NEDA BAGHERI, PHD

Department of Biological Engineering, MIT **nbagheri@mit.edu**

PROFESSIONAL EXPERIENCE

Assistant Professor, Department of Chemical & Biological Engineering. Northwestern University (*beginning 2012*).

EDUCATION

BS Electrical & Computer Engineering, University of California Santa Barbara. June 2002.
Major in Control Theory; minor in Signal Processing.

MS/PhD Electrical & Computer Engineering. University of California Santa Barbara. November 2007.
Advisor: Professor Francis J. Doyle III.

RESEARCH EXPERIENCE

Postdoctoral research. Department of Biological Engineering, MIT.
Advisor: Professor Douglas A. Lauffenburger.
January 2008 – December 2011.
Integrated experimental and computational studies to investigate cell regulatory dynamics underlying virus-host interaction and immune function.

- Computational analysis of dynamic cytokine signaling responses by individual T cells to resolve and predict complex immune function.
  Collaboration with Professor J. Christopher Love (MIT), 2010-present.
- Mechanistic and experiment driven dynamical systems modeling of interactions between virus and host cells (and their regulatory networks) to improve combinatorial effects of MEK-inhibition and oncolytic adenovirus cancer therapy.
  Collaboration with Dr. W. Michael Korn (UCSF), 2008-2010.

Graduate student research. Department of Electrical & Computer Engineering, UCSB.
Advisor: Prof. Francis J. Doyle III.
Winter 2003 – Fall 2007.
Integrated control theory with quantitative biological measurements to investigate circadian regulation, structure, and robust performance:

- Developed phase-based analysis to investigate sensitivity tradeoffs of biological oscillators.
- Employed nonlinear model predictive control to enhance phase-resetting dynamics.
- Developed a transcriptional regulatory model that relies on a positive-negative feedback switch to characterize nonlinear circadian phase dynamics.

Visiting researcher. Max Planck Institute for Dynamics of Complex Technical Systems in Magdeburg, Germany.
Advisors: Professors Ernst D. Gilles and Jörg Stelling (now at ETH).
Summer and Fall 2004.

TEACHING EXPERIENCE

Instructor. Course 20.320: Analysis of Biomolecular and Cellular Systems. Department of Biological Engineering, MIT.
Colleagues: Professors Ernest Fraenkel and Forest White.
Fall 2008, Fall 2009, Fall 2010.
Expanded the curriculum to include: ODE-based modeling, parameter estimation, model analysis, and an introduction to control theory. Developed a course project involving the theoretical design, simulation, and analysis of a synthetic biology network.

HONORS

- Voted Best Paper Award for the 2006 manuscript in Computers & Chemical Engineering.
- Research Fellow, Air Force Research Laboratory, 2005-2007.
- NSF IGERT CSE associate, 2004-2007.
- IEEE Control Systems Magazine's featured student, October 2004.
- NSF Fellow and invited participant to the 3rd International Summer School on Biocomplexity from System to Gene. Dartmouth College, NH. July 2003.
- Outstanding Graduating Electrical Engineering Student Award, June 2002.
- Harold Frank Scholarship; awarded to students showing exceptional motivation in technical leadership, 2002-2003.
- University Award of Distinction, June 2002.
- Center for Entrepreneurship and Engineering Management Scholarship, 2000-2002.
- National Engineers' Week Scholarship, 2000.

ACADEMIC PUBLICATIONS

Qing Han, **Neda Bagheri**, Douglas A. Lauffenburger, J. Christopher Love (*submitted*).
Dynamic profiles of cytokine secretion by individual human T cells.

Neda Bagheri, Marisa Shiina, Douglas A. Lauffenburger, W. Michael Korn (2011).
A Dynamical Systems Model for Combinatorial Cancer Therapy Enhances Oncolytic Adenovirus Efficacy by MEK-inhibition. *PLoS Comput Biol* 7(2): e1001085.
DOI: 10.1371/journal.pcbi.1001085.

Neda Bagheri, Jörg Stelling, and Francis J. Doyle III (2008).
Modeling the *Drosophila melanogaster* Circadian Oscillator via Phase Optimization. *Journal of Biological Rhythms* 23(6): 525-537.
DOI: 10.1177/0748730408325041.

Neda Bagheri, Jörg Stelling, and Francis J. Doyle III (2008).
Circadian phase resetting via Single & Multiple Control Targets. *PLoS Comput Biol* 4(7): e1000104.
DOI: 10.1371/journal.pcbi.1000104.

Neda Bagheri, Stephanie R. Taylor, Kirsten Meeker, Linda R. Petzold, and Francis J. Doyle III (2008).
Synchrony and Entrainment Properties of Robust Circadian Oscillators. *R. Soc. Interface* 5: S17–S28.
DOI: 10.1098/rsif.2008.0045.focus.

Neda Bagheri, Jörg Stelling, and Francis J. Doyle III (2007).
Circadian phase entrainment via nonlinear model predictive control. *International Journal of Robust and Nonlinear Control* 17: 1555-1571. DOI: 10.1002/rnc.1209.

Neda Bagheri, Jörg Stelling, and Francis J. Doyle III (2007).
Quantitative performance metrics for robustness in circadian rhythms. *Bioinformatics* 23(3): 358-364. DOI: 10.1093/bioinformatics/btl627.

Francis J. Doyle III, Rudiyanto Gunawan, **Neda Bagheri**, Henry Mirsky, and Tsz Leung To (2006).
Circadian rhythm: A natural, robust, multi-scale control system. *Computers & Chemical Engineering* 30: 1700-1711. DOI:10.1016/j.compchemeng.2006.05.029.

Book Chapters:
H. Mirsky, J. Stelling, R. Gunawan, **N. Bagheri**, S.R. Taylor, E. Kwei, J.E. Shoemaker, F.J. Doyle III.
Chap. 75: Automatic Control in Systems Biology. Springer Handbook of Automation.
Nof, Shimon Y. (Ed.). Available September 2009.

INVITED TALKS & SEMINARS

- Mathematical Biosciences Institute (MBI) workshop on Robustness in Biological Systems, Columbus, OH, February 2012.
- The Georgia Institute of Technology, School of Electrical & Computer Engineering, March 2011.
- Columbia University, Department of Chemical Engineering, March 2011.
- University of Delaware, Department of Chemical Engineering, March 2011.
- Northwestern University, Department of Chemical Engineering, March 2011.
- Washington University in St. Louis, School of Engineering & Applied Science, February 2011.
- The University of Texas at Austin, Department of Biomedical Engineering, February 2011.
- The Pennsylvania State University, Department of Chemical Engineering, February 2011.
- The Georgia Institute of Technology, School of Chemical & Biological Engineering, January 2011.

CONFERENCE PRESENTATIONS *(speakers underlined)*

Neda Bagheri, Qing Han, Douglas A. Lauffenburger, J. Christopher Love.
Computational Analysis of Dynamic Cytokine Signaling Responses by Individual T Cells.
American Institute of Chemical Engineers (AIChE) Annual Meeting, Minneapolis, MN, October 2011.
Biomedical Engineering Society (BMES) Annual Meeting, Hartford, CN, October 2011.

Qing Han, **Neda Bagheri**, Douglas A. Lauffenburger, J. Christopher Love.
A Novel Experimental Approach to Investigate Cytokine Signaling Networks of Human T Cells.
American Institute of Chemical Engineers (AIChE) Annual Meeting, Minneapolis, MN, October 2011.
Biomedical Engineering Society (BMES) Annual Meeting, Hartford, CN, October 2011.

Neda Bagheri, Qing Han, Douglas A. Lauffenburger, J. Christopher Love.
Quantitative Statistical Analysis of Cytokine Secretion Dynamics for Individual T Cells.
International Conference on Biomolecular Engineering (ICBE), San Francisco, CA, January 2011.

Neda Bagheri, Marisa Shiina, W. Michael Korn, and Douglas A. Lauffenburger.
Data-Driven Modeling Enhances Oncolytic Adenovirus Therapy. *American Institute of Chemical Engineers (AIChE) Annual Meeting*, Salt Lake City, UT, November 2010.

Neda Bagheri, Marisa Shiina, W. Michael Korn, and Douglas A. Lauffenburger.
Data-Driven Modeling Enhances Oncolytic Adenovirus Therapy. *Biomedical Engineering Society (BMES)* Annual Meeting, Austin, TX, October 2010.

Neda Bagheri, Marisa Shiina, W. Michael Korn, and Douglas A. Lauffenburger.
Refining an experimentally-driven quantitative model for oncolytic adenovirus cancer treatment to include virus dynamics. *Gordon Research Conference on Cells & Viruses*, Italy, June 2009.

Neda Bagheri, Marisa Shiina, W. Michael Korn, and Douglas A. Lauffenburger.
An experimentally driven quantitative model for predicting and optimizing oncolytic adenovirus cancer treatment. *International Conference on Systems Biology (ICSB)*, Gothenburg, Sweden, August 2008.

Stephanie R. Taylor*, **Neda Bagheri***, Kirsten Meeker, Linda R. Petzold, Francis J. Doyle III.
Robust Timekeeping in Circadian Networks: From Genes to Cells. *Foundations of Systems Biology in Engineering (FOSBE)*, Stuttgart, Germany, September 2007. **Equal contribution*.

Neda Bagheri and Francis J. Doyle III.
The entrainment and optimal control of circadian phase dynamics. *SIAM Conference on Computational Science and Engineering*, Costa Mesa, CA, February 2007.

Neda Bagheri, Jörg Stelling, and Francis J. Doyle III.
Circadian phase entrainment via nonlinear model predictive control. *American Institute of Chemical Engineers (AIChE) Annual Meeting*, San Francisco, CA, November 2006.

CONFERENCE PRESENTATIONS *(continued)*

Neda Bagheri, Jörg Stelling, and Francis J. Doyle III.
Phase-based performance analysis for robustness in the mammalian circadian oscillator. *International Conference on Systems Biology (ICSB)*, Yokohama, Japan, October 2006.

Francis J. Doyle III, Rudi Gunawan, **Neda Bagheri**, Henry Mirsky, and Tsz Leung To.
Circadian rhythm: A natural, robust, multi-scale control system. *Chemical Process Control VII*, Alberta, Canada, January 2006.

Neda Bagheri, Stephanie Taylor, Jörg Stelling, and Francis J. Doyle III.
A finite differences approach to phase-based sensitivity analysis of biological oscillators. *Foundations of Systems Biology in Engineering (FOSBE)*, Santa Barbara, CA, August 2005.

Neda Bagheri, Jörg Stelling, and Francis J. Doyle III.
Optimal phase-tracking of the nonlinear circadian oscillator. *American Control Conference (ACC)*, Portland, OR, June 2005.

Neda Bagheri, Jörg Stelling, and Francis J. Doyle III.
Stochastic sensitivity analysis of the circadian gene network. *9th meeting for the Society for Research on Biological Rhythms (SRBR)*, Whistler, British Columbia, Canada, June 2004.

Neda Bagheri, Jörg Stelling, and Francis J. Doyle III.
Analysis of robustness/fragility tradeoffs in a stochastic circadian rhythm gene network. *International Conference on Systems Biology (ICSB)*, St. Louis, MO, 2003.

INDUSTRY CONSULTING

Immuneering Corporation, 2011-present.

REFERENCES

Available upon request.