Alvaro Perez-Diaz

PERSONAL DETAILS

Birthdate	December, 1990
Nationality	Spanish
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EDUCATION

Ph.D. Program. Next Generation Computational Modelling 2015-2019
University of Southampton (UK)

Supervisors: Dr Enrico Gerding and Professor Frank McGroarty

Four year program consisting on a taught master year followed by three years of research.

Major thesis: my research focuses on the integration of large fleets of electric vehicles (EVs) into the existing power systems infrastructure. During my first year I developed a price-maker day-ahead bidding algorithm for large EV aggregators, which improves the state-of-the-art bidding algorithms by considering price impact as a computationally tractable optimisation problem. Also, I designed a mechanism design framework to allow for cooperation of self-interested EV aggregators competing in the same day-ahead market. By employing a Vickrey-Clarkes-Groves mechanism, each participating EV aggregator will quasi-truthfully report its real preferences to a third-party coordinator who will bid on their behalf and distribute the purchased energy among the aggregators achieving greatly reduced costs. In the second year, I studied the previously described coordination setting under the perspective of cooperative game theory. We proved that the multi-aggregator scenario is balanced, and hence full cooperation is the most beneficial strategy for all the aggregators. Two payment distribution mechanisms we studied, the Shapley Value and the Least-Core, providing computationally tractable ways of distributing payments. Next, the issues of price and driving pattern forecasting will be addressed, both key components to successful participation in electricity markets. Machine Learning presents itself as a promising candidate for this task.

Minor thesis: three-month project looking at ways to improve the ways that programming can be taught to young learners by gamification using Python and Minecraft. I developed a Minecraft modification (*mod*) in Java, Python-Tool Mod , to allow interactive execution of Python scripts that alter the virtual world in real time. This software has been used for outreach purposes in science festivals and centres in the UK. For more information, see Publications section.

Research Interests: Multi-Agent Systems, Electric Vehicle Aggregation, Mathematical Optimisation, Game Theory, Mechanism Design, Forecasting, Machine Learning.

MSc Complex Adaptive Systems
2nd year Erasmus Mundus Master in Complex Systems Science 2014-2015
Chalmers University of Technology (Sweden)

First Class Honours.

Modules included: Game theory, Simulation of Complex Systems, Quantum Physics and Scientific Visualisation.

Master Thesis: The Minority Game: evolution of strategy scores. Supervisor: Dr Mats Granath.

`http://publications.lib.chalmers.se/records/fulltext/220180/220180.pdf`

MSc Complexity Science

1st year Erasmus Mundus Master in Complex Systems Science 2013-2014
University of Warwick (UK)

First Class Honours.

Modules included: Mathematical Networks, Dynamical Systems, Self-organisation and Chaos, Statistical Mechanics, Machine Learning, Statistics.

Master Thesis: Ultrasonic transducers: From analytical modelling to design optimisation and validation. Supervisor: Dr Nishal Ramadas.

`https://www2.warwick.ac.uk/fac/cross_fac/complexity/study/emmcs/outcomes/studentprojects/perez_diaz_m1.pdf`

MPhys. Fundamental Physics 2009-2015
Universidad Nacional de Educación a Distancia (Spain)

Upper Second Class Honours.

Modules included: Classical Mechanics, General Relativity, Quantum Mechanics, Solid State Physics, Statistical Mechanics, Electromagnetism, Electronics.

Erasmus Exchange Program in Mathematics 2011-2012
University of Manchester (UK)

First Class Honours.

Modules included: Partial Differential Equations, Differentiable Manifolds, Algebraic Topology, Functional Analysis, Fluid Dynamics, Set Theory.

Thesis: Categories, Functors and Natural Transformations. Supervisor: Professor Mike Prest.

MMath. Mathematics 2008-2013
Universidad Complutense de Madrid (Spain)

First Class Honours.

Modules included: Linear Algebra, Real and Complex Calculus, Group Theory, Differential Equations, Numerical Methods, Algebraic Geometry.

PUBLICATIONS

Journal papers:

- Perez-Diaz, A., Gerding, E., McGroarty F. *Coordination and payment mechanisms for electric vehicle aggregators*. Applied Energy, 212:185-195 (2018).
- Granath, M. and Perez-Diaz, A. *Diffusion and localization of relative strategy scores in the Minority Game*. Journal of Statistical Physics, 165(1):94–114 (2016).

Conference papers:

- Perez-Diaz, A., Gerding, E., McGroarty F. *Coordination of Electric Vehicle Aggregators: A Coalitional Approach*. In Proc. of the 17th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2018).
- Perez-Diaz, A. *Coordination of Electric Vehicle Aggregator Participation in the Day-Ahead Market*. In Proc. of the 17th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2018). Doctoral Consortium.

Workshop papers:

- Perez-Diaz, A., Gerding, E., McGroarty F. *Decentralised Coordination of Electric Vehicle Aggregators*. In International Workshop on Optimization in Multiagent Systems (OptMAS-18).

Software:

- Perez-Diaz, A. and Fangohr, H. PythonTool-Mod for Minecraft: developing programming skills with Minecraft & Python (2016). DOI: 10.5281/zenodo.801627 `https://github.com/ngcm/PythonTool-Mod`

ADDITIONAL EDUCATION

Introduction to Pandas (Python) June 2017
University of Southampton, NGCM Summer school

Introduction to Scikit-learn (Python) June 2017
University of Southampton, NGCM Summer school

Introduction to C++ Programming Oct 2016
University of Southampton, Jacek Generowiczl

Programming the Intel Phi June 2016
University of Southampton, NGCM Summer school

GPU Programming Using CUDA June 2016
University of Southampton, NGCM Summer school

Project Planning and Management April 2016
University of Southampton & Boeing UK

Parallel Programming with OpenMP April 2016
University of Southampton & ARCHER

Parallel Programming with MPI April 2016
University of Southampton & ARCHER

Control of Mobile Robots March 2013
Coursera (Georgia Institute of Technology)

Creative Programming for Digital Media & Mobile Apps Sept 2013
Coursera (University of London)

AWARDS, SCHOLARSHIPS, AND GRANTS

AAMAS 2018 Student Scholarship 2018

19th European Agent Systems Summer School Scholarship 2017

Best New Outreach Activity Award March 2017
University of Southampton Science and Engineering Festival. Awarded to the three NGCM activities including PythonTool-Mod for Minecraft: developing programming skills with Minecraft & Python.

UK EPSRC International Doctoral Scholarship 2015-2019

EU EACEA Postgraduate Scholarship 2015

Fundación Mutua Madrileña Postgraduate Scholarship 2013-2015

EU Erasmus Exchange Scholarship 2011-2012

CONFERENCES, SUMMER SCHOOLS, PRESENTATIONS AND EVENTS ATTENDED

19th European Agent Systems Summer School August 2017
University of Gdańsk (Poland)

NGCM Strategic Advisory Board 2016 Nov 2016
University of Southampton (UK)
Gave **presentation**: *Developing Programming Skills with Minecraft & Python*
Presented **poster**: *Agent-Based Modelling of High-Frequency Trading*

Southampton Python User Group Aug 2016
University of Southampton (UK)
Gave **presentation**: *Continuous Integration using CircleCI*, together with Ryan Pepper.

EuroPython 2016 July 2016
Euskalduna Conference Center (Spain)

NGCM Summer School 2016 June 2016
University of Southampton (UK)
Presented **poster**: *Agent-Based Modelling of High-Frequency Trading*

NGCM Strategic Advisory Board 2015 Nov 2015
University of Southampton (UK)
Gave **presentation**: *Agent-Based Modelling of High-Frequency Trading*

Student Conference on Complexity Science SCCS 2014 Aug 2014
University of Sussex (UK)

Erasmus Mundus Summer School on Networks June 2014
Chalmers University of Technology (Sweden)
Gave **presentation**: *Ultrasonic transducers: From analytical modelling to design optimisation and validation.*

OTHER CONTRIBUTIONS

NGCM Summer Academy 2017 June 2017
University of Southampton (UK)
Part of the organising committee: general management.

Academic Paper Reviews
I have sub-reviewed several papers in top journals and conferences, such as Applied Energy, AAMAS and AAAI.

TEACHING

Outreach Activity: PythonTool-Mod for Minecraft: developing programming skills with Minecraft & Python March 2017
University of Southampton Science and Engineering Festival (UK)

Outreach Activity: PythonTool-Mod for Minecraft: developing programming skills with Minecraft & Python Feb 2017
Winchester Science Centre (UK)

Beginner Python Programming Workshop May 2016
University of Southampton (UK)
Helped as a demonstrator.

Beginner Python Programming June 2016
NGCM Summer Academy 2016, University of Southampton (UK)
Helped as a demonstrator.

Version Control June 2016

NGCM Summer Academy 2016, University of Southampton (UK)
Helped as a demonstrator.

Continuous Integration Workshop Feb 2016
University of Southampton (UK)
Seminar leader together with Ryan Pepper.

Postgraduate Demonstrator 2016-
University of Southampton (UK)
Demonstrator for undergraduate problem sessions and tutorials, for various courses.

SKILLS

Languages	Spanish (mother tongue) English (fluent) French (intermediate)
Programming	Python, C, Java, R, Matlab
Teaching	Postgraduate Demonstrator. Regularly supervise undergraduate problem sessions and tutorials, and mark assignments.
Other	Knowledge of research methodologies Knowledge of technical writing Knowledge of presentation skills

REFERENCES

Associate Professor Enrico Gerding
Department of Electronics and Computer Science, University of Southampton, SO17 1BJ, United Kingdom.

Professor Frank McGroarty
Southampton Business School, University of Southampton, SO17 1BJ, United Kingdom.