



## *Emerging Topics in Biological Networks and Systems Biology*

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*Multi-resolution Network Modelling of T-cells for Precisions Medicine*

### **Abstract:**

Networks analysis has great potential for precision medicine, but is most often either too precise, by focussing on individual genes, or only focussed on statistical associations. My research focus on three recent network medicine concepts that enable a gradually increased resolution of modelling for complex diseases, which I ultimately aims at integrating in a unifying precision medicine toolbox. First, disease genes have shown to co-localise for many complex diseases in the protein-interaction network. Second, upstream hub transcription factors (TFs) regulating those modules have shown to be good candidates for early medicine (Gustafsson Science Transl Med 2015). Third, those TFs tend to form nonlinear core circuits, whose genome-wide influence are tremendous and could be modelled by our recent dynamic ordinary differential equation based modelling tool, LASSIM. Each of these concepts increase the modelling resolution, but a critical problem is that parts of the models are individual, and parts are global. Hence, we are exploring how these concepts should be integrated for increased resolution and what concepts should be individualised. For this purpose, we are performing detailed modelling of CD4+ T-cells and multiple sclerosis using general applicable principles in open access pipelines, which I will talk about during my presentation.

### **About:**

I received a PhD in theoretical physics 2010 working on inference and analysis of large-scale gene regulatory network applied on yeast (twice DREAM winner). Since then I have together with physicians at Linköping University (LiU) Hospital concentrated on building successful precision medicine models by combining human T-cell differentiation and relapsing T-cell associated disease models like seasonal allergic rhinitis and multiple sclerosis (Science Transl Med x2, Cell Reports x2, PLoS Genet, Genome Med x3, Lancet Respir Med). Since 2015 I hold a tenure Assoc Professorship and have established an independent interdisciplinary omics group of ~8 people at LiU.