Intership offer M2 – 2024/2025 in Marseille
Multiscale killer-target dynamics in an immunotherapy assay

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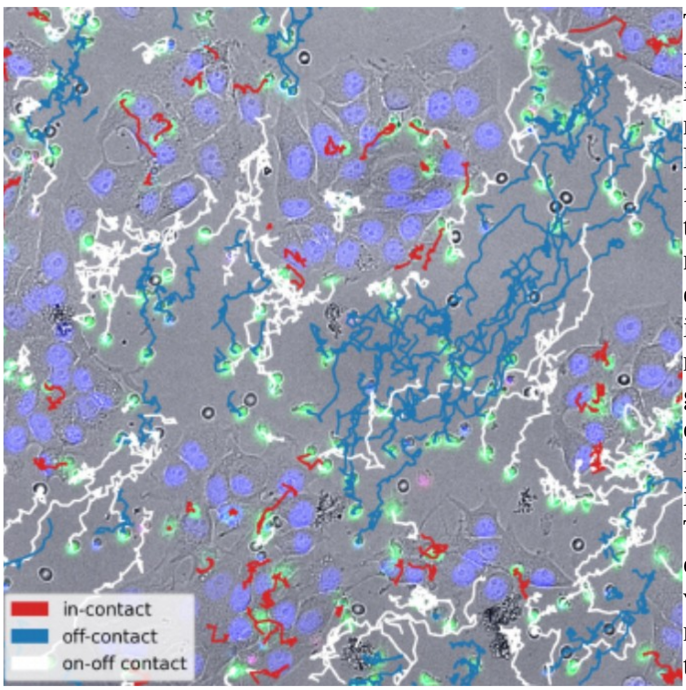
Immunotherapy holds great promises for fighting cancer, but the understanding of fundamental mechanisms of action of existing or potential treatments is often lacking, therefore limiting broader or more efficient applications. To address that, quantitative in vitro assays for testing and modeling phenomena are central. We developed a quasi 2D microscopy assay where cancer cells and human immune cells are co-cultured in presence of original antibodies forming molecular bridge between the two cell types. Using a powerful home-made image analysis software, cells can be followed during their interactions but we lack now a theoretical approach to model these complex phenomena. This will help to optimize new molecules for maximizing immune cell recruitment and target cancer cell killing, while minimizing drug amounts and side effects.



The goal of the project is to develop a theoretical framework to analyze and interpret the dynamics of interactions between immune and target cells. A multiscale modeling would encompass the localisation and binding of antibodies, the threshold for cells response as well as the population spatio-temporal dynamics. It will rely on analytical tools and numerical simulations, in close comparison with the experiments.The different tasks of the project will involve: (1) design numerical simulations to test and reproduce experimental data, using Langevin or more general stochastic dynamics (2) define a minimal set of parameters to describe natural and antibody-induced behaviour (kinetic parameters, effective interactions, etc.)

The main dataset concerns bispecific mediated killing of tumour cell lines by primary immune cells in videomicroscopy. It is complemented by higher resolution data of synapse formation on mimetic targets. Both datasets will be further extended within an on-going collaborative project lead by L. Limozin.

References:

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