Kevin Oishi, PhD

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Education

University of Washington, Ph.D. in Electrical Engineering, 2014.
Thesis: Programming Molecules and Cells: Design Architectures for Chemical Reaction and Gene Regulatory Networks.
Advsior: Professor Eric Klavins.

Carnegie Mellon University, M.S. in Robotics, 2006.
Thesis: Stability and Control for a Class of Dynamic Legged Climbers.
Advisor: Professor Alfred A. Rizzi.

Carnegie Mellon University, B.S. in Computer Science and B.S. in Discrete Math and Logic, 2004.

Research Experience

Institute for Disease Modeling, Postdoctoral Researcher, 2014–present.

HIV Modeling Team, 2014–present. Contributed to the specification, design, development, and statistical validation of a detailed stochastic and spatial model of the HIV epidemic. Led the design and implementation of the user-configurable *cascade of care* modeling framework, enabling the ability to specify individual-level health care system interactions. Advised and contributed to the development of browser-based apps for cascade of care visualization.

Algorithms and Applied Math Group, 2015–present. (Nascent work.) Developing and comparing algorithms and techniques to calibrate stochastic epidemiological models to observed data. Metamodeling with Gaussian Process Regression, experiment design, and sampling for Bayesian inference.

University of Washington, Graduate Researcher, 2006–2013.

Computation in Cells and Growing Microcolonies. Contributed to the development of `gro`, a programming language and 2D stochastic simulation environment for rapid prototyping and design of multicelled behaviors in a growing microcolony of rod-shaped bacteria. Designed a method for compiling arbitrary finite state machines into gene regulatory networks. Collaborated with plant and yeast geneticists, and mentored new graduate students in designing synthetic transcription factors to implement synthetic cell development programs couched in the framework of finite state machines in *S. cerevisiae*. Assisted in writing a successful proposal for a grant from the Semiconductor Research Corporation: *Sequential Logic for Control of Cell State.*

DNA Programming. Implemented a toolkit in Mathematica for simulation and analysis of mass action and stochastic chemical reaction networks. Designed a method for approximating arbitrary linear I/O systems with mass action chemical reaction networks, as well as a biomolecular implementation using DNA polymers. Mentored undergraduate and new graduate students in the design and implementation of DNA logic gates *in vitro*.

Carnegie Mellon University, 2002–2006.

Dynamic Legged Climbing Robots. MATLAB simulation, controller design, and stability analysis for multi-legged climbing robots.

Urban Search and Rescue Robotics. Developed control and interface software for a semi-autonomous, tele-operated, urban search and rescue robot.

Undergraduate Work Experience

Microsoft Corporation, Software Development Engineer Intern. Developed a web application to organize and manage the work flow for Office Update localization. Summer 2003.

Sandia National Laboratories, Intern. Contributed to several modules of an in-house virtual reality environment, including multi-user interaction through haptic devices, and porting a rigid body collision detection library to the Umbra simulation framework. Summers 2004, 2002, 2001.

Journal Articles

[1] K. Oishi and E. Klavins, "Framework for engineering finite state machines in gene regulatory networks," *ACS synthetic biology*, vol. 3, no. 9, pp. 652–665, 2014.

[2] S. S. Jang, K. T. Oishi, R. G. Egbert, and E. Klavins, "Specification and simulation of synthetic multicelled behaviors," *ACS synthetic biology*, vol. 1, no. 8, pp. 365–374, 2012.

[3] K. Oishi and E. Klavins, "Biomolecular implementation of linear i/o systems," *IET Systems Biology*, vol. 5, p. 252, 2011.

Invited Presentations

"Epidemiological Modeling Disease Transmission Kernel for HIV," Health Econometrics and Epidemiology Research Office, University of Witwatersrand, Johannesburg, South Africa, October 23, 2014.

"A Framework for Implementing Finite State Machines in Gene Regulatory Networks," Molecular Programming Project Workshop, Oxnard, CA, December 14, 2013.

"Implementing Finite State Machines with Gene Regulatory Networks," University of California San Francisco, March 29, 2013.

"Using See-Saw Gates and Linear Systems to Implement an Oscillator," University of Washington, January 21, 2011.

"Approximating Linear Systems with DNA Reactions," Molecular Programming Project Workshop, Oxnard, CA, January 9, 2009.

"Stability and Control for a Class of Dynamic Legged Climbers," Carnegie Mellon University, May 11, 2006.

Poster Abstracts

[4] A. Bershtyn, D. Klein, K. Oishi, and P. Eckhoff, "Where to strengthen care: model-based triangulation of trends in the hiv care cascade," in *8th IAS Conference on HIV Pathogenesis, Treatment and Prevention*, July 2015.

[5] ——, "Modeling the impact of targeting treatment and prevention to the migrant populatio of male miners in a generalized epidemic setting," in *HIV Research for Prevention*, 2014.

[6] C. Selinger, A. Bershteyn, K. Oishi, and P. Eckhoff, "Intra-host model of transmitted tenofovir resistance after breakthrough infection with topical hiv prep," in *HIV Research for Prevention*, 2014.

[7] K. Oishi and E. Klavins, "Finite state machines and turing universal computation in cells," in *6th International Meeting on Synthetic Biology*, 2013.

[8] K. Oishi, S. Jang, R. Egbert, and E. Klavins, "gro: Specification and programming of multi-celled behavior," in *q-bio*, 2012.

[9] S. Jang, K. Havens, J. Guseman, E. Pierre-Jerome, N. Bolton, B. Moss, K. Oishi, Y. Yang, M. Gardner, T. Gu, J. Nemhauser, and E. Klavins, "Engineering with auxin: characterization of a synthetic signal processing toolbox," in *q-bio*, 2012.

[10] J. Bishop, K. Oishi, and E. Klavins, "Feedback-regulated rna fuel for dna circuits," in *17th International Conference on DNA Computing and Molecular Programming*, 2011.

[11] K. Oishi, Y. Chen, and E. Klavins, "Implementing autonomous linear systems with dna," in *17th International Conference on DNA Computing and Molecular Programming*, 2011.

Teaching Experience (University of Washington)

Molecular and Neural Computation, CSE P 590: Graduate course in the design and implementation of DNA-based computation and models of computation inspired by biophysical processes. (Helped develop course.) Teaching Assistant, 2014.

Unconventional Computing, EE 590: Graduate course in computational models. Guest lecturer, 2013.

Introduction to Synthetic Biology, BioE 423/423, CSE 486/586, EE 423/523: Undergraduate and graduate course in designing and building synthetic biological organisms. Teaching Assistant, 2012, 2009, 2007.

Operating Systems, CSE 451: Undergraduate course in operating system design. Teaching assistant, 2008.

Introduction to Computer-Communication Networks, CS461: Undergraduate course in computer networks. Teaching assistant, 2007.

Service Activities

Program Committee Member, International Workshop on Bio-Design Automation, 2013.

Journal Reviewer, PLOS ONE, since 2015.

Journal Reviewer, ACS Synthetic Biology, since 2012.

Conference Reviewer, International Workshop on Bio-Design Automation, since 2011.

Conference Reviewer, International Meeting on DNA Computing and Molecular Programming, since 2011.