

s. shelly jang

PhD candidate

contact

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languages

English & Korean

programming

♥ Mathematica
Matlab, Python
CSS & HTML5

reference 1

Dr. Eric Klavins
klavins@uw.edu
Associate Professor
Dept of EE
University of
Washington

reference 2

Dr. Radha Poovendran
rp3@uw.edu
Professor
Dept of EE
University of
Washington

reference 3

Dr. Kyle Havens
kyle.havens@pregenen.com
Research Scientist
Pregenen

education

- 2009–2014 **PhD** in Electrical Engineering University of Washington
Model Identification of Complex Synthetic Biological Systems
Identifying mathematical models from experimental data of biological systems allows researchers to answer questions motivated by both science (study of existing systems) and engineering (study of novel synthesis). My work is guided by the principle of Occam's razor – achieving the balance between fidelity to the reality and ease of human interpretation.
- 2007–2009 **MASc** in Chemical and Biological Engineering University of British Columbia
Nonlinear System Identification with Bayesian Inference
- 2002–2007 **BS** in Chemical Engineering University of Washington
Minor in Mathematics and Chemistry

experience

- 2009–2014 **Professor E. Klavins, University of Washington** Seattle, WA
PhD Candidate
The bottom up approach of synthetic biology enables a complementary approach to traditional biological investigation and allows the identification of design principles of natural systems. Driven by the need to obtain modularity, characterization and standardization of parts to enable rational engineering, I use experimental data to identify mathematical models that capture the observed dynamics of system entirely. However, over-fitting is a critical issue especially when considering predictive power of the model. Therefore the final model is identified with the aim of keeping the complexity to a minimum for enhanced human interpretation. Though simple, the models are capable of generating new verifiable hypothesis, thus closing the feedback loop in the scientific inquiry.
- System identification and quantitative analysis of *S. cerevisiae* synthetic auxin signaling pathway
 - Engineering multi-cellular behavior in *E. coli*
- 2007–2009 **Professor B. Gopaluni, University of British Columbia** Vancouver, BC, Canada
Graduate Research Assistant
Many chemical and biological processes are restricted by physical and logistical factors and do not allow samples to be taken at regular time intervals in large quantity. I developed a Bayesian inference algorithm that allow estimation of parameter probability distribution using a small number of irregularly sampled data from multiple experiments.
- 2006–2007 **Professor B. Ratner, University of Washington** Seattle, WA
Undergraduate Research Assistant
Characterization and Analysis of polymer surface immobilized with amino acids.
- 2005 **Professor S. Jiang, University of Washington** Seattle, WA
Undergraduate Research Assistant
Maintenance of overall lab organization, preparing various chemical buffers, electrophoresis gel and bacterial growth media for biochemical experiments for pharmacological research

experience cont.

- 2003–2007 **Professor N. Zheng, University of Washington** Seattle, WA
Undergraduate Research Assistant
Development of Surface Plasmon Resonance Biosensor
- 2001-present **Seoul National University** Seoul, Republic of Korea
Freelance Translator
Translation of academic journals and textbooks from Korean to English and from English to Korean, bi-lingual technical writing skills required for academic research

publications

- 2013 **Mutations in the TIR1 Auxin Receptor That Increase Affinity for Auxin/Indole-3-Acetic Acid Proteins Result in Auxin Hypersensitivity.**
H. Yu, B. Moss, **Seunghee S. Jang**, M. Prigge, E. Klavins, J. Nemhauser, and M. Estelle. *Plant Physiology*.
- 2012 **Specification and simulation of synthetic multi-celled behaviors.**
Seunghee S. Jang, K. Oishi, R. Egbert and E. Klavins. *Journal of American Chemical Society*
- 2012 **A synthetic approach reveals extensive tunability of auxin signaling.**
K. A. Havens*, J. M. Guseman*, **S. S. Jang***, E. Pierre-Jerome*, N. Bolten, E. Klavins and J. L. Nemhauser. *Plant Physiology*
- 2011 **Parameter Estimation in Nonlinear Chemical Biological Processes with Unmeasured Variables.**
S. S. Jang, R. B. Gopaluni. *Canadian Journal of Chemical Engineering*
- 2011 **Parameter estimation in nonlinear chemical and biological processes with unmeasured variables from small data sets.**
S. S. Jang, H. De La Hoz, A. Ben-Zvi, W. C. McCaffrey, R. B. Gopaluni. *Chemical Engineering Science*
- 2008 **Parameter Estimation using Scarce and Irregular data from Multiple Experiments.**
S. S. Jang, H. De La Hoz, A. Ben-Zvi, R. B. Gopaluni. *Proceedings of Advanced Control in Industrial Process*

technical skills

Modeling and analysis: Systems and Control theory, Markov processes, MCMC simulations, Stochastic Simulation Analysis, Chemical master equations, Bayesian inference, parameter identification and model reduction

Software: Mathematica, **gro**, MATLAB, Adobe Illustrator, Python, $\text{\LaTeX}$, Maple

Biology Laboratory: DNA recombination techniques, plasmid construction, gene modification, cloning, transformations and cell culture. Fluorescence microscopy, microfluidic chambers, flow cytometry

Biomaterials Laboratory: Toxicity screening, ESCA and ToF SIMS, PCA analysis, manufacture and analysis of electrophoresis gel and polymer

awards

2013	Global Grand Challenges Summit Delegate	CoE, University of Washington
2012	Kenney Fellowship	CoE, University of Washington
2009	Clairmont L. Egtvedt Fellowship	University of Washington
2007	Graduate Entrance Scholarship	University of British Columbia
2005	Kimberly-Clark Engineering Scholarship	Chemical Engineering, University of Washington
2002–2004	Dean's List	University of Washington
2003	Engineering Early Admission Student	Dept of Chemical Engineering, University of Washington

presentations

2012	Poster	q-Bio, 2012, Santa Fe, NM Engineering with auxin: characterization of a synthetic signal processing toolbox
2008	Oral Presentation	Advanced Control in Industrial Process, Jasper, AB Parameter Estimation using Scarce and Irregular data from Multiple Experiments
2008	Oral Presentation	Control Systems/Pan Pacific - PAPTAC, Vancouver, BC Parameter Estimation of Nonlinear Process Model using Multiple Experimental Data

teaching

2011	Introduction to Synthetic Biology (TA)	Dept of Electrical Engineering, UW
2008	Biotechnology Laboratory (TA)	Dept of Chemical and Biological Engineering, UBC
2008	Process Synthesis (TA)	Dept of Chemical and Biological Engineering, UBC
2008	Chemical & Biological Engineering Thermodynamics (TA)	Dept of Chemical and Biological Engineering, UBC

courses

Mathematical Foundation Systems Theory
Introduction to Synthetic Biology and Laboratory Course
Introduction to Digital Image Processing
Optimization Methods
Mathematical Operations in Chemical Engineering
Fluid Dynamics
Chemical Engineering Thermodynamics
Foundations in Control Engineering
Self-Tuning Control