MY-ATRIA

Milan Winter School

Newsletter 04
2021

Contents

Edited and reviewed by the ESRs

The last summer school of the MY-ATRIA project, part of the H2020's Marie Sklodowska-Curie ETN network, was supposed to be held in "Palazzo Feltrinelli", at the Garda lake in Gargnano (BS, Italy). Due to the COVID-19 pandemic and traveling restrictions, this meeting was held online with technology's help. The meeting took place from the 11th to the 15th of January 2021, and organized by Università degli Studi di Milano.

The scientific problem tackled by the network was the design and implementation of new technologies to support the treatment and management of atrial fibrillation (AF). Since the ESRs are in the last year of their PhD program, the school focused on the different aspects regarding technology transfer. In particular, topics such as identification of market potential of the scientific research, protection using patents and trade secrets, CE certification, marketing and pitch presentation design for startups were discussed. The winter school was opened to the public, including university students, clinical doctors and professionals in the biomedical engineering field.

ESRs Presentations and Panel Discussion

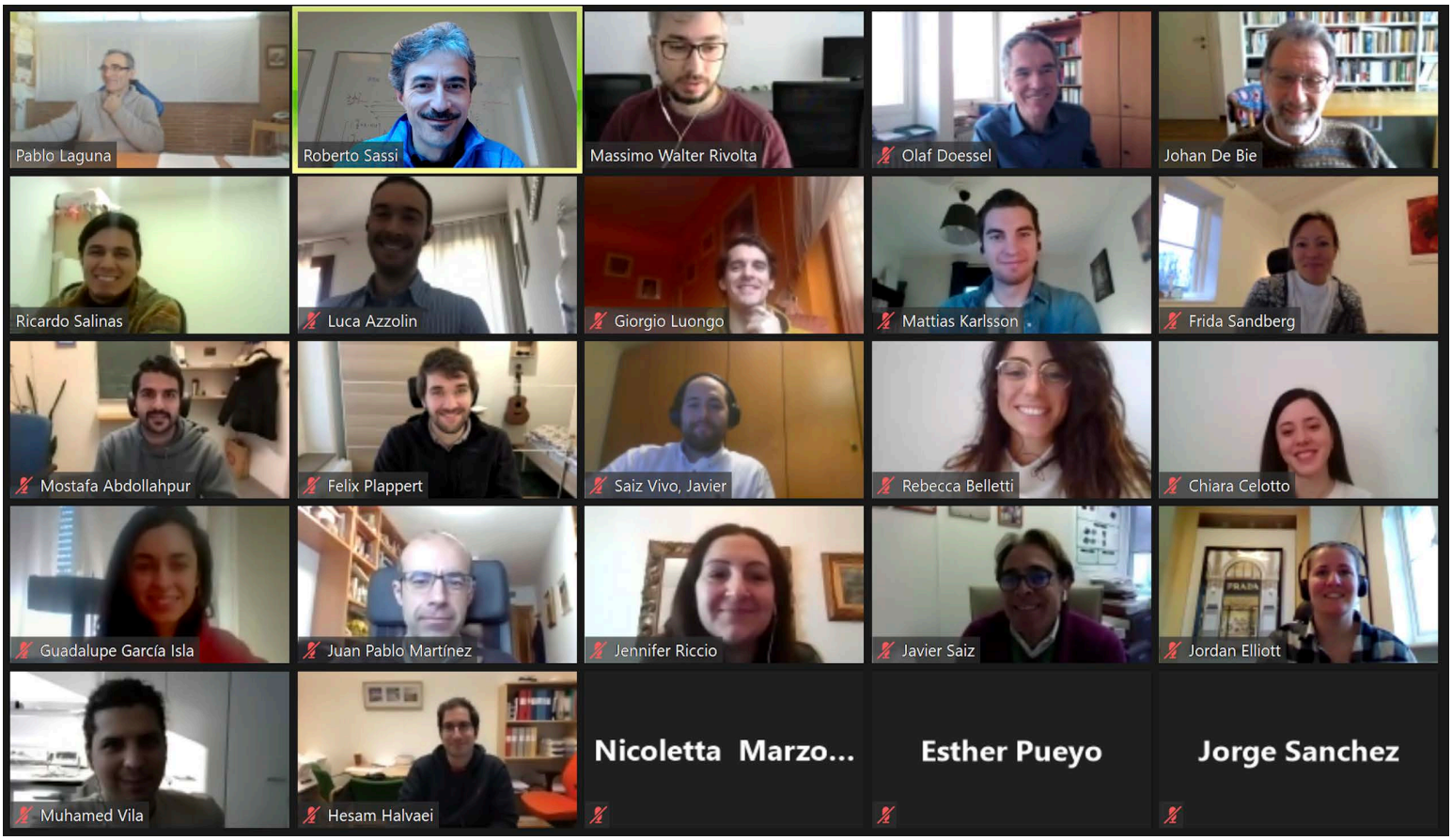
The first two days were dedicated to ESRs' presentations. Each one of them was given 20 minutes to present their research progresses, followed by other 15 minutes of open panel discussion in which supervisors and ESRs could ask their questions and share their opinions and suggestions. The PhD students could then benefit from the feedback for modifying their research and improving their skills.

Keynote Lectures

In the following days, the winter school was dedicated to the different lecturers and keynote speakers. Being close to the end of the project, the technical issues related to AF were already covered by the first two MY ATRIA winter and summer schools. The topics covered in this meeting were thus more related to the development and management of research careers in academia or industry.

In the third day, the identification of scientific potential in research was covered by Mirko De Melis (PhD, Senior Principal Scientist, Medtronic). The second presentation was given by Ryan Donlon, (Senior Produect Manager, Mortara) who had a speech about how to assess the technological and commercial potential in the research. Finally, Maurizio La Cava (Startup Pitch Strategist, PoliHub) talked about presentation and pitch design. The fourth day started with Mirko de Melis, who gave a speech about marketing and entrepreneurship in life sciences. After that, the opportunities in Horizon Europe 2021-2027 were explained by Laura Mazzola (PhD, POLIMI, Fondazione Politecnico di Milano). On the fifth and final day, there was a grant writing workshop by Alice Barbaglio (PhD, UMIL, Officina H2020). The objective of the workshop was to train the ESRs to write a proposal, stressing out the important points for the evaluators and the correct timing to prepare it.

The knowledge of covered topics benefits the ESRs in terms of finding the potential markets for their research, presenting innovative ideas and protecting them with licensing and patenting. The winter school was ended with an interesting lecture about "Math & Music" by Giulio Pravisani (Site Manager, Siemens Healthcare). In the end, ESRs and supervisors closed this winter school with a toast by remote drinking.



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Machine learning in Atrial Fibrillation

The term machine learning (ML) refers to a broad set of algorithms that learn their task directly from data, in contrast to conventional approaches, where rules, driven by the knowledge of experts, are applied.

Today, ML has made its way into a wide range of applications, from speech recognition to self-driving cars, from fraud detection to medical diagnosis. The great impact of ML in other applications, combined with the availability of large amounts of cardiology data, has made AF an interesting topic for ML practitioners and researchers, resulted in an increasing the number of research papers in the field in the recent years.

So far, ML models have been used in different AF management applications, including AF prediction and characterization of AF mechanisms. Deep neural network can be applied to predict AF progression form normal ECGs, detect paroxysmal AF and characterize AF mechanisms, using different signal modalities.

Promising outcomes have been achieved by the application of ML in clinical treatment of AF which is likely to be enhanced in the coming years. However, the broad use of such approach is yet to be established in the health care system due to several reasons, including the explainability of complex ML models (especially in deep neural networks), or the quality treatment of training data, since their assessment is a demanding task when large amounts of data are available.

Beneficiaries Profile:University of Milan

The University of Milan (UNIMI) is one of the largest and most renowned higher education centers in Europe with more than 65,000 students and 2,000 among the academic staff. UNIMI hosts one of the ESRs within MY-ATRIA project, Muhammed Vila, supervised by Prof. Roberto Sassi and Massimo Rivolta, PhD, from the Department of Computer Science, which is well-known for research expertise in the autonomic regulation of the cardiovascular system

Medtronic

Medtronic Bakken Research Center (BRC), founded in 1987, is a R&D center in Maastricht, Netherland. It is well-known for one of the most important medical innovations, pacemaker. BRC is now hosting the ESR Javier Saiz, who is pursuing his PhD under the supervision of Mirko de Melis, jointly with the Polytechnique University of Milan.

Mortara

Mortara Instrument Europe is a subsidiary of Mortara Instrument Inc, founded in 1984 by David Mortara in the US. The company is mostly renowned for developing innovative ECG equipment and algorithms and hosts another ESR, Ricardo Salinas, under the supervision of Johan de Bie, PhD, jointly with Lund University.

Researcher profiles

ESR9

Guadalupe García Isla (POLIMI)

Evaluation of the interplay mechanism between AF and AT detected by a single lead ECG

Since a young age I have been interested in the world around me, the Why behind everything, the behaviour of animals and the existence of organisms that could only be discovered under a microscope. Now, I am happy and proud to say that I am making out of this curiosity a career. Being part of MY-ATRIA has allowed me to continue learning and exploring. It has enabled me to spend my time feeding my curiosity in a different country, with a different language and a different (although quite similar to the Spanish!) culture. The time I have been forming part of MY-ATRIA has been one of the most enriching and mind-opening experiences I have ever lived. This project is not only an academic challenge, but also a window to how research is carried out in different countries in Europe and to how projects and ideas evolve in some of the best minds working on the computational cardiac electrophysiology field. I truly feel privileged to have, and continue to, form part of this network and I am certain most of the bounds that have been formed during these years will remain solid for years to come. If any of the readers is a student, perhaps doubting if to start a similar adventure I will for sure say: go for it, don't be overwhelmed by the challenge, it is definitively worth trying!

ESR8

Javier Saiz (Medtronic)

Assessment of the Atrial Fibrillation triggers and their role in its progression

As an engineer, I have studied with the main goal of making society s life easier and even though my Bachelor's degree was focused on an industrial and technological level, improving the life s condition of those in need is something that has always driven me. It was no surprise I jumped at the opportunity of joining My-Atria, where I could research the medical applications of technology. This multidisciplinary network has not only helped me grow as a professional by challenging my engineering abilities, it has also allowed me to become part of a team of industry, academia and health professionals distributed across Europe and focused on tackling the various problems derived from AF. Yes, moving from Valencia to Maastricht took some adjustments. Leaving my friends and family, the Fallas festivities, and last but not least, paella, seemed quite daunting at first. However, for me the chance of experiencing a new culture was just one of the many treats of this network and bitterballen and Dutch beer certainly made the transition seem like a breeze.

ESR7

Mostafa Abdollahpur (LU)

Risk stratification and prediction of intervention outcome in AF using novel ECG-based markers of atrial remodeling

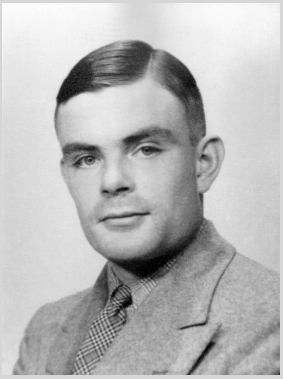
I got my master's degree in mechanical engineering, the field of control and dynamic system in Iran. My thesis was related to signal processing from heart activity. I was constantly searching for my major's practical applications, which improve the quality of life in different societies. In fact, I deem such research to be critical and worth total commitment.

Having become enthralled by the beauties of applications of my major in biomedical engineering, I realized that this is something that satisfies me. The MY-ATRIA project was exactly what I was searching for, So, I applied and jumped at it.

Now, I'm living in Lund, one of the southern cities in Sweden with lots of beautiful places. I'm an active person, spending lots of time playing tennis and football here. For me, it's an excellent experience to live in this small city compared to the place that I came from.

Right now, I'm working in the signal processing group at Lund University, the department of biomedical engineering. Being in this group and the MY-ATRIA project allowed me to improve my communication and networking skills, share ideas, and get feedback for my research.

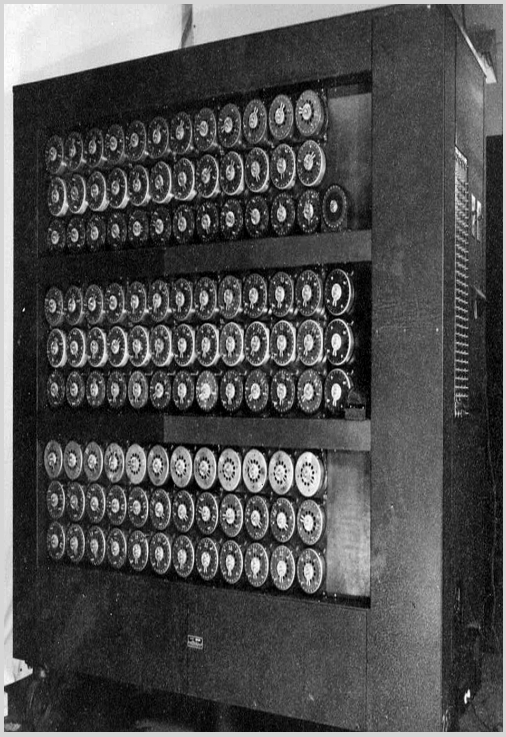
AlanTuring



If you've ever used a computer, or asked your smartphone a question, you owe a debt of gratitude to Alan Turing. You may be familiar with the name, or may have heard of the Turing test of artificial intelligence (AI), but surprisingly few people know his story. Alan Turing is one of the most influential scientists of the 20th century. Regarded as a mathematician, computer scientist, logician and cryptanalyst, he is widely considered as one of the pioneers of AI, started as early in the mid-20 century. An application of AI is ML, whose algorithms have found broad application in the biomedical field. The MY ATRIA program has largely benefited of these tools, applying them to electrocardiogram (ECG) signals quality assessment, automatic detection of ECG features and ECG morphology analysis.

Early life:
Alan Turing was born in London in 1912. He received his mathematics degree from King's college, Cambridge, in 1934, and then obtained his PhD from Princeton University in 1938.

Career:
Coming back to UK after graduation, Turing joined the Britain's code-breaking centre, where he devised methods to help cracking the Enigma code that was being used at the time by German forces as a secure connection during the Second World War. Turing developed Bombe, which helped decoding Enigma-machine encrypted messages.
In 1950, Turing designed a test, known as Turing test (or imitation game) as a basis to indicate whether a computer is thinking. In other words the test implies if artificial intelligence is exhibiting equally, as intelligent as human behavior. However, his prediction that a computer in the year 2000 would have been able to "play the imitation game so well that an average interrogator will not have more than a 70-percent chance of making the right identification after five minutes of questioning" has yet to happen.



Legacy:
Turing made major contribution to mathematics, cryptanalyst, logic and even philosophy. Despite his accomplishments, his contributions remained mostly unrecognized to the public as they were protected and classified national security state secrets. Turing died in 1954.

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