

Big data in cardiac medical imaging

Project Management and Software Development
for Medical Applications

General Info



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Project Abstract

The scope of this project is to analyze a medical imaging database with the intent to make it intelligible for the different end users of Virtonomy – internally, implant developers and clinical professionals. It is expected for the applicant to identify trends and patterns in the patient's background – demographics or clinical history – to better understand how can machine learning algorithms be put to use to more accurately and efficiently serve medical diagnosis and implant's manufacturer's design loops.

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 clinical scans (CT, MRI), pathology data and data about the medical devices. The 3D anatomy model reconstruction from image data is one of the key parts of the entire processing pipeline.

Everyday more and more, the medical imaging technology evolves and datasets and increasingly being stored in healthcare hubs. Big data is a term that describes large, hard-to-manage volumes of data – both structured and unstructured – that inundate businesses on a day-to-day basis. Such data can be mined and analyzed for insights that improve medical diagnosis and may give confidence for smarter implant design or treatment planning. Parallely, understanding data patterns and

characteristics will allow smarter training for artificial intelligence algorithms used in pathology detection or anatomical reconstruction.

Student's Tasks Description

- Research and implement data processing techniques that transform the data in intelligible deliverables for the different end-users.
- Implement data mining techniques that identify trends and patterns in patient clinical history and demographics that can potentially improve the diagnosis of cardiac diseases.
- Document findings in a manner that creates value in implant design and treatment decisions.

At the end of the project, the student shall have the following outcome: a document with the identified trends and patterns that create value in the medical database with all the relevant source code in a GIT repo. Virtonomy will provide supervision with medical industrial computer vision training and software development experience.

Technical Prerequisites

- Thorough experience with Python and pandas.
- Basic knowledge of medical image and deep learning methods.
- Good understanding and experience with GIT

References

- Au-Yong-Oliveira, M., Pesqueira, A., Sousa, M. J., Dal Mas, F., & Soliman, M. (2021). The potential of big data research in healthcare for medical doctors' learning. *Journal of Medical Systems*, 45(1), 1-14.
- Kart, T., Bai, W., Glocker, B., & Rueckert, D. (2021). DeepMCAT: Large-Scale Deep Clustering for Medical Image Categorization. In *Deep Generative Models, and Data Augmentation, Labelling, and Imperfections* (pp. 259-267). Springer, Cham.