Rui Yuan

PhD Candidate

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PhD Student Specialized in *Machine Learning*, *Optimization* and *Reinforcement Learning*

Education

Meta/Facebook AI & Télécom Paris
Paris, France

PhD in Applied Mathematics — *2019 - Present*

- 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 expected on **March 17th, 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*

- Specialization 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 - Present*

- 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, which results 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 (ICLR, AISTATS and SIAM).
- Published 1 preprint under review, where I served as **senior author** to lead the project.

African Institute for Mathematical Sciences (AIMS)
Kigali, Rwanda

Teaching Assistant — *2019*

- Helped teaching **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 on the Paris-Saclay Junior Conference on Data Science and Engineering 2018 (**JDSE2018**).

Kaggle Challenge
Palaiseau, France

Forest Cover Type Prediction — *2015*

- **Results:** Obtained **83% accuracy** of the prediction; **ranked 22nd** among 1692 teams (Spent two months on the competition and left at **14th** at the time which was eight months before the end).
- **Objective:** Use cartographic dataset to classify forests in 7 categories (11 features, 15120 samples for training and 565892 instances for test).
- **Work:** First, performed a specific feature engineering depending on the data; then, applied a combination of **Random Forest** and **Adaboost** algorithm as an estimator by 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 by twelve themes.
- **Work:** First, extracted data on Twitter by its APIs and a Java library – Twitter4j; then, standadized the textual data by Snowball; finally, classified tweets in using maximum entropy by a NLP library of Stanford.

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

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*

Miscellaneous

2020 - 2022	**[Review Services] Reviewer for NeurIPS, ICML, AISTATS, FOCS, SISC,** including an **Outstanding Reviewer Award** given to the **top 8%** of reviewers at NeurIPS 2021.
2012 - 2014	**[Volunteering] Executive Committee Member of Binet X-Chine,** in charge of communication and activities of the Chinese cultural association of École Polytechnique.
2012 - 2014	**[Volunteering] Active member of Binet ASK (Social Action of the KES),** in charge of 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. Preprint, 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.
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.

*Equal contributions.