

# Michael Arbel

## Curriculum Vitae

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### Education

- 2016-2021 **Gatsby Computational Neuroscience Unit - UCL**, London, UK.  
*PhD in Machine Learning*  
Advisor: Arthur Gretton  
Subject: Regularization and Optimization of Generative Adversarial Networks.
- 2014-2015 **École Normale Supérieure**, Cachan, France.  
*MSc in Machine Learning and Computer Vision (MVA). High honors.*  
Courses: Graphical models, Kernel methods, Convex optimization, Reinforcement Learning, Object Recognition and Computer Vision.
- 2011-2014 **École Polytechnique**, Palaiseau, France.  
*B.S. & M.S. in Applied Mathematics with minor physics. GPA: 3.93/4.*  
Major: Probability and Measure theory, Statistics, Learning theory, Dynamical systems, Distribution theory, Stochastic Calculus.  
Minor: Quantum mechanics, Statistical physics, Special Relativity.
- 2009-2011 **Moulay Youssef & Omar Ibn Al Khattab**, Rabat & Meknes, Morocco.  
Preparatory classes for the French national entrance exams for admission to the 'Grandes Ecoles' Science and Engineering schools.

### Research and Work Experience

- 2021-Now **Starting Research Fellow**, THOTH Team, INRIA Grenoble Rhône-Alpes.  
Unsupervised Representation learning, Optimization and Sampling.
- 2016-2021 **Gatsby Computational Neuroscience Unit - UCL**, London, UK.  
Advisor: Arthur Gretton  
- Optimization methods for Reinforcement Learning [2,3]  
- Methods for Generative Adversarial methods [4,5,11,12]  
- Optimization methods based on Optimal Transport Geometry [3,8,9,10]  
- Particles samplers [1,7,10]  
- Kernel methods for density estimation and classification [6,13,15]
- 2015-2016 **Prophesee**, Paris, France.  
*Computer Vision Research Engineer*  
-Real-time multi-target tracking algorithms for Neuromorphic event-based cameras.  
-Auto-calibration algorithms for event-based stereo cameras using structure from motion.
- 2015 **Ecole Normale Supérieure**, Paris, France.  
*Visiting Student Researcher*  
Advisor: Stéphane Mallat  
Recurrent networks for long-range dependencies in simple grammars using wavelets.
- 2014 **Princeton University**, Princeton, USA.  
*Visiting Student Researcher*  
Advisor: René Carmona  
Mean field games with a dependence on the distribution of the control: an Existence and Uniqueness result.

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## Research Activities

- 2018-present **Reviewer.**  
-International conferences: NeurIPS (2018, 2019,2020), ICLR (2019,2020),ICML (2021)  
-International journals: JMLR
- 2017-2019 **Research Seminars, UCL.**  
-Co-organized the DeepMind/CSML weekly research seminars in Machine Learning with invited speakers from the UK and Europe.  
-Co-organized pre-conference oral presentations events for selected accepted papers.  
-Managed an annual budget of 5000 £.
- 2017-present **Member of the Machine Learning Journal Club, UCL.**  
Weekly held journal club on various topics in Machine Learning and Statistics.
- 2015-2016 **Eurofins, Luxembourg.**  
*Data scientist*  
-Defined a new business process workflow for managing Eurofins' knowledge database.  
-Implemented a prototype of the workflow in SQL and JavaScript.

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## Publications

- 2021 [1] **Michael Arbel\***, Alexander GDG Matthews\*, Arnaud Doucet. Annealed Flow Transport Monte Carlo. *Under review*. \*equal contribution.
- 2021 [2] Ted Moskovitz, Jack Parker-Holder, Aldo Pacchiano, Michael Arbel. Deep Reinforcement Learning with Dynamic Optimism. *Under review*.
- 2020 [3] **Michael Arbel\***, Ted Moskovitz\*, Ferenc Huszar, Arthur Gretton. Efficient Wasserstein Natural Gradients for Reinforcement Learning. *Under review*. \*equal contribution.
- 2020 [4] **Michael Arbel**, Liang Zhou, Arthur Gretton. Generalized Energy Based Models. *Under review*.
- 2020 [5] Samuel Cohen, **Michael Arbel**, Marc Peter Deisenroth. Estimating Barycenters of Measures in High Dimensions. *Under review*.
- 2020 [6] Louis Thiry, **Michael Arbel**, Eugene Belilovsky, Edouard Oyallon. The Unreasonable Effectiveness of Patches in Deep Convolutional Kernels Methods. *Under review*.
- 2020 [7] Anna Korba, Adil Salim, **Michael Arbel**, Giulia Luise, Arthur Gretton. A Non-Asymptotic Analysis for Stein Variational Gradient Descent. *NeurIPS 2020*.
- 2020 [8] Tolga Birdal, **Michael Arbel**, Umut Simsekli, Leonidas Guibas. Synchronizing Probability Measures on Rotations via Optimal Transport. *CVPR 2020*.
- 2020 [9] **Michael Arbel**, Arthur Gretton, Wuchen Li, Guido Montufar. Kernelized Wasserstein Natural Gradient. *ICLR 2020*.
- 2019 [10] **Michael Arbel**, Anna Korba, Adil Salim, Arthur Gretton. Maximum Mean Discrepancy Gradient Flow. *NeurIPS 2019*.
- 2018 [11] **Michael Arbel\***, Dougal J. Sutherland\*, Mikołaj Bińkowski, Arthur Gretton. On gradient regularizers for MMD GANs. *NeurIPS 2018*. \*equal contribution.
- 2018 [12] Mikołaj Bińkowski, Dougal J. Sutherland, **Michael Arbel**, Arthur Gretton. Demystifying MMD GANs. *ICLR 2018*.
- 2018 [13] Dougal J. Sutherland, Heiko Strathmann, **Michael Arbel**, Arthur Gretton. Efficient and principled score estimation. *AISTATS 2018*.
- 2018 [14] **Michael Arbel**, Arthur Gretton. Kernel Conditional Exponential Family. *AISTATS 2018*.

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## Teaching Experience

- 2019 **Machine Learning Summer School** , London, UK.  
*Teaching assistant* for the **Optimization** Tutorial.
- 2017 **Gatsby Computational Neuroscience Unit - UCL** , London, UK.  
*Teaching assistant* for Probabilistic and Unsupervised Learning.  
*Teaching assistant* for Advanced Topics in Machine Learning.

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## Honors and Awards

- 2020 Spotlight presentation at ICLR 2020 for paper [3]. 2% of submitted papers.
- 2018 Best Poster Award at MSR AI Summer School 2018 for paper [5]. Cambridge.
- 2016-present Fully Funded PhD Scholarship. Awarded by the Gatsby Computational Neuroscience Unit.
- 2014 Award of the Financial Risk Chair of École Polytechnique for research on Mean Field Games.
- 2011–2014 Fully Funded Masters Scholarship. Awarded by the French Government Eiffel Excellence Scholarship.
- 2011–2014 Fully Funded Undergraduate Scholarship. Awarded by the French Government Eiffel Excellence Scholarship.
- 2009–2011 National Moroccan merit scholarship 'ISTIHQAQ'. For the first 100 national scores of high school final examinations.
- 2009 Participation to the 50th International Mathematics Olympiad (IMO), Bremen, Germany.

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## Invited Talks

- 2020 Kernelized Wasserstein Natural Gradient. Workshop on Functional Inference and Machine Intelligence, EURECOM (Sophia Antipolis, France).
- 2020 Maximum Mean Discrepancy Gradient flow.. The Alan Turing Institute (London, UK)..
- 2020 Wasserstein Natural Gradient: a kernel perspective. Department of Statistics, University of Oxford (Oxford, UK).
- 2019 Kernelized Wasserstein Natural Gradient. The Alan Turing Institute (London, UK)..
- 2019 Maximum Mean Discrepancy Gradient flow. Amazon Research Days (Berlin, Germany).
- 2019 MMD Gradient flow. Workshop on Recent developments in kernel methods, 2019, UCL (London, UK).
- 2019 Kernel Distances for Deep Generative Models. Deep Learning Theory Kickoff Meeting 2019, MPI (Leipzig, Germany).
- 2018 On Gradient Regularizers for MMD-GANs. Cambridge-Tübingen workshop 2018 (Tenerife, Spain).
- 2018 Gradient Regularizers for MMD-GANs. Google Developer Group Reading and Thames Valley (Reading, UK).

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## Software

- 2020 Pytorch implementation of Generalized Energy Based Models [1]. BSD 3-Clause License

- 2019 Pytorch implementation of the Measure synchronization on quaternion manifolds based on paper [5]. BSD 3-Clause License
- 2019 KWNG: Pytorch implementation of the optimizer based on paper [6]. BSD 3-Clause License
- 2019 MMDflow: Pytorch implementation of the noise-injection algorithm based on paper [7]. BSD 3-Clause License
- 2018 SMMD-GAN: Tensorflow implementation of scaled MMD-GAN based on paper [8]. BSD 3-Clause License
- 2018 KCEF: Python implementation the conditional density estimator based on paper [11]. BSD 3-Clause License

## Languages

Natural English (full proficiency), French (native).

Programming Python, C++, Pytorch and Tensorflow.