Aldo Pacchiano

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Research Interests

Online learning, reinforcement learning and algorithmic fairness.

Education

2016-2021 **University of California Berkeley**, *Ph.D in Computer Science.*
- Thesis: Model Selection for Contextual Bandits and Reinforcement Learning.
- Advisors: Peter Bartlett and Michael Jordan.

2015 **Princeton University**, *Ph.D Student in Operations Research and Financial Enginering.*
Transferred to UC Berkeley.

2013-2014 **Massachusetts Institute of Technology**, *MEng in Electrical Engineering and Computer Science.*
- Thesis: Trace Reconstruction Problem.
- Advisor: Constantinos Daskalakis.

2012-2013 **University of Cambridge**, *MASt in Mathematics.*
- Essay: Mixing Time of Random Transpositions.
- Examiner: Nathanael Berestycki.

2008-2012 **Massachusetts Institute of Technology**, *B.S. in Mathematics and in Computer Science and Engineering.*

Research Work Experience

2021- **Postdoctoral Researcher**, *Microsoft Research, New York, NY, USA.*

2019-2021 **Visiting Researcher**, *Facebook AI Research, Menlo Park, CA, USA.*
- Mentors: Jakob Foerster and Mohammad Ghavamzadeh.

05-08/2020 **Research Intern**, *Microsoft Research, New York, NY, USA.*
- Mentors: Miroslav Dudik and Robert Schapire.

05-08/2019 **Research Intern**, *Google Research, New York, NY, USA.*
- Mentor: Ariel Kleiner.

2018-2019 **Research Intern**, *Deepmind, London, UK.*
- Mentor: William Dabney.

05-08/2019 **Research Intern**, *Google Brain, New York, NY, USA.*
- Mentor: Krzysztof Choromanski.

Fellowships and Awards

2021 **Funded BAIR Commons Partnership**, *Facebook AI Research and Berkeley Artificial Intelligence Research Lab (BAIR).*
- Project: *"Mitigating Emergent Biases in Online Learning"*.

2020 **Funded BAIR Commons Partnership**, *Google and Berkeley Artificial Intelligence Research Lab (BAIR).*
- Project: *"LP-based Algorithms for Reinforcement Learning"*.

2019-2020 **Funded BAIR Commons Partnership**, *Facebook AI Research and Berkeley Artificial Intelligence Research Lab (BAIR).*
- Project: *"Stochastic Bandits with Linear Constraints"*.

2016-2019 **BAIR Huawei Fellowship**, *Berkeley Artificial Intelligence Research Lab.*

Press

2020 **Venture Beat**, *"Researchers develop technique to increase sample efficiency in reinforcement learning".*

Submissions and Preprints

** Indicates co-first authorship.*

1. A. Gupta*, T. Moskovitz, D. Alvarez-Melis, **A. Pacchiano**. (2022). Transfer Reinforcement Learning via the Undo Maps Formalism. *arXiv preprint.*

2. J. Lee, W. Kong, **A. Pacchiano**, V. Muthukumar, E. Brunskill. (2022). Estimating Optimal Policy Value in General Linear Contextual Bandits. *Working paper.*

3. A. Wagenmaker, **A. Pacchiano** (2022). Leveraging Offline Data in Online Reinforcement Learning. *arXiv preprint.*

4. **A. Pacchiano**, O. Nachum, N. Tripuraneni, P. Bartlett (2022). Joint Representation Training in Sequential Tasks with Shared Structure. *arXiv preprint.* Under review at *Transactions of Machine Learning Research (TMLR).*

5. **A. Pacchiano**, A. Saha, J. Lee (2022). Dueling RL: Reinforcement Learning with Trajectory Preferences. *arXiv preprint.* Under review at *International Conference on Artificial Intelligence and Statistics (AISTATS) 2023.*

6. **A. Pacchiano**, P. Bartlett, M. Jordan (2022). An Instance-Dependent Analysis for the Cooperative Multi-Player Multi-Armed Bandit. *arXiv preprint.* Under review at *Algorithmic Learning Theory (ALT) 2023.*

7. **A. Pacchiano**, D. Wulsin, R. Barton, L. Voloch (2022). Neural Design for Genetic Perturbation Experiments. *arXiv preprint.* Under review at *International Conference on Learning Representations (ICLR) 2023.*

8. E. Gal, S. Singh, **A. Pacchiano**, B. Walker, T. Lyons, J. Foerster (2022). Unbiased Decisions Reduce Regret: Adversarial Optimism for the Bank Loan Problem. Under review at *International Conference on Learning Representations (ICLR) 2023.*

9. J. Chan*, **A. Pacchiano***, N. Tripuraneni*, Y. Song, P. Bartlett, M. Jordan (2021). Parallelizing Contextual Linear Bandits. *arXiv preprint.*

10. **A. Pacchiano**, C. Dann, C. Gentile, P. Bartlett (2021). Regret Bound Balancing and Elimination for Model Selection in Bandits and RL. *arXiv preprint.*

11. S. Chiappa*, **A. Pacchiano*** (2020). Fairness with Continuous Optimal Transport. *arXiv preprint.* Journal submission under review at *Machine Learning.*

Publications

** Indicates co-first authorship. The fields I publish are conference-driven.*

1. **A. Pacchiano**, C. Dann, C. Gentile (2022). Best of Both Worlds Model Selection. In: *Advances in Neural Information Processing Systems (NeurIPS).* (Acceptance rate: 25.6%.)

2. J. Parker-Holder*, Y. Xu*, P. Ball*, **A. Pacchiano***, O. Rybkin, S. Roberts, T. Rocktäschel, E. Grefenstette (2022). Learning World Models in a Handful of Reward Free Deployments. In: *Advances in Neural Information Processing Systems (NeurIPS).*(Acceptance rate: 25.6%.)

3. A. Gupta*, **A. Pacchiano***, Y. Zhai, S. Kakade, S. Levine (2022). Unpacking Reward Shaping: Understanding the Benefits of Reward Engineering on Sample Complexity. In: *Advances in Neural Information Processing Systems (NeurIPS).* (Acceptance rate: 25.6%.)

4. T. Lin*, **A. Pacchiano***, Y. Yu*, M. Jordan (2022). Online Nonsubmodular Minimization with Delayed Costs: From Full Information to Bandit Feedback. In: *International Conference on Machine Learning (ICML).* (Acceptance rate: 21.9%. *Spotlight paper, acceptance rate 2%.*)

5. R Müller, **A Pacchiano** (2022). Meta Learning MDPs with linear transition models. In: *International Conference on Artificial Intelligence and Statistics (AISTATS).* (Acceptance rate: 29%.)

6. T. Moskovitz, M. Arbel, J. Parker-Holder, **A. Pacchiano** (2022). Towards an Understanding of Default Policies in Multitask Policy Optimization. In: *International Conference on Artificial Intelligence and Statistics (AISTATS).* (Acceptance rate: 29%. *Oral presentation. One of 4 papers out of 1685 submissions nominated for best paper award.*)

7. **A. Pacchiano***, S. Singh*, E. Chou, A. Berg, J. Foerster (2021). Neural Pseudo-Label Optimism for the Bank Loan Problem. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate: 26%.)

8. M. Papini, A. Trinzioni, **A. Pacchiano**, M. Restelli, A. Lazaric, M. Pirotta (2021). Reinforcement Learning in Linear MDPs: Constant Regret and Representation Selection. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate: 26%.)

9. N. Chatterji*, **A. Pacchiano***, P. Bartlett, M. Jordan (2021). On the Theory of Reinforcement Learning with Once-per-epsiode Feedback. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate: 26%.)

10. **A. Pacchiano***, J. Lee, P. Bartlett, O. Nachum (2021). Near Optimal Policy Optimization via REPS. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate: 26%.)

11. T. Moskovitz, J. Parker-Holder, **A. Pacchiano**, M. Arbel, M. Jordan (2021). Tactical Optimism and Pessimism for Deep Reinforcement Learning. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate: 26%.)

12. **A. Pacchiano**, P. Ball, J. Parker-Holder, K. Choromanski, S. Roberts (2021). Towards Tractable Optimism in Model-Based Reinforcement Learning. In: *Uncertainty in Artificial Intelligence (UAI)*. (Acceptance rate: 26.3%.)

13. A. Cutkosky*, C. Dann*, A. Das*, C. Gentile*, **A. Pacchiano***, M. Purohit* (2021). Dyanamic Balancing for Model Selection in Bandits and RL. In: *International Conference on Machine Learning (ICML)*. (Acceptance rate: 21.5%. *Spotlight paper, acceptance rate 3%.*)

14. D. Malik, **A. Pacchiano**, V. Srinivasan, Y. Li (2021). Sample Efficient Reinforcement Learning in Continuous State Spaces: A Perspective Beyond Linearity. In: *International Conference on Machine Learning (ICML)*. (Acceptance rate: 21.5%. *Spotlight paper, acceptance rate 3%.*)

15. **A. Pacchiano**, H. Jiang, M. Jordan (2021). Robustness Guarantees for Mode Estimation with an Application to Bandits. In: *Conference on Artificial Intelligence (AAAI)*. (Acceptance rate: 21%.)

16. J. Lee, **A. Pacchiano**, V. Muthukumar, W. Kong, E. Brunskill (2021). Online Model Selection for Reinforcement Learning with Function Approximation. In: *International Conference on Artificial Intelligence and Statistics (AISTATS)*. (Acceptance rate: 29.8%.)

17. **A. Pacchiano**, M. Ghavamzadeh, P. Bartlett, H. Jiang (2021). Stochastic Bandits with Linear Constraints. In: *International Conference on Artificial Intelligence and Statistics (AISTATS)*. (Acceptance rate 29.8%.)

18. H. Jiang*, Q. Jiang*, **A. Pacchiano*** (2021). Learning the Truth from Only One Side of the Story. In: *International Conference on Artificial Intelligence and Statistics (AISTATS)*. (Acceptance rate 29.8%.)

19. J. Parker-Holder, L. Metz, C. Resnick, H. Hu, A. Lerer, A. Letcher, A. Peysakhovich, **A. Pacchiano**, J. Foerster (2020). Ridge Rider: Finding Diverse Solutions by Following Eigenvalues of the Hessian. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate 20%.)

20. **A. Pacchiano***, M. Phan*, Y. Abassi-Yadkori, A. Rao, J. Zimmert, T. Lattimore, C. Szepesvari (2020). Model Selection in Contextual Stochastic Bandit Problems. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate 20%.)

21. **A. Pacchiano**, J. Parker-Holder, K. Choromanski, S. Roberts (2020). Effective Diversity in Population Based Reinforcement Learning. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate 20%. *Spotlight presentation, acceptance rate 2.9%.*)

22. X. Song, W. Gao, Y. Yang, K. Choromanski, **A. Pacchiano**, Y. Tang (2020). ES-MAML: Simple Hessian-free Meta Learning. In: *International Conference on Learning Representations (ICLR)*. (Acceptance rate 26.5%.)

23. K. Choromanski*, **A. Pacchiano***, J. Parker-Holder*, Y. Tang, D. Jain, Y. Yang, A. Iscen, J. Hsu, V. Sindwani (2020). Probably Robust Blackbox Optimization for Reinforcement Learning. In: *Conference on Robot Learning (CoRL)*. (Acceptance rate 34.7%.)

24. E. Mazumdar*, **A. Pacchiano***, Y. Ma, M. Jordan, P. Bartlett (2020). On Approximate Thompson Sampling with Langevin Algorithms. In: *International Conference on Machine Learning (ICML)*. (Acceptance rate 21.8%.)

25. J. Lee, **A. Pacchiano**, P. Bartlett, M. Jordan (2020). Accelerated Message Passing for Entropy-regularized MAP inference. In: *International Conference on Machine Learning (ICML)*. (Acceptance rate 21.8%.)

26. **A. Pacchiano***, J. Parker-Holder*, Y. Tang*, K. Choromanski, A. Choromanska, M. Jordan (2020). Learning to Score Behaviors for Guided Policy Optimization. In: *International Conference on Machine Learning (ICML)*. (Acceptance rate 21.8%.)

27. K. Choromanski, D. Cheikhi, J. Davis, V. Likhosherstov, A. Nazaret, A. Bahamou, X. Song, M. Akarte, J. Parker-Holder, J. Bergquist, Y. Gao, **A. Pacchiano**, T. Sarlos, A. Weller, V. Sindhwani (2020). Stochastic Flows and Geometric Optimization on the Orthogonal Group. In: *International Conference on Machine Learning (ICML)*. (Acceptance rate 21.8%.)

28. P. Ball, J. Parker-Holder, **A. Pacchiano**, K. Choromanski, S. Roberts (2020). Ready Policy One: World Building Through Active Learning. In: *International Conference on Machine Learning (ICML)*. (Acceptance rate 21.8%.)

29. J. Lee*, **A. Pacchiano***, M. Jordan (2020). Convergence Rates of Smooth Message Passing with Rounding in Entropy Regularized MAP Inference. In: *International Conference on Artificial Intelligence and Statistics (AISTATS)*. (Acceptance rate 30%.)

30. K. Choromanski*, **A. Pacchiano***, J. Parker-Holder*, Y. Tang* (2020). Practical Nonisotropic Monte Carlo Sampling in High Dimensions via Determinantal Point Processes. In: *International Conference on Artificial Intelligence and Statistics (AISTATS)*. (Acceptance rate 30%.)

31. S. Chiappa, R. Jiang, T. Stepleton, **A. Pacchiano**, H. Jiang, J. Aslanides (2020). A General Approach to Fairness with Optimal Transport. In: *Conference on Artificial Intelligence (AAAI)*. (Acceptance rate 20.6%.)

32. K. Choromanski*, **A. Pacchiano***, J. Parker-Holder*, Y. Tang*, V. Sindhwani (2019). From Complexity to Simplicity: Adaptive ES-Active Subspaces for Blackbox Optimization. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate 21.1%.)

33. R. Jiang*, **A. Pacchiano***, T. Stepleton, H. Jiang, S. Chiappa (2019). Wasserstein Fair Classification. In: *Uncertainty in Artificial Intelligence (UAI)*. (Acceptance rate 26%. *Oral presentation, acceptance rate 7.7%.*)

34. N. Chatterji*, **A. Pacchiano***, P. Bartlett (2019). Online Learning with Kernel Losses. In: *International Conference on Machine Learning (ICML)*. (Acceptance rate 22.6%. *Oral long talk.*).

35. **A. Pacchiano**, Y. Bachrach (2019). Computing Stable Solutions in Threshold Network Flow Games with Bounded Treewidth. In: *International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS)*. (Acceptance rate 24%.)

36. K. Choromanski, **A. Pacchiano**, J. Pennington, Y. Tang (2019). KAMA-NNs: Low-dimensional rotation based neural networks. In: *International Conference on Artificial Intelligence and Statistics (AISTATS)*. (Acceptance rate 32.4%.)

37. M. Rowland, K. Choromanski, F. Chalus, **A. Pacchiano**, T. Sarlos, R. Turner, A. Weller (2018). Geometrically Coupled Monte Carlo Sampling. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate 20.8%. *Spotlight presentation, acceptance rate 3.5%*).

38. K. Bhatia*, **A. Pacchiano***, N. Flammarion, P. Bartlett, M. Jordan (2018). Gen-Oja: A Two-time-scale Approach for Streamming CCA. In: *Advances in Neural Information Processing Systems (NeurIPS)*. (Acceptance rate 20.8%.)

39. M. Rowland, **A. Pacchiano**, A. Weller (2017). Conditions Beyond Treewidth for Tightess of Higher-Order LP Relaxations. In: *International Conference on Artificial Intelligence and Statistics (AISTATS)*. (Acceptance rate 31.7%.)

40. **A. Pacchiano**, O Williams (2015). Real Time Clustering of Time Series Using Triangular Potentials. International Conference on Artificial Intelligence and Applications (AIFU).

41. P. Etingof, S. Gong, **A. Pacchiano**, Q. Ren, T. Schedler (2012). Computational Approaches to Poisson Traces Associated to Finite Subgroups of $\mathrm{Sp}_{2n}(\mathbb{C})$. Experimental Mathematics.

Refereed Workshops without Published Proceedings

** Indicates co-first authorship.*

1. **A. Pacchiano**, D. Wulsin, R. Barton, L. Voloch (2022). Neural Design for Genetic Perturbation Experiments. In: *ReALML Workshop ICML 2022*.

2. J. Lorraine, J. Parker-Holder, P. Vicol, **A. Pacchiano**, L. Metz, T. Kachman, J. Foerster (2021). Using Bifurcations for Diversity in Differentiable Games. In: *Beyond First Order Methods Workshop ICML 2021*.

3. D. Malik, **A. Pacchiano**, V. Srinivasan, Y. Li (2021). Sample Efficient Reinforcement Learning in Continuous State Spaces: A Perspective Beyond Linearity. In: *Workshop on Reinforcement Learning Theory ICML 2021*.

4. M. Papini, A. Trinzioni, **A. Pacchiano**, M. Restelli, A. Lazaric, M. Pirotta (2021). Reinforcement Learning in Linear MDPs: Constant Regret and Representation Selection. In: *Workshop on Reinforcement Learning Theory ICML 2021*.

5. N. Chatterji*, **A. Pacchiano***, P. Bartlett, M. Jordan (2021). On the Theory of Reinforcement Learning with Once-per-epsiode Feedback. In: *Workshop on Reinforcement Learning Theory ICML 2021*. *Oral presentation*.

6. R Müller, **A Pacchiano** (2022). Meta Learning MDPs with linear transition models. In: *Workshop on Reinforcement Learning Theory ICML 2021*.

7. J. Lee, W. Kong, **A. Pacchiano**, V. Muthukumar, E. Brunskill (2021). Estimating Optimal Policy Value in Linear Contextual Bandits beyond Gaussianity. In: *Workshop on Reinforcement Learning Theory ICML 2021*.

8. J. Parker-Holder, L. Metz, C. Resnick, H. Hu, A. Lerer, A. Letcher, A. Peysakhovich, **A. Pacchiano**, J. Foerster (2020). Ridge Rider: Finding Diverse Solutions by Following Eigenvalues of the Hessian. In: *First Order Methods in ML Systems Workshop ICML 2020*. *Spotlight presentation*.

9. R. Muller, J. Parker-Holder, **A. Pacchiano** (2020). Taming the Herd: Multi-Modal Meta-Learning with a Population of Agents. In: *Workshop LifelongML ICML 2020*.

10. **A. Pacchiano***, J. Parker-Holder*, K. Choromanski, S. Roberts (2020). Effective Diversity in Population Based Reinforcement Learning. In: *Fourth Lifelong Machine Learning Workshop ICML 2020*.

11. X. Song, K, Choromanski, J. Parker-Holder, Y. Tang, W. Gao, **A. Pacchiano**, T. Sarlos, D. Jain, Y. Yang (2020). Reinforcement Learning with Chromatic Networks for Compact Architecture Search. *Workshop on Neural Architecture Search ICLR 2020*.

12. M. Abdullah*, **A. Pacchiano***, M. Draief (2018). Reinforcement Learning with Wasserstein Distance Regularisation, with Applications to Multipolicy Learning. In: *European Workshop on Reinforcement Learning*.

Public Repositories

PLOT - Neural bandits library with access to public datasets.

Patents

1. K. Choromanski, A. Pacchiano, V. Sindhwani. "Robust And Data-Efficient Blackbox Optimization". U.S. Patent 62/793,248. 2019.

Talks

On the Statistical Complexity of Batch Learning: Theory and Algorithms.

University of Oxford, AIMS Seminar, 2022.

Best of Both Worlds Model Selection.

Carnegie Mellon University, AI Seminar, 2022.

Online Model Selection: the principle of regret balancing.

Boston University, AIR Seminar, 2022.

University of Washington, 2022.

Unpacking Reward Shaping: Understanding the Benefits of Reward Engineering on Sample Complexity.

Princeton University, RL Seminar, 2022.

University College London, Gatsby Unit ML Seminar, 2022.

An Instance-Dependent Analysis for the Cooperative Multi-Player Multi-Armed Bandit.

Massachusetts Institute of Technology, 2022.

Model Selection in Stochastic Bandit Problems and RL, from CORRAL to Regret Balancing.

Microsoft Research, MSR NYC Seminar - Job Talk, 2021.

Regret Bound Balancing and Elimination for Model Selection.
Stanford University, 2020.

Learning to Score Behaviors for Guided Policy Optimization.
Massachusetts Institute of Technology, 2020 (link).

Teaching Assistantships

2016 **Introduction to Artificial Intelligence**, *University of California Berkeley.*

2016 **Introduction to Machine Learning**, *University of California Berkeley.*

2014 **Introduction to Inference**, *Massachusetts Institute of Technology.*

2013 **Theory of Computation**, *Massachusetts Institute of Technology.*

Professional Activities and Service

Reviewer NeurIPS (2019 - 2021), NeurIPS 2022 (*top reviewer*), ICML (2019-2022), L4DC 2020, ICLR (2021), AISTATS (2020-2022), TMLR,TPAMI.

Area Chair AISTATS 2023.

Organizer TTIC Summer Workshop 2022 "New Models in Online Decision Making for Real-World Applications".

≈ 100 attendees from US and international institutions.

Oranizer RIIAA 2018 (student-run AI conference in Mexico City).

Other Publications and Texts

2016 **La Unión de Morelos**, *Triángulos y voces, reflexiones sobre inteligencia Artificial*, *Newspaper Article.*

Newspaper article discussing the future of AI research in Spanish. Published in Mexican newspaper 'La Unión de Morelos'.

2014 **Los Hijos de la Malinche**, *El Vandam, Nosotros y Ellos, La Otra Costa*, *Short Stories.*

Short stories published in Mexican literary magazine 'Los Hijos de la Malinche'.

- **Copyrighted Literary Texts**, *Al otro lado del río, Cuestión de Ser, La cúpula de hielo*, *Novels*
- **Literary Wesbsite**, *Short stories and other texts.*

Other Work Experience

2014-2015 **Associate**, *Goldman Sachs, London, UK.*

05-08/2014 **Intern**, *Knight Capital Group, New York, NY, USA.*

2012-2013 **Intern**, *Jump Trading, London, UK.*

05-08/2011 **Intern**, *Facebook Inc, Palo Alto, CA, USA.*

Personal Information

Citizenship	Mexico.
Languages	Spanish, Italian, English.
Full Name	Aldo Pacchiano Camacho.