Automation of the ML lifecycle of medical applications

Project Management and Software Development
for Medical Applications

General Info

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Project Abstract

The development and deployment of machine learning (ML) applications differ significantly from traditional applications in many ways, which have led to an increasing need for efficient and reliable production of ML applications and supported infrastructures. The big challenge in building such an infrastructure lies in the interface programming between data income, the ML model and its predictions and subsequent steps. More specifically, this project is about identifying automation opportunities, using CI/CD processes, and writing automated test plans in a whole heart segmentation and registration pipeline.

Background and Motivation

Virtonomy GmbH is developing the first web platform for conducting fully data driven clinical trials of medical devices with the use of virtual patients. Our system is based on medical images (CT, MRI), including pathology data and data about the medical devices. The three-dimensional model reconstruction of such data is intended for different purposes within our system, most importantly web viewing and simulation purposes. To ensure the interconnectivity and maintenance of such machine learning framework, the quality control, the process automation and inter-team communication we propose to, together with the applicant, plan and implement a set of tools that can handle such tasks in an intelligible manner.

Student's Tasks Description

- Planning and implementation of automated processes in a ML pipeline using Azure Functions
- Implementation of CI/CD processes with test and monitoring tasks
- Present MLOps topics (e.g., pros and cons of Azure ML - AWS SageMaker) to the team.

Technical Prerequisites

- Good understanding and experience with GIT
- First experience with cloud computing topics (e.g. SaaS, FaasS) is a plus
- Experience with of Docker containers and/or MLFlow/Azure ML is a plus
- Basic knowledge of medical image processing, namely deep learning, and surface meshes

Why you should choose us

- Opportunity to work in an international start-up environment or remotely
- Participation in the exciting development and growth of a start-up
- Contributing to an exciting real-life medical data solution with impact

References

Symeonidis, Georgios, et al. "MLOps--Definitions, Tools and Challenges." arXiv preprint arXiv:2201.00162 (2022).

https://www.analyticsvidhya.com/blog/2021/06/mlops-machine-learning-operations-in-microsoft-azure/

https://azure.microsoft.com/en-gb/services/machine-learning/mlops/#features

Please send the completed proposal to ardit.ramadani@tum.de, lennart.bastian@tum.de and tianyu.song@tum.de. Please note that this proposal will be evaluated by the BMC coordinators and will be assigned to a student only in case of acceptance.