Ioannis Panageas

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Positions

University of California, Irvine, USA
Winter 2021 - Present

Assistant Professor, School of Information and Computer Sciences

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

Postdoctoral researcher

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 (Top 1%) (*with highest honors*)

- Major: Computer Science, Minor: Mathematics, Networks

Research Interests

Theory of computation and its interface with optimization, dynamical systems, probability and statistics, machine learning and their applications to game theory, evolution and dynamics on networks.

Academic Service

Committee Member for EC 2020, AAAI 2020, NeurIPS 2019, ICML 2019, EC 2019, WINE 2019.
Reviewer for
Conferences: COLT, IJCAI, FSTTCS, ISIT, ICALP, SODA, FOCS, STOC.
Journals: Mathematical Reivews (AMS), Games and Economic Behavior, IEEE Transactions on Information Theory, Math Programming.

Accepted Publications

1. *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.

2. *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.

3. *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.

4. *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**.

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

6. *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.

7. *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.

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

9. *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**.

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

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

12. *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.

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

14. *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.

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

16. *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.

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

18. *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.

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

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

21. *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.

22. *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.

Manuscripts

1. *Convergence to Second-Order Stationarity for Non-negative Matrix Factorization: Provably and Concurrently .*
with Stratis Skoulakis, Antonis Varvitsiotis and Xiao Wang.
`https://arxiv.org/abs/2002.11323`

2. *Last Iterate Convergence in No-regret Learning: Constrained Min-max Optimization for Convex-concave Landscapes.*
with Qi Lei, Sai Ganesh Nagarajan and Xiao Wang.
`https://arxiv.org/abs/2002.06768`

3. *Efficient Statistics for Sparse Graphical Models from Truncated Samples.*
with Arnab Bhattacharyya, Rathin Desai and Sai Ganesh Nagarajan.
`https://arxiv.org/abs/2006.09735`.

Invited Talks

- 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, 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

Teaching

- CS 295, Spring 2021
- Optimization for Machine Learning, Graduate Class, Spring 2020.
  `https://panageas.github.io/optimizationforML/`
- Introduction to Algorithms, Undergrad Class, Fall 2019.
- Introduction to Algorithms, Undergrad Class, Fall 2018.

Honors and Awards

- NRF fellowship for AI.
- MIT-SUTD Postdoc Fellowship.
- ARC fellowship Fall 2014.
- ARC fellowship Spring 2013.
- Onassis fellowship Fall 2011.
- My team (3 members) 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) 2005-07.
- Bronze medal in Balkan Olympiad in Informatics 2005.
- Member of the National Mathematical Team, 2001, 2004, 2005.
- Member of the National Team in Informatics, 2004, 2005.

Students and Postdocs

Postdoc Xiao Wang
`https://xiiaowang.github.io/`
PhD student Sai Ganesh Nagarajan
`https://sites.google.com/view/sgnagarajan/home`