Rui **Yuan**

Doctor

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Doctor Specialized in *Machine Learning*, *Optimization* and *Reinforcement Learning*

Education

Meta/Facebook AI & Télécom Paris — *Paris, France*

PhD in Applied Mathematics — *2019 - 2023*

- Subject: Stochastic Second Order Methods and Finite Time Analysis of Policy Gradient Methods.
- **CIFRE PhD** at Meta AI & Télécom Paris, supervised by Alessandro Lazaric (Meta AI), Robert M. Gower (Flatiron Institute), François Roueff (Télécom Paris). Graduation on **March 17, 2023**.

École Polytechnique — *Palaiseau, France*

Master's Degree in Data Science — *2017 - 2018*

- One of the **best** master programs in artificial intelligence in France.

École Polytechnique — *Palaiseau, France*

Master of Science & Engineering (Diplôme d'Ingénieur) — *2012 - 2015*

- Specialized in Applied Mathematics in the **Rank 1** French engineering school.

Lycée Janson de Sailly — *Paris, France*

Classes Préparatoires (equivalent to bachelor in Mathematics and Physics) — *2010 - 2012*

- Intensive courses of Mathematics, Physics and Computer Science leading to the nationwide highly competitive exam for admission to a graduate-level engineering school ("Grande Ecole")

Experience

Meta/Facebook AI & Télécom Paris — *Paris, France*

PhD Research Assistant — *2019 - 2023*

- Developed a fundamental understanding of optimization methods applied in **Reinforcement Learning** (RL) to bridge the gap between theory and practice, achieved **state-of-the-art** convergence analysis, including **deep RL** as special cases.
- Designed new efficient practical **optimization** algorithms to solve **large scale Machine Learning** problems and achieved **state-of-the-art** learning performance, both theoretically and empirically.
- Contributed to the **automated theorem proving** project at Meta AI, resulting in the following publications: 1.HyperTree Proof Search for Neural Theorem Proving; 2. Draft, Sketch, and Prove: Guiding Formal Theorem Provers with Informal Proofs.
- Published **4 first author research papers** in top Machine Learning conferences and journals (**1 ICLR**, **2 AISTATS** and **1 SIAM**).
- Published **1 senior author research paper** in top Machine Learning conference (**NeurIPS**), in which I led the project.

African Institute for Mathematical Sciences (AIMS) — *Kigali, Rwanda*

Teaching Assistant — *2019*

- Helped teach **African Master's in Machine Intelligence - Stochastic Optimization for Machine Learning**.

Télécom Paris — *Paris, France*

Research Intern — *2018*

- Introduced an optimization algorithm for general large scale machine learning problems, supervised by Robert M. Gower and Olivier Fercoq, which was accepted at the Paris-Saclay Junior Conference on Data Science and Engineering 2018 (**JDSE2018**).

Kaggle Challenge — *Palaiseau, France*

Forest Cover Type Prediction — *2015*

- **Results:** Achieved **83% prediction accuracy**; **ranked 22nd** out of 1692 teams (spent two months in the competition and finished **14th** at the time, eight months before the end)
- **Objective:** Use a cartographic dataset to classify forests into 7 categories (11 features, 15120 samples for training and 565892 instances for testing).
- **Work:** First, a specific feature engineering was performed depending on the data; then, applied a combination of **Random Forest** and **Adaboost** algorithm as an estimator using scikit-learn and WEKA.

IBM — *Gentilly, France*

Collective Scientific Project in Computer Science - Applied Mathematics — *2013 - 2014*

- **Realization:** Created an **Android application** that classified a user's tweets into twelve themes.
- **Work:** First, data was extracted from Twitter using its APIs and a Java library - Twitter4j; then, textual data was standardized using Snowball; finally, tweets were classified using maximum entropy by a Stanford NLP library.

Presentations

Scientific Talks

2022	**A general sample complexity analysis of vanilla policy gradient.** Invited talk at International Conference on Continuous Optimization (**ICCOPT**) at Lehigh University.	*Bethlehem, U.S.A*
2020	**Sketched Newton-Raphson.** Invited talk at Workshop on Scientific Computing and Optimization at University of Hong Kong.	*Online*

Posters

2023	**A Novel Framework for Policy Mirror Descent with General Parametrization and Linear Convergence.** 16th European Workshop on Reinforcement Learning (**EWRL 2023**) at Vrije Universiteit Brussel.	*Brussels, Belgium*
2022	**Linear Convergence of Natural Policy Gradient Methods with Log-Linear Policies.** 15th European Workshop on Reinforcement Learning (**EWRL 2022**) at Politecnico di Milano.	*Milan, Italy*
2021	**A general sample complexity analysis of vanilla policy gradient.** **ICML 2021** Workshop on "Reinforcement learning theory".	*Online*
2021	**SAN: Stochastic Average Newton Algorithm for Minimizing Finite Sums.** 3rd PRAIRIE/MIAI AI summer school (**PAISS**).	*Online*
2020	**Sketched Newton-Raphson.** **ICML 2020** Workshop on "Beyond first-order methods in ML systems".	*Online*

Honors & Awards

2021	**Outstanding Reviewer Award at NeurIPS 2021**	*Online*
2009	**2nd Prize** China National Mathematics Olympiad (CNMO)	*Guangdong, China*
2008	**2nd Prize** China National Mathematics Olympiad (CNMO)	*Guangdong, China*

Miscellaneous

2020 - 2023	**[Review Services] Reviewer for NeurIPS, ICML, AISTATS, FOCS, SISC, SIMODS, EWRL.**
2012 - 2014	**[Volunteering] Executive Committee Member of Binet X-Chine,** responsible for communication and activities of the Chinese Cultural Association of École Polytechnique.
2012 - 2014	**[Volunteering] Active member of Binet ASK (Social Action of the KES),** responsible for helping local college and high school students by collecting books and reading together.
2011 - 2012	**[Volunteering] Class Monitor in the French preparatory class.**
·	**[Interests]** Accordion: 5 years; Basketball: 11 years; Skiing: 10 years; Badminton: 2 years; Jogging: 2 years.

Skills and Tools

Programming	Python (master - NumPy, PyTorch, scikit-learn, pandas, ...), LEAN, Java, R, Matlab, CAML, SQL, JavaScript, HTML/CSS.
Tools	Sublime Text (master), Git (master), LaTex (master), VS Code, macOS, Linux, tmux, Slurm, Apache Hadoop, Hue, Spark.
Languages	Mandarin (Native), Cantonese (Native), French (Full working proficiency), English (Full working proficiency).

Publications

1. Carlo Alfano, **Rui Yuan**, Patrick Rebeschini. A Novel Framework for Policy Mirror Descent with General Parametrization and Linear Convergence. Accepted at *Neural Information Processing Systems* (**NeurIPS**), 2023.
2. **Rui Yuan**, Simon S. Du, Robert M. Gower, Alessandro Lazaric, Lin Xiao. Linear Convergence of Natural Policy Gradient Methods with Log-Linear Policies. Accepted at *International Conference on Learning Representations* (**ICLR**), 2023.
3. **Rui Yuan**, Robert M. Gower, and Alessandro Lazaric. A general sample complexity analysis of vanilla policy gradient. Accepted at *International Conference on Artificial Intelligence and Statistics* (**AISTATS**), 2022.
4. Jiabin Chen*, **Rui Yuan***, Guillaume Garrigos, Robert M Gower. SAN: Stochastic Average Newton Algorithm for Minimizing Finite Sums. Accepted at *International Conference on Artificial Intelligence and Statistics* (**AISTATS**), 2022.
   *Equal contributions.
5. **Rui Yuan**, Alessandro Lazaric, and Robert M. Gower. Sketched Newton-Raphson. Accepted at *Society for Industrial and Applied Mathematics (SIAM) Journal on Optimization* (**SIOPT**), 2022.