

**1.** T cells constantly patrol the whole body to detect and fight disease

**2.** T cells detect disease early, before symptoms (yellow dots)

**3.** T cells then fight diseases and the patients get symptoms (blue dots)

**4.** We constructed a mathematical model of how T cells detect and fight disease

**5.** We used the model to study symptom-free stages of multiple sclerosis and allergy

**6.** The results support that the model can be used for early diagnosis, before symptoms

$$\min_{\{w_{ij}\}_{i=1, \dots, N}} \sum_{k=1}^K \left( \dot{x}_j(t_k) - \sum_{j=1}^N w_{ij} x_j(t_k) \right)^2 + \lambda_i \sum_{j=1}^N P_{ij} |w_{ij}|$$



Illustration: Antonio Lentini