

Huy Duc Vo

Postdoctoral Fellow

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Selected Publications and preprints (Full list on page 3)

Preprints

- D. Kalb, H. D. Vo, S. Adikari, E. Hong-Geller, B. Munsky, J. Werner. Visualization and Modeling of Inhibition of IL-1beta and TNFalpha mRNA Transcription at the Single-cell Level. BioRxiv preprint. DOI: <https://doi.org/10.1101/2020.10.16.342576>.
- H. D. Vo, B. Munsky. A parallel implementation of the Finite State Projection algorithm for the solution of the Chemical Master Equation. BioRxiv preprint. DOI: <https://www.biorxiv.org/content/10.1101/2020.06.30.180273v2.abstract>

Journal publications

- T. Catanach, H. D. Vo, B. Munsky. Bayesian inference of Stochastic Reaction Networks using Multifidelity Sequential Tempered Markov Chain Monte Carlo. *International Journal of Uncertainty Quantification*, Volume 10, Issue 6, March 2020.
- H. D. Vo, Z. R. Fox, A. Baetica, B. Munsky. Bayesian estimation of stochastic gene expression using multifidelity models. *Journal of Physical Chemistry B*, Volume 123, Issue 10, March 2019. Part of invited Special Issue on 'Deciphering Molecular Complexity in Dynamics and Kinetics from the Single Molecule to the Single Cell Level'.
- H. D. Vo, R. B. Sidje. Adaptive solution to the chemical master equation using tensors. *Journal of Chemical Physics*, Volume 147, Issue 4, July 2017.

Presentations

Invited Talks

- Measurement Noise and Optimal Design of Single-Cell Experiments. Workshop on Visualizing Living Systems, Los Alamos National Laboratories. Virtual meeting, February 25, 2021.
- New tools for design and analysis of single-cell experiments. MS on Modeling Transcription. Society of Mathematical Biology Annual Meeting 2019. Montreal, Canada, July 21-26, 2019.
- Noise makes gene regulation mechanisms harder to analyze but easier to identify and predict. MS on System Identification for Biological Systems. SIAM Annual Meeting 2018. Portland, OR, July 9-13, 2018.

Contributed Talks

- Maximizing Information from Noisy Measurements of Single-Cell Gene Expression Distributions. APS March Meeting 2021. Virtual meeting, March 17, 2021.
- Solving the Chemical Master Equation by an adaptive finite state projection method. SIAM Conference on the Life Sciences 2016. Boston, MA, July 11-14, 2016.
- Solving the Chemical Master Equation with adaptive methods. SIAM Southeast Atlantic Section 2016-Athens, GA. March 11-13, 2016.
- Adaptive stepsize control for the Krylov-based finite state projection algorithm. Biomathematics and Ecology, Education and Research. Claremont, CA, October 10-12, 2014.

Posters

- Adaptive solution of the Chemical Master Equation using tensors. SIAM Computational Science and Engineering – Atlanta, GA, February 27. March 3, 2017.
- Tensor train solution to the Chemical Master Equation. The Tenth q-bio Conference – Nashville, TN. July 27-30, 2016.
- A projection method for the chemical master equation. The Ninth q-bio Conference – Blacksburg, VA, August 5-8, 2015.

Technical Skills

- Programming: Fortran, MATLAB, C++, Python, Cython, OpenMPI, CUDA.

- Software packages: Tensor Toolbox, TT-Toolbox, TensorFlow.
- Other tools: LATEX, Github, Atom, Amazon Elastic Computing service.

Education

- Ph.D., University of Alabama, Tuscaloosa
 - Discipline: Mathematics
 - Dissertation: Krylov approximation and model reduction methods for the chemical master equation.
 - Advisor: Prof. Roger B. Sidje.
- B.Sc. University of Science, Ho Chi Minh, Viet Nam.
 - Discipline: Mathematics and Computer Science.
 - Honor class, High Distinction.

Research Interests

- Scientific computing.
- Computational Systems Biology.
- Bayesian computation.
- Experiment design.
- Data science.

Research Experience

- Colorado State University, Fort Collins, CO. July 2017-Present.
 - Title: Postdoctoral Research Fellow.
 - Supervisor: Prof. Brian Munsky.
 - Past and present projects:
 - Conceive and develop novel computational methods for optimal design and making statistical inference from single-cell experiments in systems and synthetic biology.
 - Develop stochastic models to explain and predict transcriptional response of inflammation genes.
 - Research machine learning methods to predict environmental variables from soil microbiome data.
- University of Alabama, Tuscaloosa, AL. September 2014-May 2017.
 - Title: Graduate Research Assistant.
 - Supervisor: Prof. Roger B. Sidje.
 - Past projects:
 - Develop novel numerical methods to solve the Chemical Master Equation and apply to stochastic models in systems and synthetic biology.

Summer Schools and Workshops

- Uncertainty Quantification Summer School. University of Southern California campus, LA, CA. August 14-16, 2019.
- AMS Mathematics Research Communities 2016, workshop on Mathematics and Physiology and Medicine. Snowbird, UT. June 19-25, 2016.
- IMA Workshop: Biological Systems and Networks – Minneapolis, MN. November 16-20, 2015.
- The Ninth Annual q-Bio Summer School – Fort Collins, CO. July 6-21, 2015.

Professional Development

- Coursera Deep Learning Specialization.
 - Credential URL: <https://www.coursera.org/account/accomplishments/specialization/certificate/A8GTLXPVEJH3>.

Awards and Scholarships

- Travel support by AMS to attend the AMS Mathematics Research Communities 2016.
- Scholarship from Summer School organizers to attend the Ninth Annual q-Bio Summer School.
- Ainsworth Scholarship 2015-2018 for excellent research students in applied mathematics. Department of Mathematics, University of Alabama.
- Travel grants in Fall 2014, Spring-Fall 2015, Spring-Fall 2016 for Graduate School, University of Alabama, and College of Arts and Sciences, University of Alabama.

Teaching Experience

- Courses taught at University of Alabama as a graduate instructor
 - Spring 2017: Introduction to Linear Algebra.
 - Fall 2016: Business Calculus, Applied Differential Equations.
 - Spring 2016: Precalculus Trigonometry.
 - Spring and Fall 2015: Precalculus Algebra.

Full list of publications and preprints

Preprints

- H. D. Vo, B. Munsky. A parallel implementation of the Finite State Projection algorithm for the solution of the Chemical Master Equation. BioRxv preprint. DOI: <https://doi.org/10.1101/2020.06.30.180273>.
- D. Kalb, H. D. Vo, S. Adikari, E. Hong-Geller, B. Munsky, J. Werner. Visualization and Modeling of Inhibition of IL-1beta and TNFalpha mRNA Transcription at the Single-cell Level. BioRxv preprint. DOI: <https://doi.org/10.1101/2020.10.16.342576>.

Journal publications

- T. Catanach, H. D. Vo, B. Munsky. Bayesian inference of Stochastic Reaction Networks using Multifidelity Sequential Tempered Markov Chain Monte Carlo. *International Journal of Uncertainty Quantification*, 2020 (accepted). Co-first authors.
- H. D. Vo, Z. R. Fox, A. Baetica, B. Munsky. Bayesian estimation of stochastic gene expression using multifidelity models. *Journal of Physical Chemistry B*, Volume 123, Issue 10, March 2019. Part of invited Special Issue on 'Deciphering Molecular Complexity in Dynamics and Kinetics from the Single Molecule to the Single Cell Level'.
- H. D. Vo, R. B. Sidje. Adaptive solution to the chemical master equation using tensors. *Journal of Chemical Physics*, Volume 147, Issue 4, July 2017.
- H. D. Vo, R. B. Sidje. Approximating the large sparse matrix exponential using incomplete orthogonalization and Krylov subspaces of variable dimensions. *Numerical Linear Algebra with Applications*, Volume 24, Issue 3, May 2017.
- H. D. Vo, R. B. Sidje. Implementation of variable parameters in the Krylov subspace projection for solving the Chemical Master Equation. *Applied Mathematics and Computations*, Volume 293, Issue 15, January 2017.
- R. B. Sidje, H. D. Vo. Solving the Chemical Master Equation by a fast adaptive finite state projection based on the stochastic simulation algorithm. *Mathematical Biosciences*, Volume 269, November 2015.

Conference proceedings

- H. D. Vo, R. B. Sidje. Solving the Chemical Master Equation by aggregation and Krylov approximations. *IEEE Conference on Decision and Control*, 2016.
- H. D. Vo, R. B. Sidje. Improved Krylov-FSP method for solving the chemical master equation. WCECS 2016.
- H. D. Vo and R. B. Sidje. Advances in the Krylov-based finite state projection algorithm. *Biotechnology and Bioinformatics (BIOT) Symposium*, 2015.
- H. D. Vo and R. B. Sidje. A projection method based on stochastic simulation algorithm. *Biotechnology and Bioinformatics (BIOT) Symposium*, 2014.

Journal Referee Service

SIAM Journal of Applied Mathematics, Applied Mathematics and Computation, Entropy, Journal of Chemical Physics.

Past and Present Professional Society Membership

SIAM, AMS, IEEE.