CSNN (SS11) – Seminar Topics

1. **Random Boolean Networks**
   Yeast cell cycle - simulation and discussion of the robustness of the cell cycle.
   http://www.pnas.org/content/101/14/4781.long

2. **Random Branching**
   (Branching Theory, Self-Organized Criticality) Evaluation of the avalanche duration by generalizing methods discussed in the lecture for the avalanche size within the sandpile model (see CADS script, sec. 5.1).
   http://prl.aps.org/abstract/PRL/v75/i22/p4071_1

3. **Cellular automata**
   Review of types and classes of cellular automata and their application in various fields.
   For various references go to
   http://en.wikipedia.org/wiki/Cellular_automaton

4. **Forest Fire Model**
   (Cellular Automata, Self-Orginized Criticality) Simulation and discussion of the forest-fire model (see CADS script, pp. 166-167):
   http://itp.uni-frankfurt.de/~gros/Vorlesungen/CADS/downloads.php

5. **Game of Life**
   (Cellular Automata) Simulation and discussion of Conway's "Game of Life". This game is a zero-player game, meaning that its evolution is determined by its initial state. See, e.g.
   http://www.bitstorm.org/gameoflife/
   https://secure.wikimedia.org/wikipedia/en/wiki/Conway%27s_Game_of_Life

6. **Bak and Sneppen model**
   For the Bak and Sneppen model, evaluate the branching probability p_{bran} explicitly through a numerical simulation. (see CADS script, Sec. 5.6).
   http://itp.uni-frankfurt.de/~gros/Vorlesungen/CADS/downloads.php

7. **Evolutionary Algorithms and Applications**
   Overview of various evolutionary algorithm techniques and their applications.
   http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.45.1144&rep=rep1&type=pdf
   http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.108.8521&rep=rep1&type=pdf
   http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.81.1058

8. **Models of Life**
   (Modeling Theory) Play around with the JAVA applets
   http://cmol.nbi.dk/javaapp.php
   for models of life. Select then a specific model, search for literature and discuss it.

9. **The Prisoner's Dilemma on a Square Lattice** Simulation and discussion of the prisoner's dilemma game on a lattice where agents are interacting with their neighbors. Analyze the influence of memory on the game evolution (see CADS script, pp. 223-225).
   http://itp.uni-frankfurt.de/~gros/Vorlesungen/CADS/downloads.php
   http://www.mfa.kfki.hu/~szabo/pdg2s.pdf
   http://pre.aps.org/abstract/PRE/v78/i4/e041129

10. **Spiking Neurons**
    (Neural Networks) Overview of spiking neuron models and different forms of adaptation.
    http://icwww.epfl.ch/~gerstner/SPNM/node25.html

11. **Echo state networks**
    Formalism, theory and application of echo state networks.
    For various references go to
    http://www.scholarpedia.org/article/Echo_state_network

12. **Liquid state machine in a bucket**
    Demonstration of how waves produced on the surface of water can be used as the medium for a "liquid state machine", which can be used for solving the XOR problem and undertake speech recognition. Review of a general theory behind Liquid State Machines.
    http://www.springerlink.com/content/xlnymhf0qp946rce/

13. **Finding Structure in Time**
    Learning temporal order (e.g. grammar structure or XOR function) with recurrent neural networks. Discussion of general problems of time representation.
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.28.9476&rep=rep1&type=pdf
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1.4822&rep=rep1&type=pdf

14. **Other** Anything else you may find interesting as a CSNN seminar topic and it's not listed here. For the literature consult one of the tutors.