

## **Program SIKS course Mathematical Methods for IKS**

**Monday May 26 2014**

Lecturer:

**Eric Postma**  
Tilburg University

09.30-10.00 Coffee and tea

10.00-11.45 Welcome/Lecture and exercises on mathematical models  
Topics: exponential growth, predator-prey models, deterministic chaos

11.45-12.00 Break

12.00-13.00 Lecture and exercises  
Topics: percolation model, Ising model, phase transitions, critical behavior, network theory (small-world networks and scale-free networks). Information theory.

13.00-14.00 Lunch

14.00-15.30 Lecture and exercises on self-organisation  
Topics: models of self-organisation, Hopfield model, Kohonen's self-organizing feature map.

15.30-16.00 Break

16.00-17.00 Wrap up (take-home messages)

Literature:

[http://www.barabasilab.com/pubs/CCNR-ALB\\_Publications/200305-01\\_SciAmer-ScaleFree/200305-01\\_SciAmer-ScaleFree.pdf](http://www.barabasilab.com/pubs/CCNR-ALB_Publications/200305-01_SciAmer-ScaleFree/200305-01_SciAmer-ScaleFree.pdf)

Excerpts from:

<http://www.inference.phy.cam.ac.uk/itprnn/book.pdf>

**Tuesday May 27 2014**

Lecturer:

**Tom Heskes**

Radboud University Nijmegen

9.30-11.00 Lecture on Mixture Models

Literature:

- <http://research.microsoft.com/en-us/um/people/cmbishop/prml/>, chapter 9
- <http://www.inference.phy.cam.ac.uk/itprnn/book.pdf>, chapters 20 and 22

11.00-12.30 Exercise session

12.30-13.30 Lunch

13.30-15.00 Lecture on Model Comparison and Decision Theory

Literature:

- <http://www.inference.phy.cam.ac.uk/itprnn/book.pdf>, chapters 28 and 36

15.00-16.30 Exercise session

- NB: there will be **no printed course material**. Download (and print, if you want to) the relevant material from <http://www.cs.ru.nl/~tomh/siks/siksmm.zip>.
- If you'd like to solve a programming exercise, make sure to bring your laptop with Matlab (or something alike) on it.