Projects for PCNS - DEADLINE DEC 16

Each student should choose a project, complete the task assigned, and prepare a write-up on the assignment and its results. Your project must be directly related to the subject of the course. The write-ups should be as short as possible, while still including an overview of the project and the results produced. Please e-mail the write-ups to me at goutsias@jhu.edu by the deadline. The source code should be written in MATLAB and e-mailed to goutsias@jhu.edu so that I can reproduce the results. **Source code in other languages will not be accepted and lack of reducibility will result in a lower grade.**

If desired, groups of 2 are allowed and will be required to author individual write-ups detailing their individual contributions to the group work.

You are not allowed to use software produced by other. If you do, your project will receive a zero grade.

By **December 2**, you must e-mail me (goutsias@jhu.edu) your project choice and your team-mate's name (if any).

Here is a list of suggested projects (but feel free to come up with your own if you so wish).

Enzyme Kinetics:

Project 1. Reproduce all of Figure 2 from [1].

Dimerization:

Project 2. Reproduce Figure 1 from [3].

Viral Kinetics:

Project 3. Reproduce Figures 5 and 6 from [1].

Transcription Regulation:

Project 4. Reproduce Figures 3a and 3b from [2].

Project 5. Reproduce Figures 3a and 3c from [2].

Project 6 Reproduce Figures 3a and 3d from [2].

Project 7. Reproduce Figures 3a and 3e from [2].

Quadratic Autocatalator:

Project 8. Reproduce Figure 3 from [3].

Avalanches in Biological Neural Networks:

Project 9. Reproduce Figure 3a,b,c from [4].

SIR Epidemiology:

Project 10. Reproduce Figures 2, 3, 4 from [5].

References:

[1] Goutsias, J. 2005. *Quasiequilibrium approximation of fast reaction kinetics in stochastic biochemical systems.* The Journal of Chemical Physics. **122,** 184102.

[2] Goutsias, J. 2006. *A hidden markov model for transcriptional regulation in single cells.* IEEE/ACM Transactions on Computational Biology and Bioinformatics. Volume 3, Number 1, pages 57-71.

[3] Goutsias, J. 2007. *Classical versus stochastic kinetics modeling of biochemical reaction systems.* Biophysical Journal. Volume 92, pages 2350-2365.

[4] Benayoun, M. Cowan, J.D. van Drongelen, W. Wallace, E. 2010. *Avalanches in a Stochastic Model of Spiking Neurons.* PLoS Computational Biology. Volume 6, Issue 7, e1000846.

[5] Chen, WY. Bokka, S. 2005. *Stochastic modeling of nonlinear epidemiology.* Journal of Theoretical Biology. Volume 234, pages 455-470.