Dr Marcin Abram

New Haven, CT, USA
+44 7491 808 413
abram.mj@gmail.com
https://linkedin.com/in/marabram

Professional Experience

Lead Research Scientist **Jan 2019 – present**
Fetch.AI in New Haven, CT, USA

Responsibilities: Setting up a new US research unit for Fetch.AI in New Haven, Connecticut. Research on consensus algorithms, system design, economic limits of blockchains, and machine learning applications in multi-agent systems.

Machine Learning Scientist **July 2018 – Jan 2019**
Fetch.AI in Cambridge, UK

Responsibilities: Research on blockchain's security and long-term stability. Modeling actor's incentives in multi-agent systems. Research on machine learning applications in blockchain systems. Leading group of 3 researchers.

Results: Co-author of a novel consensus protocol. Implementation of a threshold random oracle based on a multi-signature scheme. Proposition and implementation of ranking algorithm based on Bayesian inference.

Skills & Technologies: Distributed Ledger Technology (DLT), Consensus Mechanisms, Blockchain Security, Cryptography, Probabilistic Modeling, Bayesian Inference, Python 3.7, C++14.

Machine Learning Engineer **Aug 2016 – June 2018**
TypeScore in London, UK

Responsibilities: Data collection and cleaning. Building and evaluating machine learning models. Preparing production code. Databases and servers maintenance. Monitoring the latest technological advancements and proposing new development directions.

Results: Creation of a system that automatically collect data, re-train the models and upload the predictions. Creation of a web-server with API access for our clients. Development of an extension to the system that utilizes Bayesian Neural Networks.

Skills: Statistical Models, Random Forests, Neural Networks, Natural Language Processing (NLP), Bayesian Inference, Python 3.6, Keras (with Tensorflow), ElasticSearch, MongoDB, Docker, AZURE and Google Cloud Services.

Research Assistant **Oct 2011 – Aug 2016**
Jagiellonian University in Kraków, Poland

Responsibilities: Mathematical modeling. Analytical and numerical computation. Software development (in C++). Algorithm optimization. High-performance computing (on a supercomputer). Data analysis and interpretation.

Results: 7 reviewed articles published in international journals. Several scientific presentations at conferences (talks and posters).

Skills: Quantum Mechanic, Advanced (Noncommutative) Algebra, Numerical Calculations, High-Performance Programming in C++, Scientific Writing and Presentation.

Teaching Assistant **2013 – 2014**
Jagiellonian University in Kraków, Poland

Responsibilities: Led practical sessions for *Statistical Physics* course. Exercise design and preparation. Preparing and marking exams.

Results: I was evaluated by students at 4.88/5.0 in 2013 and at 4.97/5.0 in 2014 (the annual university averages were 4.40 and 4.36 respectively).

Skills: Group teaching (∼20 people in a class).

Education

PhD in Physics **2011 – 2016**
Jagiellonian University, Kraków, Poland

Reserach on approximation methods used in modeling strongly-correlated quantum systems. Focuse on scientific simulations and high-performance computing techniques. Team member in two national grants.

Dissertation title: *"Nonstandard Representation of Correlated-Fermion Models and its Application to Description of Magnetism and Unconventional Superconductivity."*

Supervision: Prof. J. Spałek and Dr. M. Zegrodnik.

Final mark: Degree awarded with distinction.

Interdisciplinary studies:
Society–Environment–Technology **2012 – 2015**
Jagiellonian University, Kraków, Poland

This competitive, application–only program for top PhD students, consisted of three years of coursework and independent research using social science, natural science and humanities research methods in English.

Final mark: 4.4 (maximum 5.0)

MSc in Physics
Theoretical Physics specialization **2006 – 2011**
Jagiellonian University, Kraków, Poland

During my 5 year Master's program I accumulated 413.5 ECTS points due to a large number of non-obligatory courses (in the European Union just 300 points are sufficient to obtain an MSc degree).

Dissertation title: *"Selected methods of correlated particles applied to atomic systems in optical lattices."*

Supervision: Prof. J. Spałek.

Final mark: 5.0 (maximum 5.0)

BSc in Computer Science **2009 – 2012**
Jagiellonian University, Kraków, Poland

Obtained independently from the Physics program, as a second degree. Final project resulted in a publication in a world-class journal, *Physical Review E* (Statistical, Nonlinear, and Soft Matter Physics).

Final mark: 4.5 (maximum 5.0)

Physics Study Abroad **Jan – Jun 2010**
Niels Bohr Institute, Copanhagen, Denmark

Study abroad funded by the Erasmus Scholarship Program.

Academic Experience

I published 7 articles in world-class scientific journals including Physical Review B and Journal of Physics: Condensed Matter. Since 2018 I regularly review articles for Journal of Physics: Material (3) and New Journal of Physics (2) related to such topics as: application of machine learning in physics, neural networks, scientific computing, magnetism and novel materials.

Awards (selection)

- 2013 – 2015, Exceptional Doctoral Performance Award (awarded to the top 15% of PhD students departmentally).
- 2012 – 2015, Scholarship: participation in *Interdisciplinary Ph.D. studies in English* program at Jagiellonian University in Kraków.
- 2008 – 2009, Academic Achievement Scholarship.
- April 2006, Finalist (top 60) in the LV Polish Physics Olympiad.
- March 2006, Finalist (9th place) in the XLIX Polish Astronomy Olympiad.

Essential Skills

- **Distributed Ledger Technology**
  - Consensus mechanisms (PoW, PoS, BTF, DAG-based), blockchain design.
  - Security in decetraized systems, blockchain attack vectors, incentives design, long-term blockchain stability.
  - Cryptography (eliptic curves, digital signatures, treshold cryptography, random beacons).
  - Machine learning applications in mult-agent systems.
- **Mathematics and Modeling**
  - Statistics, Advanced Algebra, Differential Equations, Stochastic Processes.
  - Mathematical Modeling, Numerical Simulations, Algorithm Optimization, Data Analysis.
- **Machine learning**
  - Deep Neural Networks, Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM).
  - Bayesian Inference, Bayesian Neural Networks.
  - Natural Language Processing (Skip-gram, CBOW).
  - Decision Trees, Random Forests.
  - Regressions, ANOVA, Nested Models.
- **Programming and Software Development**
  - Python 3: experience with *numpy*, *SciPy*, *pandas*, *scikit-learn*, *tensorflow*, *Keras*, *PyMC3*.
  - C/C++: experience with *OpenMP*, *GSL*, *Boost*.
  - Agile Methodologies, Test Driven Development (TDD), Scrum, Unit Testing, Continuous Integration, Version Control (git), Containerization (Docker).
  - Other Languages: R, Bash.
- **Tools & Technologies**
  - NoSQL databases: *MongoDB*
  - Cloud computing: *Microsoft AZURE* and *Google Cloud Platform*.
  - Data visualization: *gnuplot* (standalone), *ggplot* (R), *matplotlib* (Python) and *Root* (C++).
  - Professional software: *Wolfram Mathematica*.
  - Linux, LaTeX, *Elasticsearch*.
- **Organization and Communication Skills**
  - Scientific writing and lectures presentation.
  - Teaching (high-school and university level).
  - Team leading and work organization.

Publications

7 publications published in world-class scientific journals.

- M. Abram, D. Honerkamp, J. Ward, J.-M. Wong, *Democratising blockchain: A minimal agency consensus model*, (under review).
- M. Abram, M. Zegrodnik, and J. Spałek, *Antiferromagnetism, charge density wave, and d-wave superconductivity in the extended t–J–U model*, J. Phys.: Condens. Matter **29**, 365602 (2017).
- M. Abram, M. M. Wysokiński, and J. Spałek, *Tricritical wings in UGe_2: A microscopic interpretation*, J. Magn. Magn. Mater. **400**, 27–30 (2016).
- M. M. Wysokiński, M. Abram, and J. Spałek, *Criticalities in the itinerant ferromagnet UGe_2*, Phys. Rev. B **91**, 081108(R) (2015).
- M. M. Wysokiński, M. Abram, and J. Spałek, *Ferromagnetism in UGe_2: A microscopic model*, Phys. Rev. B **90**, 081114(R) (2014).
- A. Kapanowski and M. Abram, *Model of hard spheroplatelets near a hard wall*, Phys. Rev. E **89**, 062503 (2014).
- M. Abram, *t–t'–J–U Model in Mean-Field Approximation: Coexistence of Superconductivity and Antiferromagnetism*, Acta. Phys. Pol. A **126**, 25 (2014).
- M. Abram, J. Kaczmarczyk, J. Jędrak, and J. Spałek, *d-wave superconductivity and its coexistence with antiferromagnetism in t–J–U model: Statistically consistent Gutzwiller approach*, Phys. Rev. B **88**, 094502 (2013).

Conferences (selection)

- Sept 2018 – *"CESC 2018: Cryptoeconomics and Security Conference"*, San Francisco, USA.
- April 2018 – *"PyData London 2018"*, workshop (tutor) and conference (organization – volunteer).
- July 2015 – *"20th International Conference on Magnetism"*, Barcelona, Spain (poster).
- June 2015 – *"Cracow Colloquium on f-electron systems"*, Kraków, Poland (lecture).
- Sept 2014 – *"From Spins to Cooper Pairs: New Physics of Spins"*, Zakopane, Poland (lecture).
- March 2014 – *"XVI National Conference on Superconductivity"*, Zakopane, Poland (lecture).
- Jul 2012 – *"Quantum Monte Carlo: Fundamentals and Applications"*, University of Illinois, Urbana-Champaign, IL, USA.

Volunteering

- Volunteer during the *PyData London 2018* conference (London, 26-29 April 2018).
- Math tutor in the Center for the Blind and Visually Impaired (Kraków, 2012 – 2014).
- Leading physics workshops for gifted high-school students (Kraków, 2011 – 2014).
- Cultural mentor for Erasmus Student Network (Kraków 2010/2011).