Sarah Adamo

Implementation of AI solutions for medicine and telemedicine

Tutor: Prof. Mario Cesarelli

Cycle: XXXVII   Year: First

My background

- MSc Degree in Biomedical Engineering @ DIETI – Federico II
  - *Thesis: "Machine Learning to predict rehabilitative outcomes in post-stroke patients"*
- Ph.D. Fellowship founded by Consortium GARR
  - *Starting date: 01/11/2021*
  - *Host Institution: IRCCS Maugeri, Telese Terme (BN)*
- Research group:
  - UNINA Bioengineering Research Group;
  - Maugeri Bioengineering Unit.

Research field of interest

Telemedicine and medical remote assistance:

⊕ Patients with chronic disease are more exposed to acute events and require constant monitoring

⊕ Telemedicine can be crucial since patients can be assisted from their own home

! An effective way to collect huge amount of data…

…used as input for Machine Learning algorithms

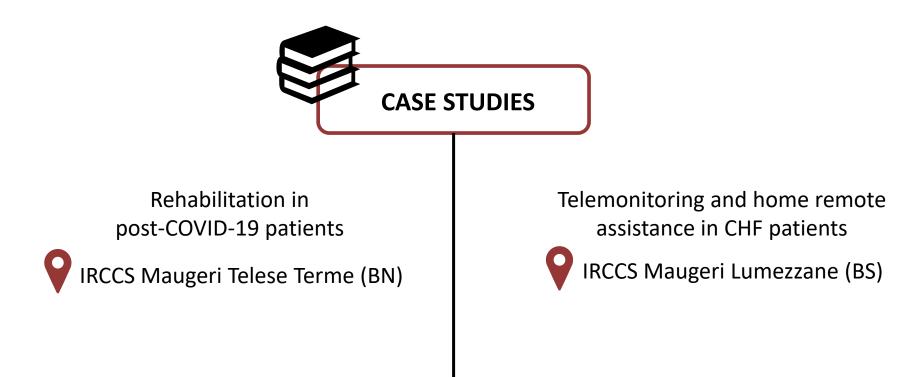itee**PhD**
information technology
electrical engineering

Research activity: Problem

?

Which are the main parameters able to…

- Predict an acute event?
- Improve a rehabilitation result?
- Identify different phenotypes?

CASE STUDIES

Rehabilitation in
post-COVID-19 patients

IRCCS Maugeri Telese Terme (BN)

Telemonitoring and home remote
assistance in CHF patients

IRCCS Maugeri Lumezzane (BS)

Research activity: Objective

Implementation of AI solutions ➡ **Prediction of clinical outcomes**

Supporting clinical decision making ➡ **More improvements**
Less healthcare management costs

Essential Assistance Levels (LEA) in non-urbanized area ➡ **Better Quality of Life for all patients**

Research activity: Methodology

Data acquisition and processing

Definition of clinical outcomes:
1. 6 Minute Walking Test (6MWT)
2. Quality of Life (QoL)

Implementation of Machine Learning algorithms to predict the outcomes

Identification and validation of main clinical parameters for remote patients management

Creation of a telemedicine platform for a real-time and continuous data exchange

Summary of study activities

- Ad hoc PhD courses:
  - Ultra High Field Magnetic Resonance Imaging (Prof. G. Ruello);
  - Statistical data analysis for science and engineering research (Prof. R. Pietrantuono);
  - Big Data Architecture and Analytics (Prof. G. Sperlì);
  - Data Science for Patient Records Analysis (Prof. M. Cinque);
  - Interaction control in surgical and rehabilitation robotics (Prof. F. Ficuciello)

- Research and study on machine learning in medicine and telemedicine (particularly focusing on post-COVID-19 and Chronic Heart Failure)

Products

[P1]	Donisi, L., Ricciardi, C., Cesarelli, G., Coccia, A., Amitrano, F., Adamo, S., & D'Addio, G. (2022). Bidimensional and Tridimensional Poincaré Maps in Cardiology: A Multiclass Machine Learning Study. Electronics, 11(3), 448. https://doi.org/10.3390/electronics11030448
[P2]	Adamo, S.; Ambrosino, P.; Ricciardi, C.; Accardo, M.; Mosella, M.; Cesarelli, M.; d'Addio, G.; Maniscalco, M. A Machine Learning Approach to Predict the Rehabilitation Outcome in Convalescent COVID-19 Patients. J. Pers. Med. 2022, 12, 328. https://doi.org/10.3390/jpm12030328
[P3]	D'Amato, M., Ambrosino, P., Simioli, F., Adamo, S., Stanziola, A. A., D'Addio, G., ... & Maniscalco, M. (2022). A machine learning approach to characterize patients with asthma exacerbation attending an acute care setting. European Journal of Internal Medicine.
[P4]	Amboni, M., Ricciardi, C., Adamo, S., Nicolai, E., Volzone, A., Erro, R., Cuoco, S., Cesarelli, G., Basso, L., D 'Addio, G., Salvatore, M., Pace, L., Barone, P. (2022, Accepted). Machine learning can predict Mild Cognitive Impairment in Parkinson disease. Frontiers in Neurology.
[C1]	Adamo, S., Ricciardi, C., Ambrosino, P., Maniscalco, M., Biancardi, A., Cesarelli, G., Donisi, L. & D'Addio, G. (2022, June). Unsupervised Machine Learning to Identify Convalescent COVID-19 Phenotypes. In 2022 IEEE International Symposium on Medical Measurements and Applications (MeMeA).

Thanks for the attention!