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Mirko Polato

Curriculum vitæ

Personal Information

Name Mirko
Surname Polato
Date of Birth 17/05/1988
Place of Birth Monselice, (Padova, Italy)
Nationality Italian

Current Position

08/19 – Today **Postdoctoral Fellow**, at *University of Padova, Department of Mathematics*,
Project: Blockchain-based digital forensics technologies for mobile devices and
cloud computing, H2020.
Scientific Coordinator: Prof. Mauro Conti

Research Interests

Recommender Systems, interpretability in machine learning, representation learning, kernel methods,
kernel learning, relational data mining, process mining, applied machine learning, adversarial machine
learning, security in machine learning

Previous Positions

07/18 – 7/19 **Postdoctoral Fellow**, at *University of Padova, Department of Mathematics*,
Project: Machine Learning and Data Fusion methods with application to environ-
mental data, H2020 - GEOEssential.
Scientific Coordinator: Prof. Mario Putti

02/18 – 06/18 **Research Fellow**, at *Human Inspired Technology Research Centre*, Fellowship
title: Security and privacy in information centric networks..
Scientific Coordinator: Prof. Mauro Conti.

11/14 – 11/18 **Ph.D. Student**, Course: *Brain, Mind and Computer Science*, at University of
Padova, Research area: Machine Learning and Recommender Systems..
Advisor: Prof. Fabio Aioli

10/13 – 10/14 **Research Fellow**, at *University of Padova, Department of Mathematics*, in the European Project PROMPT.

Development of Process Mining based predictive techniques for business processes.

I developed a prediction method able to forecast the remaining time of running business process instances. This method exploits an approach at the state of the art combined with machine learning techniques (i.e., Naïve Bayes and Support Vector Regression). This work it is going to be included in a generic Service Level Agreement violations predictor.

Education

11/14 – 03/18 **Ph.D.**, Course: *Brain, Mind and Computer Science*, at University of Padova.

Research field: Machine Learning and Recommender Systems

Thesis title: *Definition and learning of logic-based kernels for categorical data, and application to collaborative filtering.*

Supervisor: Prof. Fabio Aioli.

Co-Supervisor: Prof. Anna Spagnoli.

12/10 – 07/13 **Master degree in Computer Science**, *University of Padova, Department of Mathematics*, Curriculum: Artificial Intelligence.

Thesis title: Development of a support tool for email classification concerning IT services help desk

Main classes: Machine Learning, Artificial Intelligence, Temporal Reasoning, Constraint reasoning, Bioinformatics, Combinatorial Optimization and Approximation Algorithms.

Final mark **110/110 with honours**.

10/07 – 12/10 **Bachelor degree in Computer Science**, *Facoltà di Scienze MM.NN.FF dell'University of Padova*.

Thesis title: Design and development of a CAD environment

Final mark **106/110**.

09/02 – 07/07 **Diploma di scuola superiore**, *ITIS F.Viola*, Rovigo, Indirizzo tecnico industriale specializzazione informatica.

Thesis title: Game theory: development of a checkers engine

Final mark **100/100**.

Reviewer/Referee

- Journals
- **Neurocomputing** (Elsevier)
 - **Neural Processing Letters** (Springer)
 - **Transactions on Information Systems** (ACM)
 - **Transactions on Intelligent Systems and Technology** (ACM)
 - **Neural Networks** (Elsevier)
 - Concurrency and Computation: Practice and Experience (Wiley)
 - **Computing** (Springer)
 - International Journal of Information Security (Springer)
 - Entropy (MDPI)
 - Knowledge and Information Systems (Springer)
 - Journal of Information and Knowledge Management (World Scientific Publishing Co.)
 - Mathematics (MDPI)
 - Stats (MDPI)
 - Applied Sciences (MDPI)
 - International Journal of Finance and Economics (Wiley)
 - PLOS ONE
 - Advances in Water Resources (Elsevier)
- Conferences
- Conference on Neural Information Processing Systems (**NeurIPS**)
 - AAAI Conference on Artificial Intelligence (**AAAI**)
 - IEEE International Joint Conference on Neural Networks (**IJCNN**)
 - European Symposium on Artificial Neural Networks Computational Intelligence and Machine Learning (ESANN)
 - ENNS International Conference on Artificial Neural Networks (ICANN)
 - Workshop on Machine Learning for Signal Processing, New Generation of Circuits and Systems (NGCAS)
 - ASIA Conference on Computer and Communications Security (ASIACCS)
 - International Conference of the Italian Association for Artificial Intelligence (AI*IA)
 - INNS Conference on Big Data and Deep Learning (INNS BDDL)
 - New Generation of Circuits and Systems Conference (NGCAS)
 - IEEE International Workshop on Machine Learning for Signal Processing (MLSP)

Publications

Journal

- J06 Learning with subsampled kernel-based methods: Environmental and financial applications**, *M. Aminian Shahrokhbadi, A. Neisy, E. Perracchione, M. Polato*, Dolomites Research Notes on Approximation, Padova University Press, Vol. 12, 2019.
- J05 Boolean kernels for rule based interpretation of Support Vector Machines**, *M. Polato, F. Aiolli*, Neurocomputing, (inpress), 2019.
- J04 A Novel Boolean Kernels Family for Categorical Data**, *M. Polato, I. Lauriola, F. Aiolli*, Entropy, Vol. 20 (6), n. 444, 2018.

- J03 Disjunctive Boolean Kernels for Collaborative Filtering in Top-N Recommendation**, *M. Polato, F. Aiolli*, Neurocomputing, Vol. 286, pp. 214-225, 2017.
- J02 Time and Activity Sequence Prediction of Business Process Instances**, *M. Polato, A. Sperduti, A. Burattin, M. de Leoni*, Computing, 2018.
- J01 Exploiting sparsity to build efficient kernel based collaborative filtering for top-N item recommendation**, *M. Polato, F. Aiolli*, Neurocomputing, Vol. 268, pp. 17-26, 2017.
- Conference
- C15 Playing the large margin preference game**, *M. Polato, G. Faggioli, I. Lauriola, F. Aiolli*, International Conference on Artificial Neural Networks (ICANN, Munich, Germany), 2019.
- C14 Evaluation of tag clusterings for user profiling in movie recommendation**, *G. Faggioli, I. Lauriola, M. Polato, F. Aiolli*, International Conference on Artificial Neural Networks (ICANN, Munich, Germany), 2019.
- C13 A Preference-Learning framework for modeling Relational data**, *I. Lauriola, M. Polato, G. Faggioli, F. Aiolli*, INNS Conference on Big Data and Deep Learning (INNS BDDL, Sestri Levante, Italy), 2019.
- C12 Mind Your Wallet's Privacy: Identifying Bitcoin Wallet Apps and User's Actions through Network Traffic Analysis**, *F. Aiolli, M. Conti, A. Gangwal, M. Polato*, ACM Symposium On Applied Computing (SAC, Limassol, Cyprus), 2019.
- C11 Interpretable preference learning: a game theoretic framework for large margin on-line feature and rule learning**, *M. Polato, F. Aiolli*, AAAI Conference on Artificial Intelligence (AAAI, Honolulu, Hawaii (USA)), 2019.
- C10 A game-theoretic framework for interpretable preference and feature learning**, *M. Polato, F. Aiolli*, International Conference on Artificial Neural Networks (ICANN, Rhodes, Greece), 2018.
- C09 Learning preferences for large scale multi-label problems**, *I. Lauriola, M. Polato, F. Aiolli*, International Conference on Artificial Neural Networks (ICANN, Rhodes, Greece), 2018.
- C08 Boolean kernels for interpretable kernel machines**, *M. Polato, I. Lauriola, F. Aiolli*, European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN, Bruges, Belgium), 2018.
- C07 The Minimum Effort Maximum Output Principle applied to Multiple Kernel Learning**, *I. Lauriola, M. Polato, F. Aiolli*, European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN, Bruges, Belgium), 2018.
- C06 LSTM Networks for Data-Aware Remaining Time Prediction of Business Process Instances**, *N. Navarin, B. Vincenzi, M. Polato, A. Sperduti*, IEEE Symposium Series on Computational Intelligence 2017 (SSCI, Honolulu, Hawaii), 2017.
- C05 Model-free predictive current control for a SynRM drive based on an effective update of measured current responses**, *D. Darù, M. Polato, S. Bolognani*, IEEE International Symposium on Predictive Control of Electrical Drives and Power Electronics (PRECEDE, Pilsen, Czech Republic), 2017.

- C04 Radius-margin ratio optimization for dot-product boolean kernel learning**, *I. Lauriola, M. Polato, F. Aiolli*, International Conference on Artificial Neural Networks (ICANN, Alghero, Italy), 2017.
- C03 Classification of categorical data in the feature space of monotone DNFs**, *M. Polato, I.Lauriola, F. Aiolli*, International Conference on Artificial Neural Networks (ICANN, Alghero, Italy), 2017.
- C02 Kernel based collaborative filtering for very large scale top-N item recommendation**, *M. Polato, F. Aiolli*, European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN, Bruges, Belgium), 2016.
- C01 Data-Aware Remaining Time Prediction of Business Process Instances**, *M. Polato, A. Sperduti, A. Burattin, M. de Leoni*, International Joint Conference on Neural Networks (IEEE World Congress on Computational Intelligence, Beijing, China), 2014.
- [Workshop](#)
- W04 Tag-Based User Profiling: A Game Theoretic Approach**, *G.Faggioli, M. Polato, F. Aiolli*, International Workshop on Explainable and Holistic User Modeling at the ACM Conference On User Modelling, Adaptation And Personalization (Larnaca, Cyprus), 2018.
- W03 Efficient Similarity Based Methods For The Playlist Continuation Task**, *G.Faggioli, M. Polato, F. Aiolli*, RecSys Challenge (RecSys, Vancouver, Canada), 2018.
- W02 Disjunctive Boolean Kernel based Collaborative Filtering for top-N item recommendation**, *M. Polato, F. Aiolli*, Italian Information Retrieval Workshop (IIR, Lugano, Switzerland), 2017.
- W01 A preliminary study on a recommender system for the job recommendation challenge**, *M. Polato, F. Aiolli*, RecSys Challenge (RecSys, Boston, USA), 2016.
- [Technical Report](#)
- T02 Modelling and processing services and tools**, *E. Perracchione, M. Polato, D. Tran, F. Piazzon, F. Aiolli, S. De Marchi, S. Kollet, C. Montzka, A. Sperduti, M. Vianello, M. Putti*, GEO Essential Deliverable 1.3, 2018.
http://www.geoessential.eu/wp-content/uploads/2019/01/GEOEssential-D_1.3_final.pdf
- T01 Data fusion guidelines**, *E. Perracchione, M. Polato, D. Tran, F. Piazzon, F. Aiolli, S. De Marchi, S. Kollet, C. Montzka, A. Sperduti, M. Vianello, M. Putti*, GEO Essential Deliverable 1.6, 2018.
http://www.geoessential.eu/wp-content/uploads/2019/01/GEOEssential-D_1.6_final.pdf

Research period abroad

04/17 – 07/17 **Visiting Ph.D. Student**, at *Technische Universiteit Delft*, Multimedia Computing group, Supervision: Prof. Martha Larson.

Scientific Communications

- As speaker
- M. Polato, F. Aioli. *A preliminary study on a recommender system for the job recommendation challenge*. RecSys Challenge Workshop, Boston (USA), 15 – 19 September 2016.
 - M. Polato, F. Aioli. *Disjunctive Boolean Kernel based Collaborative Filtering for top-N item recommendation*. Italian Information Retrieval Workshop, Lugano (Switzerland), 05 – 07 June 2017.
 - M. Polato, A. Sperduti, A. Burattin, M. de Leoni. *Data-Aware Remaining Time Prediction of Business Process Instances*. International Joint Conference on Neural Networks (IEEE World Congress on Computational Intelligence), Beijing (China), 06 – 11 July 2014.
 - M. Polato, F. Aioli. *Kernel based collaborative filtering for very large scale top-N item recommendation*. European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning, Bruges (Belgium), 27 – 29 April 2016.
 - M. Polato, I.Lauriola, F. Aioli. *Classification of categorical data in the feature space of monotone DNFs*. International Conference on Artificial Neural Networks, Alghero (Sardegna, Italy), 11 – 14 September 2017.
 - M. Polato, I.Lauriola, F. Aioli. *Boolean kernels for interpretable kernel machines*. European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning, Bruges (Belgium), 25 – 27 April 2018.
 - M. Polato, F. Aioli. *Interpretable preference learning: a game theoretic framework for large margin on-line feature and rule learning*. AAAI Conference on Artificial Intelligence, Honolulu (Hawaii, USA), 27 January – 1 February 2019.
 - M. Polato, F. Aioli. *Tag-Based User Profiling: A Game Theoretic Approach*. ExHum Workshop at the ACM Conference On User Modelling, Adaptation And Personalization, Larnaca (Cyprus), 9 – 12 June 2019.
 - M. Polato, G. Faggioli, I. Lauriola, F. Aioli. *Playing the large margin preference game*. International Conference on Artificial Neural Networks (Germany), 17 – 19 September 2019.
- As participant
- ACM Conference on Recommender Systems, Como (Italy), 27 – 31 August 2017.
- Seminars
- Series of seminars entitled “Scrittura di testi scientifici”, sponsored by Fondazione Cariparo, for high school students, at University of Padova - Department of Mathematics, 10 – 14 July 2017.
 - Seminar on “Interpretable preference learning: a game theoretic framework for large margin on-line feature and rule learning”, at University of Padova - Department of Mathematics, 29 November 2018.

Teaching and Tutoring

- 10/18 – 01/19 **Teaching support**, at *University of Padova*.
Teaching support for the Programming course (**python**) for the bachelor degree in Mathematics.
- 10/18 – Today **Teaching support**, at *University of Padova*.
Teaching support for the Computer Architecture course for the bachelor degree in Computer Science.
- 10/16 – 01/17 **Teaching support**, at *University of Padova*.
Teaching support for the Programming course (**python**) for the bachelor degree in Mathematics.
- 10/15 – 01/16 **Teaching support**, at *University of Padova*.
Teaching support for the Programming course (**python**) for the bachelor degree in Mathematics.
- 11/14 – 01/15 **Teaching support**, at *University of Padova*.
Teaching support for the Programming course (**python**) for the bachelor degree in Mathematics.

Work Experience

- 09/11 – 09/13 **Software Developer**, at *Laura Sapiens s.r.l.*, Research and development.
I took charge of the development of *EGO! Service Pack*, desktop application for Windows and Mac OS X.
I developed the client application of the EGO! ecosystem by Laura Sapiens. This application allows EGO! Smartmouse (a device with bluetooth connectivity) to communicate with Windows and Mac OS X.
- 07/10 – 09/10 **Intern**, at *IT+Robotics*, development of a CAD environment as plugin of a work cell simulator.
I developed a plugin of the work cell simulator, which allows users to create a 2D CAD model with most of the functionality offered by a professional CAD software. This 2D model is then integrated with the simulator by an extrusion module.

Projects and Softwares

- 01/19 – Today **PRL**, *Preference and Rule Learning algorithm implementation for Python 3*, developed at University of Padova.
PRL is a preference learning algorithm which learns the maximal margin hypothesis by incrementally solving a two-player zero-sum game. The algorithm has theoretical guarantees about its convergence to the optimal solution. PRL has been presented at AAAI 2019 (see the *Publications* section).
Source code available at <https://github.com/makgyver/PRL>.
- 06/15 – Today **Pyros**, *Collaborative Filtering Framework for top-N recommendation*, developed during my ongoing PhD at University of Padova.
The framework offers different algorithms for top-N recommendation with implicit feedback. In particular it contains the implementation of all the methods presented in my publications (see the *Publications* section).
Source code available at <https://github.com/makgyver/pyros>.

- 06/13 – 09/13 **EGO! Service Pack**, *Desktop application for Mac OS X*, developed at Laura Sapiens s.r.l.
This is one of the main components of the EGO! family. It allows to EGO! Smartmouse and EGO! Keywi to communicate with Mac OS X via bluetooth.
- 10/12 – 07/13 **E-mail classifier**, *Java application*, developed as Master degree in Computer Science thesis project.
Support tool for email classification concerning IT services help desk, used by the Italian company Infonet Solutions s.r.l.
- 11/12 – 12/12 **Scala Game of Life**, *Scala application*, developed for the *Advance programming language* course.
Simulation of the cellular automata, called *Game of Life*, by John Conway.
- 09/11 – 09/13 **EGO! Service Pack**, *desktop application for Windows*, developed at Laura Sapiens s.r.l.
This is one of the main components of the EGO! family. It allows to EGO! Smartmouse and EGO! Keywi to communicate with Windows via bluetooth.
- 07/11 – 12/11 **PoBo-CP Net**, *Java application*, developed for the *Constraint Networks* course.
This software allows the user creating and solving acyclic CP-Nets.
Source code available at <https://github.com/bonnyfone/PoBo-CP-Net>
- 03/11 – 09/11 **MKCE 64**, *chess engine*, developed for the *Artificial Intelligence* course.
Chess engine (with a command line interface) optimized for 64 bit architecture.
- 07/10 – 09/10 **CAD Editor**, *desktop application for Windows*, developed at IT+Robotics.
This is a plugin of the work cell simulator software called *WorkCellSimulator*.
- 2007 **Checkers game**, *desktop application for Windows*, developed as high school thesis project.
Checkers engine with GUI developed in C#.

Technical Skills

- Programming Languages **python** (excellent), **C#**, **C++**, **java**, scala, SQL, HTML, CSS, \LaTeX , javascript, XML, C, ML, Objective C
- OS **Mac OS X** (excellent), Windows, Linux
- IDE Visual Studio, eclipse, Code Runner, PyCharm
- Platforms and Frameworks .NET, Android, ProM
- Versioning tools Git, SVN
- Personal skills Adaptability, **problem solving**, **rapid learning**, team work, dedication

Certificates and Awards

- 04/19 **Best Student* Paper Award**, by *Internation Neural Network Society (INNS)*, at the INNS BDDL 2019, *the awarded student has been I. Lauriola.
- 09/17 **Student Travel Grant**, by *European Neural Network Society (ENNS)*, for the ICANN conference 2017.

- 10/15 **Introduction to Recommender Systems**, by University of Minnesota on Coursera, License: VMV6CND54VUP.
- 2015 **English Level B2**.
- 2006 **Driving license**, Categoria B.
- 2006 **ECDL**, European Computer Driving Licence.
- 2017 **1a Categoria Nazionale**, Chess, Federazione Scacchistica Italiana.

Formative activities

Schools

- 09/19 **International Summer School on “Machine Learning and Security”**, University of Padova.

Courses

- 02/15 **Introduction to Machine Learning**, Lecturer: Prof. Alessandro Sperduti, University of Padova.
- 03/15 – 04/15 **Methods and Case Studies in Human Computer Interaction**, Lecturers: Prof. Luciano Gamberini and Prof. Anna Spagnolli, University of Padova.
- 04/15 **Internet of Things**, Lecturers: Prof. Tullio Vardanega and Prof. Alessandro Beghi, University of Padova.
- 05/15 – 06/15 **Elements of Neuroscience**, Lecturers: Prof. Gianluca Campana, Prof. Massimo Grassi and Prof. Giuseppe Sartori, University of Padova.
- 07/15 **Principles of Cloud Computing**, Lecturer: Prof. Tullio Vardanega, University of Padova.
- 09/15 **Scientific Communication - How to Write and Present Scientific**, Lecturer: Prof. Konstantinos Priftis, University of Padova.
- 09/16 **Research design laboratories**, Lecturer: Prof. Luciano Gamberini, University of Padova.

Languages

- Italian **Mother tongue**
- English **Professional**

Other Activities

- 03/19 Chess teacher at Scuole medie di Pozzonovo (PD).
- 03/19 Chess teacher at Scuole medie di Tribano (PD).
- 03/18 – 05/18 Chess coach at Biblioteca Comune di Valbona (PD).
- 02/18 Chess teacher at Istituto Istruzione Superiore Cattaneo-Mattei (Monselice, PD).
- 02/18 Chess teacher at Scuole medie di Tribano (PD).
- 2006 Teacher for a series of chess lessons at Istituto Tecnico Industriale Statale “F.Viola” (Rovigo).

Other Information

Associations Institute of Electrical and Electronics Engineers (IEEE) member, Association for Computing Machinery (ACM) member, European Neural Network Society (ENNS) member