MARie Curie Intelligent UltraSound

Sprawozdania

Informacje na temat projektu

MARCIUS

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Strona internetowa projektu

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GE VINGMED ULTRASOUND AS
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Periodic Reporting for period 2 - MARCIUS (MARie Curie Intelligent UltraSound)

Okres sprawozdawczy: 2021-10-01 do 2023-09-30

Podsumowanie kontekstu i ogólnych celów projektu

Cardiovascular disease (CVD) is the number one cause of death in Europe and is estimated to cost the EU economy €210 bn a year – with the ongoing population aging providing additional tailwind to these alarming numbers. The common goal uniting the MARCIUS partners was to provide training and develop new solutions at the intersection of clinical cardiac imaging, basic cardiac physiology and

pathophysiology, and biomedical engineering through a combination and exchange of expertise in the different, but highly complementary, fields of echocardiography, artificial intelligence, and biophysical cardiac modelling, with the aim of reducing the financial burden and improving care of CVD patients.

The MARCIUS consortium consisted of three beneficiaries; GE Vingmed Ultrasound (the coordinator) in Norway, KU Leuven in Belgium, and Maastricht University in The Netherlands, and four partner institutes; Intelligent Ultrasound (formerly MedaPhor Ltd.) in Wales, Jessa Hospital in Belgium, and Oslo University Hospital and the University of Oslo in Norway. Two early-stage researchers (ESR's) from each of the beneficiary institutes were recruited for the MARCIUS project.

The MARCIUS goal was to develop a comprehensive in-silico simulation platform comprising both the generation of virtual patients, the work of ESR1 - Claudia Alessandra Manetti, from Italy, working at Maastricht University, and their associated realistic image data, the work of ESR2 – Nitin Burman, from India, working at KU Leuven. This made it possible to LEARN the most relevant patterns within a wide representative set of patients to lead the training of machine learning-based image processing algorithms in order to ANALYZE real-world clinical data by: 1) characterizing tissue properties, the work of ESR3 – Paulo Tostes, from Brazil, working at KU Leuven, 2) evaluate anatomy and function, the work of Cristiana Tiago, from Portugal, working at GE Vingmed Ultrasound AS and 3) ultimately automate the interpretation of the resulting information into clinical decisions, the work of ESR5 - Mujde Akdeniz, from Turkey, working at GE Vingmed Ultrasound AS. The consortium leveraged existing clinical & simulated data to fast-track the development of the core methodologies and reduce the critical inter-dependency between projects. Lastly, a clinical-oriented ESR6 – Ahmed Salem Beela, from Egypt, working at Maastricht University, not only curated the available data but also ensured tight connections to clinical key opinion leaders and ultimately APPLIED the developed tools in in order to validate them and to study the pathophysiology of failing hearts.

Prace wykonane od początku projektu do końca okresu sprawozdawczego oraz najważniejsze dotychczasowe rezultaty

MARCIUS was the European EID that brought together a consortium of industrial and academic partners in a novel and bespoke doctoral training program; multi-disciplinary in its content & inter-sectoral regarding the employability of the technology leaders of tomorrow, while providing a coherent training platform to address the increasingly critical challenge of interdisciplinary medical diagnostics.

Six early-stage researchers (ESRs) were recruited as the MARCIUS fellows, two at each of the beneficiary partner institutions. Recruitment was delayed due to challenges related to the pandemic, with the last ESR starting in November 2020, thus delaying the milestones and deliverables of the project. Despite these delays, the ESR's made good progress on the projects and all deliverables and milestones were completed within the duration of the project. A project introduction meeting was held online on the 14th October, where all partners were invited and all ESR's were present. The first MARCIUS school was held remotely in March 2021 due to travel restrictions. The next MARCIUS school was held in Norway in September 2021 and was the first occasion for the ESR's to meet in person. The third MARCIUS school was held in Switzerland in February 2022, and the final

MARCIUS school was held in France in July 2022. Bi-weekly online scientific update meetings allow ESR's to share progress and receive feedback and input from other MARCIUS members.

The progress of the MARCIUS fellows was carefully monitored via progress meetings that are documented through in the Career Development Plans (CDP), and Supervision Quality Reports (SQR), in addition to progress reports required from each of the hosting university institutes, thus ensuring that the projects were on track and the required supervision and resources were available for each of the fellows.

In-person outreach activities were limited due to travel restrictions during the pandemic, however the ESR's were present virtually at international conferences, including a presentation by Cristiana at the MIDL conference in July 2021. Cristiana and Mujde were featured in the University of Oslo press and Claudia was featured in the Maastricht University Observant journal and the CARIM newsletter. Cristiana presented the MARCIUS project in person at the University of Lisbon and Claudia presented in person at the Biomedical Engineering Department of Maastricht University. Relevant updates have been shared on the MARCIUS website (www.marcius-project.com) and on the MARCIUS twitter channel (https://twitter.com/MarciusProject).

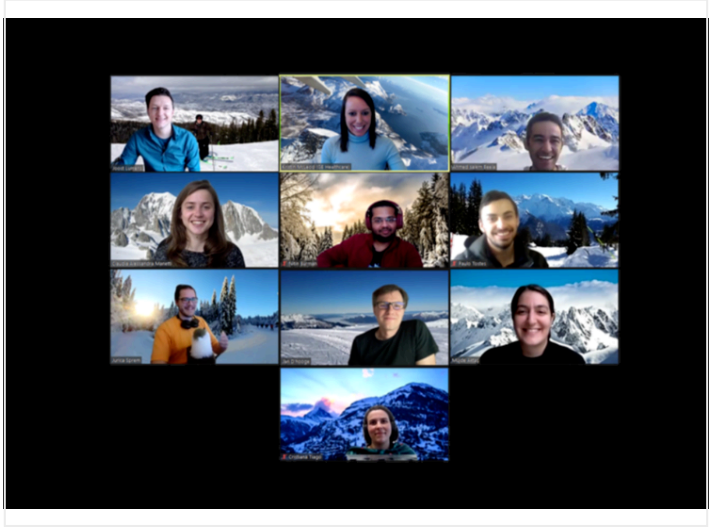
Innowacyjność oraz oczekiwany potencjalny wpływ (w tym dotychczasowe znaczenie społeczno-gospodarcze i szersze implikacje społeczne projektu)

The potential of computational techniques to automatically extract relevant quantitative information from images of the heart acquired in routine clinical settings is one of the most powerful future tools in the treatment of cardiac disorders. However, for these techniques to become fully exploitable, advances in computational cardiac imaging methodology and its effective translation into practical clinical applications are essential. For European research and industry to remain competitive in this area, both scientific knowledge as well as suitable entrepreneurial scientists must be available. Specifically, there is a strong need for young European researchers with expert multidisciplinary knowledge in 1) computational cardiac imaging; 2) the clinical treatment of cardiac disorders; and 3) the commercialization processes required to bring new research developments into actual clinical practice.

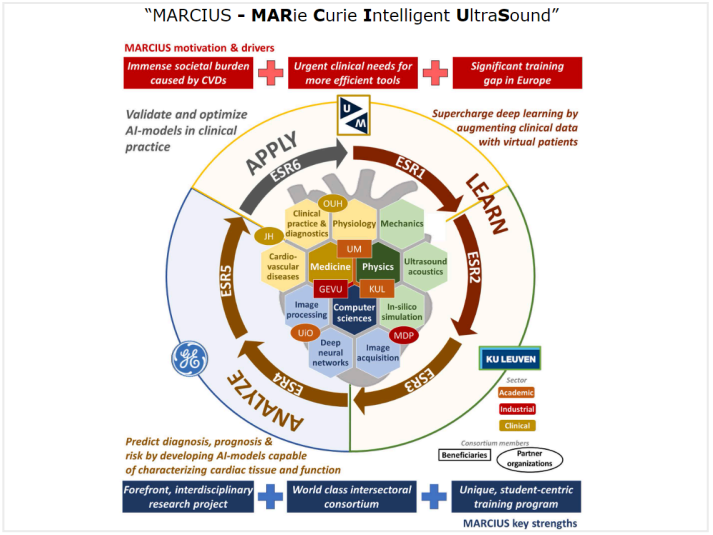
The methods and tools developed in the MARCIUS network significantly contributed to advancing the state-of-the-art in clinical cardiac imaging, enabling improved detection and progress monitoring in a wide array of cardiac disorders, and optimizing healthcare delivery specifically tailored towards the needs of individual patients. The state-of-the-art knowledge on computational cardiac imaging is mostly concentrated in academia. Conversely, the drivers and challenging for translating promising new methods into real clinical applications are essentially located in the private sector. Therefore, MARCIUS provided a doctoral research and training program to train the six highly-skilled researchers with a strong fundamental and applied insight at the interface between the fields of

computation and clinical cardiac imaging, while at the same time stimulating entrepreneurship, creativity and innovation in Europe.

2021 MARCIUS summer school in Norway



2021 MARCIUS winter school (virtual)



Overview of the 6 MARCIUS ESR projects and their relation to the long-term goal of the project

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