



RESEARCH TOPIC DASMEN2

CLINICAL ASSISTANCE WITH MACHINE INTELLIGENCE

Datascience Unit name and address

Intensive Care Unit
IRCCS Humanitas, Rozzano

Laboratory name and address

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Datascience Supervisor

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Research Supervisor

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Abstract

Candidate will elaborate on and develop predictive modelling, based on Electronic Health Records (EHR) data, to analyze the evolution of hospitalized patient over time and predict clinical deterioration.

Anonymized clinical EHR data from standard wards and in intensive care units will be derived from Humanitas Research Hospital. Models will be built using supervised and unsupervised machine learning techniques. Once the models are properly built, they will be compared and validated on the largest international public databases such as MIMIC and eICU, and on subsequent Humanitas cohorts.

As clinical deterioration has severe consequences in terms of morbidity and mortality, prediction of deterioration can allow anticipated therapeutic response with a greater probability of therapeutic success in these patients. These models will aim at improving patient health by creating new systems to advice healthcare personnel and inform decision making on hospitalized patient at risk of deterioration.

Main technical approaches

Supervised and unsupervised machine learning models (XGBoost, Deep Q-learning, Long short-term memory), using among others the following languages and functions: SQL, Python, Numpy, Pandas, Sklearn, Scipy, Tensorflow.

Scientific references

Johnson AE, Pollard TJ, Shen L, et al. MIMIC-III, a freely accessible critical care database. Sci Data. 2016;3:160035. Published 2016 May 24. doi:10.1038/sdata.2016.35



Pollard TJ, Johnson AEW, Raffa JD, Celi LA, Mark RG, Badawi O. The eICU Collaborative Research Database, a freely available multi-center database for critical care research. *Sci Data*. 2018;5:180178. Published 2018 Sep 11. doi:10.1038/sdata.2018.178

Petersen JA. Early warning score challenges and opportunities in the care of deteriorating patients . *Dan Med J*. 2018;65(2):B5439.

Kramer AA, Sebat F, Lissauer M. A review of early warning systems for prompt detection of patients at risk for clinical decline. *J Trauma Acute Care Surg*. 2019;87(1S Suppl 1):S67-S73. doi:10.1097/TA.0000000000002197

Gottesman O, Johansson F, Komorowski M, et al. Guidelines for reinforcement learning in healthcare. *Nat Med*. 2019;25(1):16-18. doi:10.1038/s41591-018-0310-5

Type of contract

PhD scholarship of € 18.000 gross per year or equivalent contract.

Borsa di dottorato di € 18.000 annui lordi o forme di sostegno finanziario equivalenti.