Epsidy internship

Real-time electrocardiogram signal analysis using deep learning

Company description

Life should never be taken for granted. As simple as a breath and as hopeful as a heartbeat. Within each of us is a quintessential energy that holds us as humans and inspires us "geeks" at Epsidy. Born from electric impulse, with smart connectivity and mindful technology, Epsidy empowers clinical science for enhanced patient care.

Epsidy is a dynamic young startup located in CHRU de Nancy, a leading French university hospital. Epsidy is in a close-knit relationship with the IADI Lab, and any Epsidy position includes regular exchanges with researchers.

Medtech being a regulated environment, quality is an essential aspect of any of the roles listed below.

Epsidy's core values are ownership, trust and curiosity.

Context and tasks

For several years, cardiovascular disease (CVD) has remained the leading cause of death and disabilities worldwide [1]. To contribute to a better prediction of the CVD risk factors, Epsidy develops a smart heartbeat detection solution based on state-of-the-art machine learning (ML) and deep learning (DL) architectures. Recently, considerable attention has been paid to the use of DL architectures to analyze signal, image and data. Compared with classical approaches (e.g. filtering and clustering techniques, statistical models, neural networks), DL architectures have achieved high performances for many applications [2]. Nevertheless, these architectures have high computational complexity and memory constraints. Hence, deploying these architectures in the production environment remains a challenging task [3]. Hence, the objective of the internship work consists in designing an edge deployment framework for heartbeat detection with real-time inference using deep learning. The main internship tasks are:

- to conduct a thorough survey of the main recent state-of-the-art DL architectures dedicated to real-time data analysis (e.g. RNN, YOLO, ViT);
- to embed the investigated DL architectures on edge platforms (e.g. NVIDIA Jetson Nano);
- to explore some optimisation tools (e.g. TensorRT, Triton inference server) for real-time inference on edge platforms;
- to carry out a comparative study of the different investigated DL models in terms of their performance and execution time (before and after optimization with a main focus on low latency).

Profile

You are in the final year of a Master/Engineering degree's program motivated by AI/ML with a particular interest in DL. You demonstrated curiosity, rigor and autonomy during your education curriculum. You enjoy discovering new programming languages and are not afraid of tackling complex problems.

Good communication and team working skills are also required, as you will work in close collaboration within the Design and Development (DND) and Data (DAT) teams of Epsidy.

Having a knowledge of programming language such as Python and basic of classical machine learning algorithms are essential. A background in biomedical applications is a plus.

Practical details

This 6-month internship, starting between January and March 2023, will take place at Epsidy and IADI premises (Bâtiment Recherche CHRU de Nancy Brabois, 5 Rue du Morvan, 54500 Vandœuvre-lès-Nancy).

Applications should be sent to careers@epsidy.com with 1-page CV, ½ page motivation letter, latest grade transcripts and optionally recommendation letters, referencing 2023-INT-DND-AI.

Bibliographic references

[1] "Cardiovascular diseases," 06 September 2022. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds).

[2] Y. LeCun, Y. Bengio et G. Hinton, «Deep learning,» *Nature,* vol. 521, pp. 436-444, 2015.

[3] S. Manzoor, E.-J. Kim, S.-H. Joo, S.-H. Bae, G.-G. In, K.-J. Joo, J.-H. Choi et T.-Y. Kuc, «Edge deployment framework of GuardBot for optimized face mask recognition with real-time inference using deep learning,» *IEEE Access,* vol. 10, pp. 77898-77921, 2022.