2019
- Cornell, Ithaca, June 2018
- Northwestern Program on Econometrics, Evanston, April 2018
- CS theory seminar, UC Irvine, California, April 2018
- CS theory seminar, Ohio State, February 2018
- Seminar on Stochastic Processes, UVA, Virginia, March 2017
- Simons Institute, Berkeley, January 2017
- SUTD Brainlab, Singapore, November 2016
- IMA workshop on Graphical Models, University of Minnesota, May 2015
- Weizmann Institute of Science, Israel, January 2015
- ACO seminar, Georgia Institute of Technology, September 2014