

# Michele Bernardini

## *Curriculum Vitae*



### Personal information

Name Michele  
Surname Bernardini  
Date of birth April 25, 1989  
Nationality Italian  
Gender Male

### Scientific Research Activity

The developed research activities involve as a unifying theme both the theory and applications of Artificial Intelligence (AI) systems, in particular, of systems interacting with the health and medical environment. The scientific research activity focuses on applying computer science and AI techniques to innovative data driven applications based on structured data (i.e., electronic health record data) within the predictive and precision medicine scenario. AI applications developed in this field has involved different aspects, both theoretical and applied, and have presented challenging areas of research with different interdisciplinary and international cooperations:

- Regarding the theoretical aspects, the research was oriented toward the study of handling the most challenging aspects of real-world structured clinical data (i.e., high dimensional and noisy data, missing values, unbalanced setting, sparse labelling, temporal ambiguity, model interpretability, generalization). Methodological aspects mainly employed in the scientific research activity to improve the state of the art include multi-task learning, semi-supervised learning, multiple instance learning and GAN-based generative approaches.
- Regarding the application aspects, the main contributions have been produced for several clinical predictive tasks (e.g., chronic diseases, diabetes complication, covid-19, etc.), also with important implications from the point of view of technology transfer with the collaboration of Italian and international universities/companies. The main research outputs focus on the study and development of machine learning and deep learning algorithms for the analysis of heterogeneous structured clinical data in order to provide decision support and contextualized information to clinicians (i.e., ML-based clinical decision support system). The applicative domains range from general practice to intensive care units.

### Research Projects

- (2019) Member of the research unit of MIRAGE project - Multidisciplinary Innovative Research actions on AGE" (n. I32F17000080005).
- (2019-2021) Member of the research unit with Federazione Italiana Medici di Medicina Generale (FIMMG) and Netmedica. Analysis and processing of electronic health records data in general practice to develop machine learning algorithms as core of decision support systems.
- (2021) Member of the research unit of DIAMED project (Regional Operational Program of the

- European Regional Development Fund POR MARCHE FESR 2014/2020) - Artificial Intelligence methods for predicting risk profiles in diabetes care processes.
- (2020-2023) Member of the research unit with Meteda srl. Development of a machine learning - based clinical decision support system to predict and temporal stratify diabetes complications within a screening scenario. The machine learning algorithm, already patented, actually has been embedded in electronic health records of diabetic centers and tested by diabetologists.
  - (2023-present) Director of research unit in AIMedical srl. Development of a machine learning - based clinical decision support system to predict severe diabetes complications.

## Work Experience

- 01/12/2024–  
present **Tenure-track Assistant Professor**, *Department of Theoretical and Applied Sciences (DiSTA)*, Università e-Campus
- 01/08/2022–  
present **Co-founder and board member of AIMedical S.r.l.**, *Innovative startup focusing on Artificial Intelligence for health and medical informatics*
- 01/01/2021–  
30/11/2024 **Postdoctoral researcher**, *Department of Information Engineering*, Università Politecnica delle Marche (UNIVPM), *Artificial Intelligence for predictive medicine by utilising structured electronic health data*

## Education

- 01/11/2017–  
31/12/2020 **European PhD**, *Department of Information Engineering*, Università Politecnica delle Marche (UNIVPM)  
Title *Machine Learning approaches in Predictive Medicine using Electronic Health Records data*
- 01/09/2012–  
18/02/2016 **M.Sc. Electronic Engineering, biomedical curriculum**, *Università Politecnica delle Marche (UNIVPM)*  
Title *Development of an automatic procedure to mechanically characterize soft tissue materials using visual sensors*
- 01/10/2008–  
20/07/2012 **B.Sc. Biomedical Engineering**, *Università Politecnica delle Marche (UNIVPM)*  
Title *Acute myocardial ischaemia: From electrical activation of the heart to the ECG signal*

## Additional information

- 20/09/2016 **Engineering license**, *Università Politecnica delle Marche*, Section A - Information Technology Sector  
Professional practice examination

## Teaching Experience

- 01/08/2023–  
present **Course owner (9 ECTS)**, *Introduzione all'Intelligenza Artificiale e Machine Learning*, Computer Science and Automation Engineering, Università e-Campus
- 12/10/2021–  
present **Course owner (4 ECTS)**, *Data Management and Internet of Health Things*, Economics and Management of Healthcare and Technological Innovation, Università San Raffaele Roma

- 12/10/2021–31/12/2022 **Course owner (4 ECTS)**, *Intelligenza Artificiale e Salute dell'uomo*, Economics and Management of Healthcare and Technological Innovation, Università San Raffaele Roma
- 06/10/2021–11/01/2022 **Teaching support (20 hours)**, *Elementi di Informatica*, Biomedical Engineering , Università Politecnica delle Marche

## Abroad Research Experience

- 01/10/2019–31/03/2020 **PhD Visiting**, *Laboratoire d'Informatique de Grenoble (LIG), Université Grenoble-Alpes (UGA)*  
A Semi-Supervised Multi-Task Learning Approach for Predicting Short-Term Kidney Disease Evolution.
- 10/04/2015–05/09/2015 **Internship**, *Bio-Electro-And Mechanical Systems (BEAMS) Department, Université Libre de Bruxelles (ULB)*  
Development of an experimental and automated procedure that allows to mechanically characterize biological soft tissues by using uni-axial tensile test and visual sensors.

## Patents

- 2024 Co-inventor of the Italian Industrial Patent N. 102022000002372, "Method for predicting the occurrence of short-to-medium-term complications in diabetic patients and their temporal stratification".

## Awards

- 2020 Microsoft Grant Award: AI for Health Grants COVID-19, aiCOVID-19 Project ID: 00011000156, Research Area: Treatment & Diagnostics, enabling research to further development.
- 2018 Best Student Paper: Machine learning-based approaches to analyse and improve the diagnosis of endothelial dysfunction. In ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference.

## Editoring

- 2021 Special Issue: Designing Machine Learning approaches for early-stage prediction of complications and risk stratification of COVID-19 patients, *Medical and Biological Engineering and Computing*, Springer, ISSN: 0140-0118

## Skills

- Languages Mother tongue: **Italian**; Reading, writing and speaking competencies for **English**
- Coding Python, Matlab, ROS
- Software Solidworks, Abaqus
- Applications Git
- Miscellaneous Academic research, teaching, training, consultation

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## Publications

### International Journal papers

- [1] Bernardini, M., Doinychko, A., Romeo, L., Frontoni, E., and Amini M.R., A novel missing data imputation approach based on clinical conditional Generative Adversarial Networks applied to EHR datasets, *Computers in Biology and Medicine* 163 (2023): 107188, DOI: 10.1016/j.combiomed.2023.107188.
- [2] Nicolucci A., Romeo L., Bernardini M., Vespasiani M., Rossi M.C., Petrelli M., Ceriello A., Di Bartolo P., Frontoni E., and Vespasiani G., Prediction of complications of type 2 Diabetes: A Machine learning approach, *Diabetes Research and Clinical Practice* 190 (2022): 110013, DOI: 10.1016/j.diabres.2022.110013.
- [3] Bernardini M., Romeo L., Mancini A., and Frontoni E., A Clinical Decision Support System to Stratify the Temporal Risk of Diabetic Retinopathy, *IEEE Access* 9 (2021): 151864-151872, DOI: 10.1109/ACCESS.2021.3127274.
- [4] Montomoli J., Romeo L., Moccia S., Bernardini M., Migliorelli L., Berardini D., Donati A. Carsetti A., Bocci M.G., Garcia P., Fumeaux T., Guerci P., Schüpbach R., Ince C., Frontoni E., and Hilty M., Machine learning using the extreme gradient boosting (XGBoost) algorithm predicts 5-day delta of SOFA score at ICU admission in COVID-19 patients, *Journal of Intensive Medicine* 1(2) (2021): 110-116, DOI: 10.1016/j.jointm.2021.09.002.
- [5] Bernardini M., Romeo L., Frontoni E., and Amini M. R., A Semi-Supervised Multi-Task Learning Approach for Predicting Short-Term Kidney Disease Evolution, *IEEE Journal of Biomedical and Health Informatics* 25(10) (2021): 3983-3994, DOI: 10.1109/JBHI.2021.3074206.
- [6] Frontoni E., Romeo L., Bernardini M., Moccia S., Migliorelli L., Paolanti M, Ferri A., Misericordia P., Mancini A., and Zingaretti P., A Decision Support System for Diabetes Chronic Care Models Based on General Practitioner Engagement and EHR Data Sharing, *IEEE Journal of Translational Engineering in Health and Medicine* 8 (2020): 1-12, DOI: 10.1109/JTEHM.2020.3031107.
- [7] Liciotti D., Bernardini M., Romeo L., and Frontoni E., A Sequential Deep Learning Application for Recognising Human Activities in Smart Homes, *Neurocomputing* 396 (2020): 501-513, DOI: 10.1016/j.neucom.2018.10.104.
- [8] Bernardini M., Morettini M., Romeo L., Frontoni E., and Burattini L., Early temporal prediction of Type 2 Diabetes Risk Condition from a General Practitioner Electronic Health Record: A Multiple Instance Boosting Approach, *Artificial Intelligence in Medicine* 105 (2020): 101847, DOI: 10.1016/j.artmed.2020.101847.
- [9] Bernardini M., Morettini M., Romeo L., Frontoni E., and Burattini L., TyG-er: An ensemble Regression Forest approach for identification of clinical factors related to insulin resistance condition using Electronic Health Records, *Computers in Biology and Medicine* 112 (2019): 103358, DOI: 10.1016/j.combiomed.2019.103358.
- [10] Bernardini M., Romeo L., Misericordia P., and Frontoni E., Discovering the Type 2 Diabetes in Electronic Health Records using the Sparse Balanced Support Vector Machine, *IEEE Journal of Biomedical and Health Informatics* 24(1) (2019): 235-246, DOI: 10.1109/JBHI.2019.2899218.

## International Conference papers

- [1] Migliorelli L., Cenci A., Bernardini M., Romeo L., Moccia S., and Zingaretti P., A cloud-based healthcare infrastructure for neonatal intensive-care units. In 15th IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications, 2019.
- [2] Bernardini M., Ferri A., Migliorelli L., Moccia S., Romeo L., Silvestri S., Tiano L., and Mancini A., Augmented Microscopy for DNA Damage Quantification: a Machine Learning Tool for Environmental, Medical and Health Sciences. In 15th IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications, 2019.
- [3] Ferri A., Rosati R., Bernardini M., Gabrielli L., Casaccia S., Romeo L., Monteriù A., and Frontoni E., Towards the Design of a Machine Learning-based Consumer Healthcare Platform powered by Electronic Health Records and measurement of Lifestyle through Smartphone Data. In IEEE 23rd International Symposium on Consumer Technologies, 2019.
- [4] Frontoni E., Loncarski J., Pierdicca R., Bernardini M., and Sasso M., Cyber physical systems for industry 4.0: Towards real time virtual reality in smart manufacturing. In International Conference on Augmented Reality, Virtual Reality and Computer Graphics, 2018.
- [5] Calamanti C., Paolanti M., Romeo L., Bernardini M., and Frontoni E., Machine learning-based approaches to analyse and improve the diagnosis of endothelial dysfunction. In ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, 2018 [best paper award].
- [6] Paolanti, M., Placidi, V., Bernardini, M., Felicetti, A., Pietrini, R., and Frontoni, E., An agent-based WCET analysis for Top-View Person Re-Identification. In International Workshop on Real Time compliant Multi-Agent Systems, CEUR Workshop Proceedings, IJCAI-ECAI, 2018.
- [7] Calamanti C., Cenci A., Bernardini M., Frontoni E., and Zingaretti P., A Clinical Decision Support System for Chronic Venous Insufficiency. In ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, 2017.
- [8] Innocenti B., Lambert P., Larrieu J.C., Pianigiani S., Paolanti M., Bernardini M., Cenci A., Frontoni E., Development of an automatic procedure to mechanically characterize soft tissue materials, in IEEE/ASME International Conference In Mechatronic and Embedded Systems and Applications, 2016.

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Ancona, February 6, 2025

