MSc Internship in Deep Learning & Cardiac Imaging:

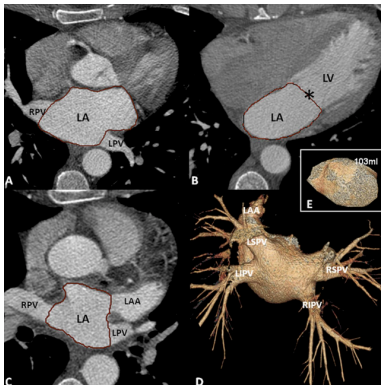
from Shape Statistics to Group-wise Physiology of the Atria

Clinical Context

Atrial fibrillation (AF) is the most common cardiac arrhythmia, characterized by chaotic electrical activation of the atria, preventing synchronized contraction. More than 6 million Europeans suffer from it and age is the most powerful predictor of risk. Life-threatening complications and fast progression to persistent or permanent forms call for as early as possible diagnosis and effective treatment of AF.

AF is often treated with anti-arrhythmic drugs, with limited efficacy and safety. Atrial ablation, an invasive procedure, is more effective. This procedure is by no means optimized, however, and AF may reoccur. The efficacy of first time ablation may range from 30%-75% depending on the individual patient and disease, such that multiple ablation procedures may be recommended.

It is critical to understand whether an ablation procedure is likely to benefit a particular patient with AF, and whether the arrhythmia is likely to reoccur in this patient, to maximize positive patient outcomes and ensure judicious resource allocation in our healthcare systems. Currently, there are no decision support tools enabling clinicians to access integrated AF patient data together with predictive models to facilitate prognosis and treatment planning.



Internship Description

The aim of this project is to integrate the existing sources of knowledge using systems medicine approach into a focused decision support system to determine which patients are good candidates for atrial ablation and which patients are at risk for arrhythmia recurrence.

The topic of the internship will be to analyse in collaboration with clinicians an existing database of 500+ MDCT 3D images and to use state-of-the-art deep learning algorithms for accurate segmentation of such images. This database was already segmented by a radiologist to serve as ground truth.

These segmentations will be used in shape statistics tools to explore correlations between shape features in this patient population and clinical factors including age, gender, type of arrhythmia, AF duration, occurrence of stroke, RF duration/number of procedures to restore sinus rhythm, acute procedural endpoint, post-ablation recurrences...

This analysis could lead to the discovery of important factors for the AF patients' management, which could integrate a new decision support system.

This internship will be at Inria, the French Institute for Research in Computer Science and Mathematics, in the Asclepios research team of the Inria Sophia Antipolis - Méditerranée Research Centre, located on the French Riviera. This centre counts 500 people and about 30 research teams. The Asclepios research team addresses a wide range of research topics in Medical Image Analysis and Simulation. The team counts about 30 people.
The internship will be done in collaboration with IHU Liryc, Bordeaux University Hospital, a world leading centre in the treatment of AF.

Searched profile

- MSc in computer science or applied mathematics
- Motivated by artificial intelligence
- Eager to work in the medical field
- Good Knowledge of Machine Learning and Statistical Analysis
- Familiar with standard Deep Learning architectures
- Good coding skills in Python
- Fluent in English (Reading, Writing, Speaking)
- Eager to learn and take initiatives

Job location: Inria, Sophia-Antipolis, Nice Area, France
Contract: 6 months internship
Start: ASAP
Salary: gross remuneration of 1445 Euros/month (net is about 1182 Euros)

Send your resume, motivation letter, and grades obtained so far to:
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