Curriculum Vitae

Francesco Cannarile, Ph.D.

Personal Data

Born: 01/04/1988
Nationality: Italian
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Work Experience

ARAMIS s.r.l. (2014-)

- Leading developer of advanced Machine Learning (ML) and Artificial Intelligence (AI) models for predictive analytics.
- Advanced data analytics, predictive models for the implementation of predictive maintenance strategies for Industry 4.0. (Oil & Gas, Manufacturing, Automotive, Aerospace, Railway, Process and Chemical Industry, Energy, etc.).
- Technical activity planning and managing.

Education

Politecnico di Milano (2014-2018)
Doctor of Philosophy (Ph.D.), Mathematical Models and Methods in Engineering.

- Title of the dissertation: "Wavelet and Instance-based Methods for Nonstationary time-series analysis". Supervisors: Prof. Piero Baraldi, Prof. Enrico Zio.
- This research work has been developed as a four year Executive Ph.D. programme between ARAMIS s.r.l. and the LASAR laboratory, Politecnico di Milano.
- Doctoral courses (grade):
    - Bayesian scientific computing (A)
    - Reinforcement learning (A)
    - Soft computing theory, techniques and applications (A)
    - Game theoretical models in engineering (A)
    - Inverse problem and data assimilation for process diagnosis (A)
    - Advanced methods in risk and reliability analysis (A)

Politecnico di Milano (2011-2014)
Master of Science (M.Sc.), Mathematical Engineering, 110 cum laude/110.

- Title of the dissertation: "Homogeneous Continuous-Time Discrete State Hidden Semi-Markov Modeling, Hierarchical K-Nearest Neighbours Classification and Differential Evolution Optimization for Fault Diagnostics and Prognostics". Supervisor: Prof. Piero Baraldi, Coadvisors: Ph.D. Michele Compare, Prof. Francesco Di Maio, Prof. Enrico Zio.

Universidade do Porto (2012-2013)
Erasmus Program (5 months)

Politecnico di Milano (2007-2011)
Bachelor of Science (B.Sc.), Mathematical Engineering.

- Title of the dissertation: Notions of convergence for random variables. Advisor: Prof. Anna Maria Paganoni.

Teaching Activity

Academia

Politecnico di Milano (2014-2018)

- Teaching assistants for M.Sc. course "Reliability, safety and risk analysis A+B" taken by Prof. Enrico Zio (70 hours).
    - Lectures notes on:
        -Discrete Time Finite State Markov chains
        -Continuous Time Finite State Markov Processes
        -Parameter Estimation: the frequentist approach
        -Parameter Estimation: the Bayesian approach
        -Parameter Estimation for dependent failure models
    - Exercise classes on:
        -Random variables and probability distrubutions
        -Reliability and availability of simple systems
        -Markov chain and markov Processes
        -Monte Carlo simulation
        -Parameter estimation: the frequentist approach
        -Parameter estimation: the bayesian approach
        -Parameter estimation for dependent failure models

- Teaching assistants for M.Sc. Course "Computational methods for reliability, availability and maintenance, taken by Prof. Piero Baraldi (6 hours).
    - Lectures notes on:
        -Wavelet transform

Lecturer at professional continuing course

Politecnico di Milano (2016-2018)

- Instructor at the continuing education course "Advanced methods for reliability, availability, maintainability, diagnostics and prognostics of industrial equipment", XVII, XVIII and XIX Edition, Politecnico di Milano – Energy Department, Milano. Lecture Notes on: Hilbert-Huang transform for predictive maintenance.

Centro Italiano delle Ricerche Aerospaziali (13-14 September 2016), Capua

- Instructor of the course "Mathematical Methods for Prognostics and Health Management" (12 hours). Lecture Notes on: time-frequency transform for time series analysis and chaotic time-series analysis for predictive maintenance.

Research

Publishing

Author/co-author of 7 papers published on international journals, 1 chapter in international books and 4 papers published in proceedings of international conferences. (for details, see the publication list).

Interests

Machine learning, representational learning and deep learning for predictive analytics with particular focus on predictive and proactive maintenance for Industry 4.0.

Academic Projects

Involved in the development of a fault detection and diagnostics tool for bearings mounted on fully electric vehicles within the European project HEMIS (http://www.hemis-eu.org/BearingsMonitoring.html).

Refereeing

- *International journals*
    - IJPHM Special Issue: Deep Learning and Emerging Analytics
    - Soft Computing
    - Internal Journal of Prognostics and Health Management
    - Applied Science
    - Machines

- *International conferences*
    - European Safety and Reliability Conference 2015-2019
    - Annual Conference of the Prognostics and Health Management Society 2016-2019

Seminars

Invited speaker at the IEEE DAY 2017, "Reliability and Maintenance 4.0: the present future of Industry development", Milan, 13 October, 2017. Seminar title: "Prognostics and Health Management of Industrial Components under Scarce Degradation Information: Developments and Applications"

Advising

Co-advisor of three master thesis at Politecnico di Milano

Honors-Awards

PHM Society (2017)
Selected to partecipate to the Prognostics and Health Management (PHM) Society Doctoral Symposium held during the "Annual Conference of the Prognostics and Health Management Society 2017", 1-5 October, St. petersburg, Florida, USA, for the devolpment of novel machine learning methods for predictive maintenance. Awarded with a full paid travel and conferences expenses.

European Project HERMES (2006)
Full paid travel and expenses for advanced English course at University of Wales of Lampeter.

Skills

Language skills

- Mother language: Italian
- Other languages

	Reading		Speaking		Writing
English (TOEIC certification)	C1	C1	C1	C1	C1
Portuguese	A1	A1	A1	A1	A1

Levels: A1 and A2: Base - B1 and B2: Good - C1 and C2: Advanced

Computer skills

- Matlab
- R
- Python
    - Machine learning libraries: Pandas, PyWavelets, Numpy, Scikit-Learn.
    - Deep learning framework: Keras, Pytorch
- Microsoft Office.

Technical skills

- Supervised and unsupervised learning
- Feature extraction and selection
- Feature learning
- Deep Learning
- Signal Processing
- Anomaly detection, fault diagnostics and prognostics

Soft skills

- Ability to work well with others as well as individually
- Problem solving and critical thinking
- Adaptability and propensity to learn new machine and statistical learning algorithms
- Communication skills and ability to boil down complex subjects to simple terms

Certified MOOCS

- Practical Deep learning with Pytorch
    - (https://www.udemy.com/certificate/UC-V1EOYRT4/)

List of publications

International Journals

- Cannarile, F., Compare, M., Baraldi, P., Diodati, G., Quaranta, V., Zio, E., "Elastic net nultinomial logistic regression for fault diagnostics of on-board aeronautical systems", Aerospace Science and Technology, accepted, 2019.
- Cannarile, F., Baraldi, P., Zio, E., "An evidential similarity-based regression method for the prediction of equipment remaining useful life in presence of incomplete degradation trajectories", Fuzzy Sets and Systems, 367, pp. 36-50.
- Cannarile, F., Baraldi, P., Colombo, P., Zio, E., "A novel method for sensor validation based on continuous wavelet transform scalograms", International Journal of Prognostics and Health Management, 9 (1), 2, pp. 14, 2018.
- Cannarile, F., Compare, M., Baraldi, P., Di Maio, F., Zio, E., "Homogeneous continuous-time, finite-state, semi-Markov modelling for enhancing empirical classification system diagnostics of industrial components", Machines, 6 (3), 34, 2018.
- Cannarile, F., Compare, M., Di Maio, F., Zio, E., "A clustering approach for mining reliability big data for asset management", Proceedings of the Institution of Mechanical Engineers, Part O: Journal of Risk and Reliability, 232 (2), pp. 140-150, 2018.
- Cannarile, F., Compare, M., Rossi, E., Zio, E. "A fuzzy expectation maximization method for estimating the parameters of a multi-state degradation model from imprecise maintenance outcomes", Annals of Nuclear Energy, 110, pp. 739-752, 2017.
- Baraldi, P., Cannarile, F., Di Maio, F., Compare, M., Zio, E., "Hierarchical k-nearest neighbours classification and binary differential evolution for fault diagnostics of automotive bearings operating under variable conditions", Engineering Applications of Artificial Intelligence, 56, pp. 1-13, 2016.

Chapters

- Cannarile, F., Compare, M., Zio, E., "A fault diagnostic tool based on a first principle model simulator", Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 10437 LNCS, pp. 179-193, 2017.

Conference proceedings

- Cannarile, F., Baraldi, P., Compare, M., Borghi, D., Capelli, L., Zio, E. "A heterogenous ensemble approach for the prediction of the remaining useful life of packaging industry machinery", In Safety and Reliability: Safe Societes in a Changing World, Proceedings of the European Safety and Reliability Conference (ESREL 2018), 2018.
- Cannarile, F., Baraldi, P., Compare, M., Borghi, D., Capelli, L., Cocconcelli, M., Lahrache, A., Zio, E. "An unsupervised clustering method for assessing the degradation state of cutting tools in the packaging industry", In Safety and Reliability: Theory and Application, Proceedings of the European Safety and Reliability Conference (ESREL 2017), 2017.
- Cannarile, F., Compare, M., Mattafirri, S., Carlevaro, F., Zio, E., "Comparison of Weibayes and Markov Chain Monte Carlo methods for the reliability analysis of turbine nozzle components with right censored data only", In Safety and Reliability of Complex Engineered Systems, Proceedings of the European Safety and Reliability Conference (ESREL 2015), 2015.
- Cannarile, F., Compare, M., Di Maio, F., Zio, E., "Handling reliability big data: a similarity-based approach for clustering a large fleet of assets", In Safety and Reliability of Complex Engineered Systems- Proceedings of the European Safety and Reliability Conference (ESREL 2015), 2015.

To be submitted/Under Review

- Cannarile, F., Baraldi, P., Zio, E. "A Functional data approach to fault diagnostics", Mechanical System and Signal processing, in preparation, 2019.
- Cannarile, F., Compare, M., Zio, E. "End-to-end sensor validation based on deep convolutional neural networks", in preparation, 2019.
- Cannarile, F., Compare, M., Zio, E., Duca, E., Febi, I., Renzetti, M., Platini, M., "A novel Dynamic-Weighing-in-Motion system for Freight Rail Carriages", IEEE Transactions on Intelligent Transportation Systems, under review, 2019.