

TESTIMONIAL

Summer program of the ISSI Weizmann Institute

I took part in the Weizmann International Summer Science Institute (ISSI) from the 30th of June till the 25th of July 2024. There were 26 participants from 10 countries: Luxembourg, the US, the UK, Germany, Switzerland, Ireland, Israel, Hong Kong, Mexico, and Canada. During the program, we were divided into 3 groups, each with their mentor, consisting of around 8-9 people. The research topic varied depending on the group, some studied antibodies, others retina or writing sounds.

In our project, we tried to implement a tool to support medical personnel in treating patients with post-traumatic stress disorder (PTSD), which affects around 3.9% of the world population. Expressive writing has already shown promising signs in helping patients improve their well-being, therefore, this was the starting point for our work. To make the process as unintrusive as possible for the patients, we limited our data collection to the audio signal of the writing. Additionally, my group was split further into 3 teams. The first studied the psychological relationship between writing and emotions to inform the other two teams on which factors and writing characteristics they should be focusing on. The second group worked on analytical, non-machine learning models and solutions, whilst the third, the group of which I was a member, created deep learning models.

Group one, determined, that pauses in writing are one of the stronger indicators of emotional state, therefore their detection became the key focus of our work. As part of the analytical approach, we implemented high-pass frequency filters (HPFF), vector and matrix scanning, used Markov chains, and more, achieving accurate but delicate results, as these methods are susceptible to the presence of noise in the audio data. The machine learning model we developed, achieved a very high classification accuracy (writing or pause) of 98.1%, thanks in large part to using a technique called transfer learning, where a smaller model is trained “on top” of a large pre-trained one. Even though we are more than satisfied with the results, to make our new tools more robust for real-life applications, there is still lots of work to do. Starting from better handling of noise to increasing the size of our dataset.

My research group’s mentor was Dr. Vyacheslav Kalchenko who is the head of the Optical Imaging and Translational Bioengineering Unit at the Weizmann. He pioneered various advanced imaging techniques such as TOVI – Transcranial Optical Vascular Imaging, Multimodal Fluorescent & Laser Speckle Imaging, and others, but Dr. Vyacheslav Kalchenko has many interests outside of imaging, as he also works on research relating to data science and cognitive computing. His extensive knowledge in the different fields of science not only helped progress the project further but also made working with him a unique and truly educational time.

Alongside the research project, we also attended (virtually) lectures by many scientists, both

senior researchers and PhD students. Each lecture covered a different area of science,
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ranging from proteins to crystals. These presentations helped us expand the horizons of our knowledge, and even though engineering and computer science (my main interests), were not as present, I nevertheless enjoyed learning new facts about the world and how it behaves.

To relax from all the hard work, we had a couple of social meetings, where we either discussed various, possibly more philosophical, topics or had some fun playing games together. Unfortunately, this is the part that suffered the most when transitioning to a virtual platform, as no computer screen can match being with someone in the same room, whilst also living together for a month in the same place. Therefore, I sincerely hope that next year, the program will be available in person, as that is the best way to experience this special event.

Nevertheless, I am honoured to have been given the chance to participate in the International Science Summer Program at the Weizmann Institute, which will remain an unforgettable experience for me. Lastly, I am profoundly grateful to the Fondation Jeunes Scientifiques Luxembourg and the Matanel Foundation for letting me have this extraordinary opportunity.