

IMB 9270: Quantitative biology, or mathematics is biology's next microscope

19.10 and 20.10.2020

Digital teaching, on zoom

Kursmateriell: /course materials:

1. Clayton DG: Prediction and Interaction in Complex Disease Genetics: Experience in Type I Diabetes. *PLoS Genetics*, 9:e1000540, 2009.
2. Xia L, Zhang Y, Zhang H, Wei Q, Liu F, Crozier S: Simulation of Brugada syndrome using cellular and three-dimensional whole-heart modelling approaches. *Physiol. Meas.* 2006; 27:1125-42.
3. Elhanati Y, Sethna Z, Callan Jr CG, Mora T, Walczak AM: Predicting the spectrum of TCR repertoire sharing with a data-driven model of recombination. *Imm. Rev.* 2018, 284:167-79.
4. Artyomov MN, Das J, Kardar M, Chakraborty AK: Purely stochastic binary decisions in cell signaling models without underlying deterministic bistabilities. *Proc Natl Acad Sci U S A.* 2007 104:18958-63.

Cohen JE: Mathematics is biology's next microscope. *PLoS Biology*, 2, e439, 2004.

Thursday 15.10:

9.00-16.00: Self study of course materials for part I of the course

The course materials consisting of the four papers need to be read before the course.

Friday 16.10:

9.00-16.00: Self study of course materials for part II of the course

The course materials consisting of the four papers need to be read before the course.

Monday 19.10:

Machine learning and modeling

09.00-10.15: Victor Greiff: Machine learning and computational methods for the analysis of adaptive immune receptor repertoires.

10.15-10.30: *Discussion groups: Predicting the spectrum of TCR repertoire sharing*

11.30-12.00: Summary of discussion in plenum

12.00-13.00: Lunch

Probabilities: Genes and heredity

13.00-14.15: Stephen Sawcer: Genetic associations

14.15-15.30: *Discussion groups: Prediction and interaction in Complex disease*

15.30-16.00: Summary of discussion in plenum

Tuesday 20.10:

Simulation: Electrophysiology of the heart:

09.00-09.30: Maja Elstad: Electrical activity in the heart

09.30-10.30: Hermenegild Arevalo: Vector simulation of electrical currents in the heart

10.30-11.30: *Discussion groups: Simulation of Brugada syndrome*

11.30-12.00: Summary of discussion in plenum

12.00-13.00: Lunch

Stochastic processes in systems biology

13.00-13.20: Anne Spurkland: From single genes to systems biology

13.20-14.10: Alvaro Köhn-Luque: Stochastic simulations of biochemical reactions

14.10-15.10: Discussion groups: *Stochastic binary decisions in cell signaling*

15.10-15.30: Summary of discussion in plenum

15.30-16.00: Course exam