

Towards a reliable clinical decision support system in personalised medicine

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Type of thesis: Computational

Required competences: Ability to program in Python (e.g. INF22306) and basic biomedical knowledge are required. It is desired that students already have experience with machine learning tools (e.g. scikit-learn) or have followed a similar course (BIF30806, FTE35306, BIF31306)

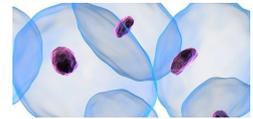
Acquired competences: Building and optimizing Machine Learning pipelines for biological/medical data

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Description

Clinical practitioners commonly rely on scoring systems aiding in the decision-making process (e.g. patient diagnosis, stratification, treatment etc.). Potentially, data-driven clinical decision-support systems (CDSS) hold the promise of improving shortcomings of currently established scoring systems, such as the lack of personalisation or the inability to adjust input variables [1]. A CDSS is a framework aiming to link health observations with health knowledge, supporting evidence-based medicine by providing consultation to medical personnel. It consists of multiple levels, incorporating data management, modelling and data visualisation in one platform. The centerpiece of the CDSS, predictive models, are frequently based on machine learning or deep learning methods and utilise computational approaches to identify disease stages, as well as patient specific patterns.

In collaboration with medical doctors, we now aim to develop a CDSS on necrotising soft-tissue infections (NSTI), a rare but fulminant infectious disease [2]. Latest efforts have covered the development of a mortality prediction model illustrating the utility of such a framework to improve NSTI patient care [3].



Aim of the MSc project is to refine the existing prediction model by (i) improving the methodology applied during development (ii) extending its functionality and (iii) potentially validate the outcomes using external (patient) cohort data. The focal points of this project will therefore include (but are not limited to): integration of additional data, applying data resampling techniques, exploration of feature selection methods, machine learning model comparison, patient stratification, and extension to additional health endpoints (besides mortality).

The realisation of the outlined project will aid in further exploring the opportunities and challenges of CDSS in healthcare and bring us one step closer in creating a reliable tool for clinicians treating NSTI patients.

References

- [1] Sutton, Reed T., et al. "An overview of clinical decision support systems: benefits, risks, and strategies for success." *NPJ digital medicine* 3.1 (2020): 1-10.
- [2] Norrby-Teglund, A., Svensson, M., & Skrede, S. (Eds.). (2020). *Necrotizing Soft Tissue Infections: Clinical and Pathogenic Aspects* (Vol. 1294). Springer Nature.
- [3] Katz S, Suijker J, et al. (2021). Decision support system and outcome prediction in a cohort of patients with necrotizing soft-tissue infections. Manuscript submitted and obtainable upon request.