JOAQUIM VIEGAS

joaquim.viegas@tecnico.ulisboa.pt | (+351) 918 712 711

jqmviegas.github.io

Keywords: Data Science, Optimization, Computational Intelligence, Intelligent Automation, Machine Learning, Sustainable Energy Systems, Smart grid, Scientific Research, Consulting

1. Education

PhD in Sustainable Energy Systems, IST, University of Lisbon, Portugal **2014 – Ongoing**

- Thesis: **Data Analysis for Smart Grids: On Consumer Behavior and Grid Management**.
- Expected to finish in 2018.
- Coursework included energy management, optimization, project financial evaluation, risk management and scientific writing (grade average: 18/20)

Master's degree (MSc) in Mechanical Engineering **2008 – 2013**

- Control and automation of mechanical systems branch.
- Thesis: **Retail Steel Cutting Optimization – Metaheuristics for Cutting & Packing problems** (graded 19/20).
- Coursework included Intelligent Systems, Optimization & Decision, Object Oriented Programming and Databases, Management, Statistics, Calculus, System Identification, Modeling and Control of Supply-Chain Systems.
- Grade average: 16/20

2. Professional experience

Researcher at IDMEC, Instituto Superior Técnico, University of Lisbon **2018 – ?**

- Leading a team responsible for the development of Industry 4.0 solutions and novel research in the fields of Simulation, Optimization and Automation for an industrial client.
- Assessment of requirements and development of tools for Simulation and Scheduling of a highly complex industrial environment.

PhD Studentship in Industry, FCT, Novabase Business Solutions and IDMEC **2014 – 2018**

- Development of research work at Novabase Business Solutions and at the Center of Intelligent Systems, of IDMEC (IST, University of Lisbon).
- Research and development of Computational Intelligence and Machine Learning based solutions for:
    - Segmentation of electricity consumers, analysis and correlation between consumption behavior and consumer characteristics and load profiling.
    - Detection of electricity fraud and non-technical losses in the electricity grid, including integration in a business analytics solution for a client.
    - Prediction of faults and critical events in smart grid assets from Big Data.
- Assessment of requirements and development of a module for the forecasting of demand and production of energy in a region, part of a solution for business planning and consolidation. Included extensive analysis of requirements and workflows, testing and support with the clients.
- Participation on the development of project proposals involving Machine Learning components for different business areas (e.g. Telecommunications, Banking).
- Writing successful project proposals for innovation grants under QREN/P2020.

Bachelor Research Scholarship, FCT **2013 – 2014**

- QREN Project – Tooling Edge – IST, University of Lisbon.
- Research and development of techniques for the optimization and simulation of association and cutting processes at a retail steel cutting company. Development of optimization software application.

Summer Internship, LUT Metal Technology, Finland **2012 – 2012**

- Research related to the automation of aluminum welding, review and correction of students reports on welding.

3. Scientific research

3.1. Scientific projects and technological development projects with industry

SusCity – Project: MITP-TB/CS/0026/2013 **2015 – 2018**

- *Urban data driven models for creative and resourceful urban transitions,* FCT (Portuguese Foundation
- This project is focused on developing and integrating new tools and services to increase urban resource efficiency with minimum environmental impacts while contributing to promote economic development and preserving the actual levels of reliability. Dispersion of agents producing data at urban level (City Council, Utilities, State agencies and

institutes, Corporations) lead to mixed results in applying indicators in different environments and sometimes with little gain in urban performance, namely in terms of sustainability. This project aims at advancing the science of urban systems modeling and data representation supported by urban "big data" collection and processing, with the double objective of enabling and demonstrating a suite of new services that explore economic opportunities associated with the transition to sustainable urban systems.

ToolingEdge **2013 – 2014**

- *Produção Sustentável de Elevado Desempenho (Projecto n.13856—Aviso 36/ SI/ 2009 – Projectos Mobilizadores*—ToolingEDGE*.*
- Development of a tool for the optimization of retail steel cutting using metaheuristics.
- Work in close cooperation with F. Ramada.

3.2. Publications

International journal articles

1. J. L. Viegas, P. R. Esteves, & S. M. Vieira. "Clustering-based novelty detection for identification of non-technical losses". *International Journal of Electrical Power and Energy Systems*, 101 (February), 301–310, (2018).
2. J. L. Viegas, P. R. Esteves, R. Melício, V. M. F. Mendes, and S. M. Vieira. "Solutions for Detection of Non-Technical Losses in the Electricity Grid: A Review." *Renewable and Sustainable Energy Reviews* 80, no. December (2017).
3. M. P. Fernandes, J. L. Viegas, S. M. Vieira, and J. M. C. Sousa, "Segmentation of Residential Gas Consumers Using Clustering Analysis," Energies, vol. 10, no. 12, p. 2047, 2017.
4. C. M. Salgado, J. L. Viegas, C. S. Azevedo, M. C. Ferreira, S. M. Vieira, and M. C. Sousa. "Takagi-Sugeno Fuzzy Modeling Using Mixed Fuzzy Clustering." *IEEE Transaction on Fuzzy Systems* 6706, no. c (2016).
5. J. L. Viegas, S. M. Vieira, R. Melício, V. M. F. Mendes, and J. M. C. Sousa, "Classification of new electricity customers based on surveys and smart metering data," *Energy 107* (2016).
6. J. L. Viegas, S. M. Vieira, E. M. P. Henriques, and J. M. C. Sousa. "Heuristics for Three-Dimensional Steel Cutting with Usable Leftovers Considering Large Time Periods." *European J. Industrial Engineering* 10, no. 4 (2016).

International conference papers

7. J. L. Viegas, N. M. Cepeda, & S. M. Vieira. (Accepted for presentation) "Electricity fraud detection using committee semi-supervised learning". *Proc. of the 2018 International Joint Conference on Neural Networks* (IJCNN).
8. J. L. Viegas and S. M. Vieira. "Clustering-Based Novelty Detection to Uncover Electricity Theft." In *Proc. of the 2017 IEEE International Conference on Fuzzy Systems (FuzzIEEE)*, 2017.

9. J. L. Viegas, S. M. Vieira, R. Melício, and J. M. C. Sousa, “Prediction of events in the smart grid : interruptions in distribution transformers,” in *Proceedings of the 17th International Conference on Power Electronics and Motion Control*, 2016.

10. J. L. Viegas, S. M. Vieira, and J. M. C. Sousa, “Mining Consumer Characteristics from Smart Metering Data through Fuzzy Modelling,” in *16th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems*, 2016.

11. J. L. Viegas, S. M. Vieira, R. Melício, V. M. F. Mendes and J. M. C. Sousa, “GA-ANN Short-Term Electricity Load Forecasting,” in *Technological Innovation for Cyber-Physical Systems*, vol. 470, Springer International Publishing, 2016, pp. 485–493.

12. M. P. Fernandes, J. L. Viegas, S. M. Vieira, and J. M. C. Sousa, “Seasonal clustering of residential natural gas consumers,” in *16th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems*, 2016.

13. M. P. Fernandes, J. L. Viegas, S. M. Vieira, and J. M. C. Sousa, “Analysis of Residential Natural Gas Consumers using Fuzzy C-means Clustering,” in *Proceedings of the 2016 IEEE International Conference on Fuzzy Systems*, 2016.

14. H. Algarvio, J. L. Viegas, F. Lopes, D. Amaro, A. Pronto, and S. M. Vieira, “Electricity Usage Efficiency in Large Buildings: DSM Measures and Preliminary Simulations of DR Programs in a Public Library,” in *Highlights of Practical Applications of Agents, Multi-Agent Systems, and Sustainability - The PAAMS Collection: International Workshops of PAAMS 2015, Salamanca, Spain, June 3-4, 2015. Proceedings*, 2015, pp. 249–259.

15. M. C. Ferreira, C. Salgado, J. L. Viegas, H. Schafer, C. Azevedo, S. M. Vieira, and J. M. C. Sousa, “Fuzzy modeling based on Mixed Fuzzy Clustering for health care applications,” in *Proceedings of the 2015 IEEE International Conference on Fuzzy Systems*, 2015.

16. H. Schafer, J. L. Viegas, M. C. Ferreira, S. M. Vieira, and J. M. C. Sousa, “Analysing the Segmentation of Energy Consumers Using Mixed Fuzzy Clustering,” in *Proceedings of the 2015 IEEE International Conference on Fuzzy Systems*, 2015.

17. J. L. Viegas, S. M. Vieira, R. Melício, V. M. F. Mendes, and J. M. C. Sousa, “Electricity demand profile prediction based on household characteristics,” *Proceedings of the 12th International Conference on the European Energy Market*, 2015.

18. J. L. Viegas, S. M. Vieira, and J. M. C. Sousa, “Fuzzy clustering and prediction of electricity demand based on household characteristics,” in *Proceedings of the16th World Congress of the International Fuzzy Systems Association (IFSA) and the 9th Conference of the European Society for Fuzzy Logic and Technology (EUSFLAT)*, 2015.

19. J. P. L. Viegas, S. M. Vieira, J. M. C. Sousa, and E. M. P. Henriques, “Metaheuristics for the 3D bin packing problem in the steel industry,” *2014 IEEE Congress on Evolutionary Computation (CEC)*, pp. 338–343, Jul. 2014

20. 1. J. L. Viegas, S. M. Vieira, E. M. P. Henriques, and J. M. C. Sousa, “A Tabu Search Algorithm for the 3D Bin Packing Problem in the Steel Industry,” in *CONTROLO’2014 - Proceedings of the 11th Portuguese Conference on Automatic Control*, 2015, pp. 355–364.

3.3. Reviews for international journals

Invited reviewer for:

- Applied Energy, Elsevier (Impact Factor = 7.90, 2017)
- IEEE Transactions on the Smart Grid (Impaxct Factor = 7.364)
- Energy Strategy Reviews, Elsevier (Impact Factor = 2.164, 2017)
- Energy Efficiency, Springer (Impact Factor = 1.634)
- Mathematics and Computers in Industry, Elsevier (Impact Factor = 1.476, 2017)

3.4. Supervision of students

MSc students concluded:

1. Co-supervisor of Diogo Caridade: Master degree in Mechanical Engineering, IST, University of Lisbon, Portugal. Thesis: Detection of Non-Technical Losses Based on Time-Series Classification
2. Co-supervisor of Miguel Pina: Master degree in Mechanical Engineering, IST, University of Lisbon, Portugal. Thesis: Prediction of electricity consumers behavior based on smart-metering data, defended in October 2016
3. Co-supervisor of Diogo Sousa: Master degree in Mechanical Engineering, IST, University of Lisbon, Portugal. Thesis: Analysis of electricity consumers behavior: main drivers and annual demand profile variation, defended in June 2017

MSc classes' projects:

- **Intelligent Systems**
  Proposal and supervision of projects for forecasting energy demand and clustering demand profiles.
- **Optimization & Decision**
  Proposal and supervision of student projects on the optimization of electricity tariffs.

3.5. Prizes and grants

- Recipient of a travel grant for the 2018 World Congress on Computational Intelligence by the Computational Intelligence Society of IEEE;
- Recipient of the best paper award at the 7th Advanced Doctoral Conference on Computing, Electrical and Industrial Systems for the paper "GA-ANN Short-Term Electricity Load Forecasting".

4. Skills

4.1. Languages

- **Portuguese** – Mother tongue
- **French** – Mother tongue
- **English** – Proficient (fluent written and spoken communication and expression)
- **Spanish** – Elementary to intermediate

4.2. Programming

- **Python**
  Proficient. Strong project architecture, scripting and data analysis/modelling skills (experienced in the use of data analysis and statistics modules, such as *pandas* and *statsmodels*, machine learning modules, such as *scikit-learn*, data visualization and plotting modules, such as *matplotlib* and *seaborn*).
- **MATLAB**
  Experienced in the development of scripts and simulation software for scientific research in optimization and operations research.
- **C++**
  Intermediate skills developed in university classes.
- **R**
  Intermediate skills. Developed models for forecasting energy demand and dashboards using the *shiny* library.
- **SQL**
  Intermediate skills. Worked with PostgreSQL and Microsoft SQL Server in multiple consulting projects.

4.3. Software

- **Microsoft Office**
  Power user of Word, Excel, PowerPoint, Outlook. Developed VBA modules to consume a predictive Web API in excel. Knowledge of PowerQuery and PowerPivot.
- **Microsoft PowerBI**
  Intermediate skills. Development of dashboards to present prediction results and performance of a Machine Learning model for electricity fraud detection.
- **Microstrategy**
  Intermediate skills. Development of data model, reports and dashboards for the detection of non-technical losses and fraud in the electric sector.
- **SAP BPC**
  Intermediate skills. Strong skills in the creation of complex reports and formatting. Intermediate skills in Script Logic and general administration tasks.
- **AzureML**

Elementary to intermediate skills. Participation in workshop at Microsoft (Lisbon) and development of prototypes.

4.4. Other

- **Artistic**
  Musician (Saxophone: Training in conservatory and participation in multiple small orchestras and groups)
- **Driver's license**
  Class B