

TESTIMONIAL

Summer program of the ISSI Weizmann Institute

I participated in the Weizmann International Summer Science Institute (ISSI) from the 4th to the 28th of July 2022. There were around 25 participants from 10 different countries: US, Mexico, UK, Germany, Luxembourg, Switzerland, Israel, India, Nepal and China. Each one of the four groups was composed of 6 - 7 people. We all investigated different topics related to physics, biology, veterinary, machine learning and computer science.

Our project revolved around RNA-sequencing (RNA-seq), which is an extremely useful tool to study tumours and has been widely used for cellular state characterization. While in the past RNA-seq profiling could only be done by sequencing at the same time the RNA from the whole tumour ("in bulk"), it is now possible to profile them at single cell resolution using a method called single-cell RNA-seq (scRNA-seq), by isolating and sequencing tumour cells separately. However, this process ignores the tumour cell's spatial organisation and morphology. Consequently, we investigated the effects of spatial transcriptomics, where all cells and their spatial organisation are retained but single-cell resolution is lost. We centred our attention on the ability to distinguish intra-tumor heterogeneity at lower resolutions by using scRNA-seq to simulate bulk expression profiles with different sizes and spatial relationships. Our findings showed that while increasing the number of cells analysed together does result in less distinct cell classes, spatial transcriptomics still allows for intra-tumor heterogeneity characterization.

My research group was mentored by Dr. Michael Tyler from the Department of Molecular Cell Biology (Tirosh Lab). Since Dr. Itay Tirosh pioneered the application of single-cell RNA seq to solid human tumours, it has been an honour to work so closely with such talented and brilliant people. I really enjoyed all the research process, the challenges we faced and the way we helped each other when we could not solve a problem. During the entire month, we received continuous feedback, support, encouragement, inspiration and constant motivation to dig deeper into our project. Under the guidance of Dr. Tyler, our mentor, we truly learnt so much. He was always willing to answer our questions, and was very patient as we learnt new concepts and shared his insight into topics that interested us.

Everyone had the opportunity to investigate such interesting topics and meet different academics from different backgrounds. We received so much input, and I am sure each and every one of us became passionate about something new, which they now want to learn and explore in more depth. Thanks to the ISSI coordinators, we had the possibility of taking part in many different activities and meeting such unique personalities like the President of the Weizmann Institute of Science, Stuart McClung, NASA Engineer who is part of the Artemis

Program, many PhD students whose research areas were extremely fascinating, and many other extraordinary role models.

I would have definitely loved for the program to be in person. This is the only thing I would change. The quality of the academic deliverable was impeccable. However, even if we had social activities and different committees, I believe it would have been easier and nicer to meet the other participants, mentors and speakers face to face. Nevertheless, even if not from Israel, I still got to experience resting on Fridays, working on Sundays, and staying in touch with many students.

I have always been interested in biology and acknowledging, through this experience, the reason why computer science can be such an amazing tool, when it comes to cancer research, was fantastic. I am genuinely fascinated by health informatics, bioinformatics and similar fields. I am intrigued by the role they have and could be playing in the future.

Healthcare is an enormously complex part of the global economy, however I believe the world's sustainability will strongly depend on the importance and priority we will give to new scientific breakthroughs. I think a multidisciplinary approach is key to the future of science. The use of AI in recognizing neurons which are about to die or are already dead 100 times faster than humans can, studying tumours using spatial transcriptomics, are just some examples highlighting what can be achieved through the combination of different subject areas.

I am extremely grateful for having been granted the opportunity to take part in this amazing program. It has truly been a wonderful experience. To conclude, I really want to thank the Fondation Jeunes Scientifiques Luxembourg and the Matanel Foundation for making it possible!