Robotic Mapping and Generative Modelling of Cytokine Responses

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An immune response is by essence a collective computation. Starting with the initial activations of few T cells, a complex dance of immune actors self-organize over long time scales. Understanding how and why immune cells communicate with one another to perform this response could be key to a better understanding of personalized medicine and immunotherapy. In collaboration with Grgoire Altan-Bonnet (NIH), we have developed a pipeline to study, decode and model cytokine communications between T cells. I will show how simple machine learning allows to project the complex immune response into a 2D latent space, where immune parameters can be simply deconvolved. Remarkably, this suggests a simple, physics inspired, model of collective communication and computation. The model is highly reproducible in different conditions, and can be applied to different types of immune T cells. I will show how our approach can be used to predict quality of unknown antigen, and how it can potentially help to better estimate success of immunotherapies.