Andrea Tirinzoni

Research Scientist at Meta, FAIR

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Work Experience

Present — Feb 2024 **Research Scientist**, *Meta, Fundamental AI Research (FAIR) team*, Paris, France.
Research Topics: Reinforcement Learning

Jan 2024 — Apr 2022 **Postdoctoral Researcher**, *Meta, Fundamental AI Research (FAIR) team*, Paris, France.
Research Topics: Reinforcement Learning

Mar 2022 — Apr 2021 **Postdoctoral Researcher**, *INRIA, SCOOL team*, Lille, France.
Research Topics: Reinforcement Learning

Apr 2020 — Jan 2020 **Research Intern**, *Facebook AI Research*, Paris, France.
Research Topics: Exploration-exploitation in structured bandits
Supervisor: Alessandro Lazaric

May 2017 — Jan 2017 **Research Assistant**, *Purposeful Prediction Laboratory, University of Illinois at Chicago*.
Research Topics: Inverse Reinforcement Learning, Robust Control, Adversarial Prediction
Supervisor: Brian Ziebart

Aug 2011 — Jun 2011 **Internship**, *Bankadati Credito Valtellinese*, Sondrio, Italy.
System and network administration

Education

Mar 2021 **Ph.D. cum laude in Computer Science**, *Politenico di Milano*, Milan, Italy.
Thesis: "Exploiting Structure for Transfer in Reinforcement Learning"
Advisor: Marcello Restelli

Oct 2017 **M.Sc. in Computer Science and Engineering**, *Politenico di Milano*, Milan, Italy.
Final Mark: 110/110 summa cum laude
Thesis: "Adversarial Imitation Learning under Covariate Shift"
Advisor: Marcello Restelli

May 2017 **M.Sc. in Computer Science**, *University of Illinois at Chicago*, Chicago, Illinois.
Final GPA: 4.0/4
Thesis: "Adversarial Inverse Reinforcement Learning with Changing Dynamics"
Advisor: Brian Ziebart

Jul 2015 **B.Sc. in Computer Engineering**, *Politenico di Milano*, Milan, Italy.
Final Mark: 110/110 summa cum laude

Research

I am interested in building *reinforcement learning* (RL) agents that require as little data as possible so as to improve their applicability to real-world problems. In this direction, I seek algorithms that adapt to the structure of the environments or tasks they face. I have worked on problems such as representation learning, unsupervised RL, transfer learning, and meta RL. My research approach is at the intersection between theory and practice: while I tend to provide a deep theoretical understanding of the problems I study, I also design and empirically validate (deep) RL methods on complex domains.

Awards, Scholarships, and Grants

From 2019 Reviewer awards: top 50% NeurIPS 2019 reviewers, top 33% ICML 2020 reviewers, outstanding reviewer award at ICLR 2021, top 8% NeurIPS 2021 reviewers

2018 - 2019 Travel awards: ICML 2018, 2019, NeurIPS 2018

Jul 2017 Ph.D. scholarship granted by the Italian Ministry of Education, University and Research

Jun 2017 Scholarship "Tesi all'estero" for the best students doing a master's thesis in a foreign country

Jul 2016 UIC scholarship for the best Italian graduate student in Computer Science

May 2016 Scholarship "SEM" for the best students that are residents in Valtellina

May 2014 Scholarship "SEM" for the best students that are residents in Valtellina

Teaching

Dec 2021 **Teaching Assistant**, *Reinforcement Learning*, ENS Paris-Saclay, Paris, France.
Sep 2021 Master MVA (Mathématiques, Vision, Apprentissage)
Lecturer: Matteo Pirotta

Dec 2019 **Teaching Assistant**, *INFORMATICA*, Politenico di Milano, Milan, Italy.
Sep 2019 Bachelor's degree in Civil Engineering
Lecturer: Marcello Restelli
Topics: C and Fortran programming

July 2019 **Teaching Assistant**, *Reinforcement Learning Summer SCOOL*, Inria, Lille, France.
July 2019 *Topics:* Reinforcement Learning and Bandits

Dec 2018 **Laboratory Assistant**, *INFORMATICA B*, Politenico di Milano, Milan, Italy.
Sep 2018 Bachelor's degree in Mechanical Engineering
Lecturer: Luca Cassano
Topics: C and MATLAB programming

June 2018 **Teaching Assistant**, *Web and Internet Economics*, Politenico di Milano, Milan, Italy.
Mar 2018 Master's degree in Computer Science and Engineering
Lecturer: Nicola Gatti
Topics: Markov Decision Processes, Reinforcement Learning, Multi-armed Bandits

Dec 2017 **Laboratory Assistant**, *INFORMATICA B*, Politenico di Milano, Milan, Italy.
Sep 2017 Bachelor's degree in Mechanical Engineering
Lecturer: Luca Cassano
Topics: C and MATLAB programming

Schools

July 2019 **Machine Learning Summer School (MLSS)**, *UCL*, London, England.

July 2019 **Reinforcement Learning Summer SCOOL (RLSS)**, *Inria*, Lille, France.

Student Supervision

Mar 2021 **Thesis Supervision**, I have supervised more than 15 MS theses, including research projects and
Sep 2017 industrial collaborations, on topics related to transfer/meta RL, exploration in RL, model-based RL, policy search, risk-averse & robust RL, bandits, autonomous driving, car racing.

Industrial Collaborations

Mar 2021 **RSE**, *Machine Learning for Photovoltaic Systems*.
Dec 2020 *Topics:* Machine learning methods for fault detection and diagnosis in photovoltaic systems.

Mar 2021 **Ferrari**, *Reinforcement Learning for Car Racing*.
Sep 2019 *Topics:* RL and inverse RL techniques for several car racing applications.

Mar 2021 **Magneti Marelli**, *Reinforcement Learning for Autonomous Driving*.
Dec 2017 *Topics:* RL and inverse RL techniques for high-level decision-making in autonomous driving.

Editorial Activities

From 2021 **Senior Program Committee**, *AAAI 2022, ALT 2024*.

From 2017 **Program Committee**, *NeurIPS 2019, 2020, 2021, 2022, 2023, ICML 2020, 2021, 2022, 2023, AAAI 2020, 2021, ICLR 2020, 2021, AISTATS 2021*.

From 2017 **Program Committee Subreviewer**, *IROS 2017, AAAI 2018, IJCAI 2018, AAAI 2019*.

Event Organization

2023 **Program Chair for EWRL 2023**, I co-organized the 16th European Workshop on Reinforcement Learning (EWRL), which took place on September 14th-16th 2023 in Brussels (https://ewrl.wordpress.com/ewrl16-2023). EWRL is one of the major gatherings of RL researchers worldwide (∼250 participants, ∼150 submitted papers).

Talks and Seminars

Talks at International Conferences

Jun 2019 **Transfer of Samples in Policy Search via Multiple Importance Sampling**, *International Conference on Machine Learning*, Long Beach, California, 2019.

Dec 2018 **Policy-Conditioned Uncertainty Sets for Robust Markov Decision Processes**, *Neural Information Processing Systems*, Montreal, Canada, 2018.

Jul 2018 **Importance Weighted Transfer of Samples in Reinforcement Learning**, *International Conference on Machine Learning*, Stockholm, Sweden, 2018.

Talks at International Workshops

Oct 2018 **Transferring Value Functions via Variational Methods**, *European Workshop on Reinforcement Learning*, Lille, France, 2018.

Jul 2018 **Policy-Conditioned Uncertainty Sets for Robust Markov Decision Processes**, *Workshop on Planning and Learning @ ICML 2018*, Stockholm, Sweden, 2018..

Seminars

Sep 2019 **Structured Multi-Armed Bandits**, *DEIB*, Politecnico di Milano, Milan, Italy.

Feb 2018 **Meta Reinforcement Learning**, *DEIB*, Politecnico di Milano, Milan, Italy.

Publications

Preprints

[P1] Aymen Al-Marjani, Andrea Tirinzoni, and Emilie Kaufmann. "Toward Instance Optimality in Online PAC Reinforcement Learning". Arxiv preprint, 2023.

Conference Papers

[C24] Edoardo Cetin, Andrea Tirinzoni, Matteo Pirotta, Alessandro Lazaric, Yann Ollivier, and Ahmed Touati. "Simple Ingredients for Offline Reinforcement Learning". In *International Confernce on Machine Learning* (ICML), Vienna, Austria, 2024.

[C23] Matteo Pirotta*, Andrea Tirinzoni*, Ahmed Touati*, Alessandro Lazaric, and Yann Ollivier. "Fast Imitation via Behavior Foundation Models". In *International Conference on Learning Representations* (ICLR), Vienna, Austria, 2024. Spotlight (top 5% accepted papers)

* Equal contribution

[C22] Aymen Al-Marjani, Andrea Tirinzoni, and Emilie Kaufmann. "Active Coverage for PAC Reinforcement Learning". In *Conference on Learning Theory* (COLT), Bangalore, India, 2023.

[C21] Liyu Chen, Andrea Tirinzoni, Alessandro Lazaric, and Matteo Pirotta. "Layered State Discovery for Incremental Autonomous Exploration". In *International Confernce on Machine Learning* (ICML), Hawaii, 2023.

[C20] Andrea Tirinzoni, Matteo Pirotta, and Alessandro Lazaric. "On the Complexity of Representation Learning in Contextual Linear Bandits". In *International Conference on Artificial Intelligence and Statistics* (AISTATS), Valencia, Spain, 2023.

[C19] Liyu Chen, Andrea Tirinzoni, Matteo Pirotta, and Alessandro Lazaric. "Reaching Goals is Hard: Settling the Sample Complexity of the Stochastic Shortest Path". In *International Conference on Algorithmic Learning Theory 34* (ALT), Singapore, 2023.

[C18] Andrea Tirinzoni, Aymen Al-Marjani, and Emilie Kaufmann. "Optimistic PAC Reinforcement Learning: the Instance-Dependent View". In *International Conference on Algorithmic Learning Theory 34* (ALT), Singapore, 2023.

[C17] Andrea Tirinzoni, Matteo Papini, Ahmed Touati, Alessandro Lazaric, and Matteo Pirotta. "Scalable Representation Learning in Linear Contextual Bandits with Constant Regret Guarantees". In *Advances in Neural Information Processing Systems 35* (NeurIPS), New Orleans, 2022.

[C16] Andrea Tirinzoni, Aymen Al-Marjani, and Emilie Kaufmann. "Near Instance-Optimal PAC Reinforcement Learning for Deterministic MDPs". In *Advances in Neural Information Processing Systems 35* (NeurIPS), New Orleans, 2022.

[C15] Andrea Tirinzoni and Rémy Degenne. "On Elimination Strategies for Bandit Fixed-Confidence Identification". In *Advances in Neural Information Processing Systems 35* (NeurIPS), New Orleans, 2022.

[C14] Clemence Reda, Andrea Tirinzoni, and Remy Degenne. "Dealing with Misspecification in Fixed-Confidence Linear Top-m Identification". In *Advances in Neural Information Processing Systems 34* (NeurIPS), Online, 2021.

[C13] Matteo Papini*, Andrea Tirinzoni*, Aldo Pacchiano, Marcello Restelli, Alessandro Lazaric, and Matteo Pirotta. "Reinforcement Learning in Linear MDPs: Constant Regret and Representation Selection". In *Advances in Neural Information Processing Systems 34* (NeurIPS), Online, 2021.

[C12] Matteo Papini, Andrea Tirinzoni, Marcello Restelli, Alessandro Lazaric, and Matteo Pirotta. "Leveraging Good Representations in Linear Contextual Bandits". In *International Confernce on Machine Learning* (ICML), Online, 2021.

[C11] Riccardo Poiani, Andrea Tirinzoni, and Marcello Restelli. "Meta-Reinforcement Learning by Tracking Task Non-stationarity". In *International Joint Conference on Artificial Intelligence* (IJCAI), Montreal, Canada, 2021.

[C10] Andrea Tirinzoni, Matteo Pirotta, Marcello Restelli, and Alessandro Lazaric. "An Asymptotically Optimal Primal-Dual Incremental Algorithm for Linear Contextual Bandits". In *Advances in Neural Information Processing Systems 33* (NeurIPS), Vancouver, Canada, 2020.

[C9] Andrea Tirinzoni, Riccardo Poiani, and Marcello Restelli. "Sequential Transfer in Reinforcement Learning with a Generative Model". In *International Conference on Machine Learning* (ICML), Vienna, Austria, 2020.

[C8] Andrea Tirinzoni, Alessandro Lazaric, and Marcello Restelli. "A Novel Confidence-Based Algorithm for Structured Bandits". In *International Conference on Artificial Intelligence and Statistics* (AISTATS), Palermo, Italy, 2020.

[C7] Giorgia Ramponi, Amarildo Likmeta, Alberto Maria Metelli, Andrea Tirinzoni, and Marcello Restelli. "Truly Batch Model-Free Inverse Reinforcement Learning about Multiple Intentions". In *International Conference on Artificial Intelligence and Statistics* (AISTATS), Palermo, Italy, 2020.

[C6] Pierluca D'Oro, Alberto Maria Metelli, Andrea Tirinzoni , Matteo Papini, and Marcello Restelli. "Gradient-Aware Model-Based Policy Search". In *AAAI*, New York, 2020.

[C5] Andrea Tirinzoni, Mattia Salvini, and Marcello Restelli. "Transfer of Samples in Policy Search via Multiple Importance Sampling". In *Proceedings of the 36th International Conference on Machine Learning* (ICML), Long Beach, California, 2019. (acceptance rate: 773/3424 (22.57%))

[C4] Mario Beraha, Alberto Maria Metelli, Matteo Papini, Andrea Tirinzoni, and Marcello Restelli. "Feature Selection via Mutual Information: New Theoretical Insights". In *International Joint Conference on Neural Networks* (IJCNN), Budapest, Hungary, 2019.

[C3] Andrea Tirinzoni, Xiangli Chen, Marek Petrik, and Brian Ziebart. "Policy-Conditioned Uncertainty Sets for Robust Markov Decision Processes". In *Advances in Neural Information Processing Systems 31* (NeurIPS), Montreal, Canada, 2018. Spotlight. (acceptance rate: 168/4856 (3.46%))

[C2] Andrea Tirinzoni, Rafael Rodriguez, and Marcello Restelli. "Transfer of Value Functions via Variational Methods". In *Advances in Neural Information Processing Systems 31* (NeurIPS), Montreal, Canada, 2018. (acceptance rate: 1011/4856 (20.82%))

[C1] Andrea Tirinzoni, Andrea Sessa, Matteo Pirotta, and Marcello Restelli. "Importance Weighted Transfer of Samples in Reinforcement Learning". In *Proceedings of the 35th International Conference on Machine Learning* (ICML), Stockholm, Sweden, 2018. (acceptance rate: 618/2473 (24.99%))

Journal Papers

[J3] Lorenzo Bisi, Davide Santambrogio, Federico Sandrelli, Andrea Tirinzoni, Brian D. Ziebart, and Marcello Restelli. "Risk-Averse Policy Optimization via Risk-Neutral Policy Optimization". Artificial Intelligence, 2022.

[J2] Amarildo Likmeta, Alberto Maria Metelli, Giorgia Ramponi, Andrea Tirinzoni, Matteo Giuliani, and Marcello Restelli. "Dealing with Multiple Experts and Non-stationarity in Inverse Reinforcement Learning: an Application to Real-life Problems". Machine Learning, 2021.

[J1] Amarildo Likmeta, Alberto Maria Metelli, Andrea Tirinzoni, Riccardo Giol, Marcello Restelli, and Danilo Romano. "Combining Reinforcement Learning with Rule-based Controllers for Transparent and General Decision-making in Autonomous Driving". Robotics and Autonomous Systems, 2020.

Workshop Papers

[W4] Andrea Tirinzoni, Matteo Pirotta, and Alessandro Lazaric. "A Fully Problem-Dependent Regret Lower Bound for Finite-Horizon MDPs". Workshop on Reinforcement Learning Theory @ ICML 2021.

[W3] Pierluca D'Oro, Alberto Maria Metelli, Andrea Tirinzoni , Matteo Papini, and Marcello Restelli. "Gradient-Aware Model-Based Policy Search". Meta-Learning Workshop @ NeurIPS 2019.

[W2] Andrea Tirinzoni, Rafael Rodriguez, and Marcello Restelli. "Transferring Value Functions via Variational Methods". In *European Workshop on Reinforcement Learning 14*, Lille, France, 2018. Oral.

[W1] Andrea Tirinzoni, Xiangli Chen, Marek Petrik, and Brian Ziebart. "Policy-Conditioned Uncertainty Sets for Robust Markov Decision Processes". In *Workshop on Planning and Learning @ ICML 2018*, Stockholm, Sweden, 2018. Oral.

Theses

[Ph.D. thesis] "Exploiting structure for transfer in reinforcement learning ". Politenico di Milano, 2021.
[Master thesis] "Adversarial imitation learning under covariate shift ". Politenico di Milano, 2017.
[Master thesis] "Adversarial inverse reinforcement learning with changing dynamics". University of Illinois at Chicago (UIC), 2017.

Languages

Italian: Mother tongue
English: Fluent (TOEFL 100/120)
French: Basic knowledge

Computer Skills

Operating Systems	GNU/Linux, Microsoft Windows, Mac OS
Programming Languages	Python, Java, C, C++, C#, Scala, MATLAB, R, Lua, Javascript, PHP, Lisp
Frameworks	Pytorch, Tensorflow, Keras, Apache Spark
IDEs	VS Code, Eclipse, PyCharm, Visual Studio, MATLAB, Dev-C++
Typesetting	LaTex, HTML, Microsoft Word