

Curriculum Vitae

Khanh Dao Duc

Contact Information

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Academic Positions

July 2019 - present Department of Mathematics, University of British Columbia (UBC)
Assistant Professor (Research Tenure Track)

Departments of Computer Science and Zoology, UBC
Associate member

May 2014- June 2015/ Computer Science Division, University of Berkeley, California
Postdoctoral scholar
Sep 2017- June 2019 Advisor: Yun Song

July 2015- August 2017 Mathematics and Biology Departments, University of Pennsylvania
Simons Maths+X Postdoctoral Fellow
Advisor: Yun Song

Education

- 2013** **Ph. D., Applied Mathematics**
Ecole Normale Supérieure, Paris, France
Title: Modeling and analysis of neuronal networks, stochastic chemical reactions in cellular microdomains and telomere length dynamics
Advisor: David Holcman
- 2009** **M.S., Applied Mathematics**
Université Pierre Marie Curie, Paris 6, France
- 2008** **Agrégation de Mathématiques**
(In France, "the Agrégation de Mathématiques" is the most prestigious nationwide competition selecting people to teach mathematics in the French public education system)
- 2007** **B.S., Mathematics**
Ecole Normale Supérieure, Lyon, France
- 2007** **B.S., History and Philosophy of Sciences**
Université Lyon 1, Lyon, France

Teaching and Supervision

2019-present University of British Columbia

- 2020 WT2: MATH 303: Introduction to stochastic processes (main instructor)
- 2020 WT1: MATH 215/255: Elementary differential equations (main instructor)
- 2019 WT2: MATH 303: Introduction to stochastic processes (main instructor)
MATH 215: Elementary differential equations

2013-14 EPITA Graduate School of Computer Science, Paris, France

Mathematics Instructor

Undergraduate courses for international students (1st and 2nd year)

2012-13 University of Paris 7, Paris, France

Teaching Assistant

Analysis and Algebra, 2nd year of Bachelor degree

2009-12 University of Paris 6, Paris, France

Teaching Assistant

Calculus, 1st year (2009-12)

Linear Regression Methods, 3rd year (2012)

Numerical Methods for ODE, 3rd year (2011)

Linear Algebra, 2nd year (2010)

Supervision:

Graduate students

- Isabela Jeronimo do O (Zoology) 2020-
- Jalal Khouhak (Math) 2020-
- Aryan Tajmir Riahi (Computer Science, co-supervised with Anne Condon) 2020-

Undergrad/Research internship

- Artie Kushner, Research Assistant: Summer-Fall 2020
- Bingyue Zhu, Work and Learn International Student: Summer 2020
- Xinpei Li, Work and Learn International Student: Summer 2020
- Arthur Ecoffet, graduate research intern (Ecole Polytechnique, France)
- Michael Resplandy, graduate research intern (Ecole Polytechnique, France)
- *Mentor for the UBC undergraduate Research Experience Program (REX): 6 mentees (two 4th year, one 3rd year, one 2nd year and two 1st year students)*

Honors, Awards and Fellowships

- 2020 - NSERC Discovery grant (cad 45k/year, 5 years) RGPIN-2020-05348:

Investigating the properties of the ribosomes and their impact on translation dynamics across scales and systems

- **New Frontiers of Research - exploration grant (cad 125k/year, 2 years) NFRFE-2019-00486**, main PI (co-investigator Dr. Cornelius Gati, SLAC at Stanford): *Beyond structure determination: Developing new algorithms for characterization of protein conformational heterogeneity and energy landscape inference from Cryo-EM data*
 - **UBC STAIR grant** (cad 25k, 1 year): co-PI Dr. Simcha Srebnik (UBC)
 - **France Canada Research fund** (under review, final round): co-PI Dr. Luca Ciandrini (University of Montpellier, France)
- 2018** *Runner-up of the DSWeb SIAM 2018 Software Contest* (competition for dynamical system software)
- 2015-17** **Simons *Math+X* Postdoctoral Fellowship** from the Simons Foundation
- 2014** **Pierre Gilles de Gennes PhD Prize**, awarded by the Institut de Biologie Physico-Chimique and the Pierre Gilles de Gennes Foundation (national French prize for best PhD in Biophysics)
- 2013** **Physics Research spotlight**: R.A. Blythe and C.E McPhee, *The Life and Death of Cells*, *Physics* (2013), 6, 129
- 2009-12** **PhD Fellowship** from Ecole Normale Supérieure, Lyon
- 2005-08** **Civil servant student (“Normalien”)** in **Mathematics**, Ecole Normale Supérieure, Lyon

Publications

In preparation / Preprints:

23. B. Zhu, **K. Dao Duc**, Y.S. Song *Unraveling local association between codon usage bias and translation speed*
22. W. Son, **K. Dao Duc**, D.D. Erdmann-Pham, Y.S. Song, *EGGTART: A computational tool to quantify the dynamics of biophysical transport processes from the inhomogeneous *l*-TASEP*
21. A. Ecoffet, F. Poitevin, **K. Dao Duc**, *Using a transport-based metric for continuous interpolation between cryo-EM density maps*
20. A. Ecoffet, F. Poitevin, **K. Dao Duc**, *MorphOT: Interpolation of conformational continuous trajectories with UCSF ChimeraX* (submitted)
19. Y. Sun, Y. Sung, Q. Zeng, **K. Dao Duc**, H. Luo, *Prochlorococcus Evolution coincided with Neoproterozoic Oxygenation and Glaciation* (submitted)

Publications in peer reviewed journals:

18. F. Poitevin, A. Kushner, X. Li, **K. Dao Duc**, *Structural Heterogeneities of the Ribosome: New Frontiers and Opportunities for Cryo-EM* (to appear in *Molecules*)
17. D.D. Erdmann-Pham, **K. Dao Duc**, Y.S. Song (2020), *The key parameters that govern translation efficiency*, *Cell Systems*
16. **K. Dao Duc**, S. Batra, N. Bhattacharya, J.H.D. Cate, Y.S. Song (2019), *Differences in the path to exit the ribosome across the three domains of life*, *Nucleic Acids Research*, gkz106 (**recommended by F1000Prime**)
15. **K. Dao Duc**, Y.S. Song (2018), *Identification and quantitative analysis of the major determinants of translation elongation rate variation*, *PLoS Genetics* 14(1) : e1007166
14. **K. Dao Duc**, Z.H. Saleem, Y.S. Song (2018), *Theoretical analysis of the distribution of isolated particles in the TASEP : Application to mRNA translation rate estimation*, *Physical Review E* 97, 012106 (**selected as Editor's suggestion**)
13. N. Rouach N., **K. Dao Duc***, J. Sibille*, D. Holcman (2018), *Dynamics of ion fluxes between neurons, astrocytes and the extracellular space during neurotransmission*, *Opera Medica et Physiologica*, 4(1), 1-18 (* equal contribution)
12. M. Wang, **K. Dao Duc**, J. Fischer, Y.S. Song (2017), *Operator Norm Inequalities between Tensor Unfoldings on the Partition Lattice*, *Linear Algebra and its Applications* 520, 44-66
11. **K. Dao Duc**, Z. Schuss, D. Holcman (2016), *Oscillatory Survival Probability : Analytical, Numerical Study for oscillatory narrow escape and applications to neural network dynamics*, *SIAM Multiscale Modeling and Simulations* 14-2, 772-798
10. **K. Dao Duc**, P. Parutto, X. Chen, J. Epsztein, A. Konnerth, D. Holcman (2015), *Synaptic Dynamics and Neuronal Network Connectivity are reflected in the Distribution of Times in Up states*, *Frontiers in Computational Neuroscience*, 9, 96
9. **K. Dao Duc**, C.Y. Lee, P. Parutto, D. Cohen, M. Segal, N. Rouach, D. Holcman (2015), *Bursting Reverberation as a Multiscale Neuronal Network Process Driven by Synaptic Depression-Facilitation*, *PLoS One* 10(5) : e0124694
8. J Sibille*, **K. Dao Duc***, N. Rouach, D. Holcman (2015) *The neuroglial potassium cycle during neurotransmission : role of Kir4.1 channels*, *PLoS Computational Biology* 11(3) : e1004137. (* equal contribution)
7. D. Holcman, **K. Dao Duc**, A. Jones, H. Byrne, K. Burrage (2015), *Post-transcriptional regulation in the nucleus and cytoplasm : study of mean time to threshold (MTT) and narrow escape problem*, *Journal of Mathematical Biology*, 70.4: 805-828
6. **K. Dao Duc**, Z. Schuss, D. Holcman (2014), *Oscillatory decay of the survival probability of activated diffusion across a limit cycle*, *Physical Review E (Rapid Communications)* 89.3: 030101

5. **K. Dao Duc**, D. Holcman (2013), *Computing the length of the shortest telomeres*, Physical Review Letters 111, 228104 (**highlighted in Physics viewpoint**)
4. Z. Xu, **K. Dao Duc**, D. Holcman, T. Teixeira (2013), *The length of the shortest telomere as the major determinant of the onset of replicative senescence*, Genetics 194(4)
3. **K. Dao Duc**, D. Holcman (2012), *Using default constraints of the spindle assembly checkpoint to estimate the associated chemical rates*, BMC Biophysics; 5(1):1
2. **K. Dao Duc**, D. Holcman (2010), *Threshold activation for stochastic chemical reactions in microdomains*, Physical Review E 81 (4(1)) : 041107
1. **K. Dao Duc**, P. Auger, T. Nguyen Huu (2008), *Predator density dependent prey dispersal in a patchy environment with a refuge for the prey*, South African Journal of Science, vol. 104, no5-6, 180-184

Others:

Textbook: **K. Dao Duc**, D. Delaunay, (2015) Probabilités CPGE scientifiques 1ère-2e année, De Boeck Supérieur, Louvain (Probability for undergraduate students - in French)

Peer-reviewed article in History of Science: **K. Dao Duc**, (2013), *Leibniz dans l'Encyclopédie*, Recherches sur Diderot et sur l'Encyclopédie, (48), pp.123-142

Selected presentations (2017-present)

Invited talks:

- SIAM Annual meeting, Toronto, Canada (2020)
- Life Science Seminar, Chinese University of Hong Kong, Hong Kong, China (2020)
- 7th International Conference on Mathematical Modeling and Analysis of Populations in Biological Systems (ICMA VII), Tempe, USA (2019)
- Arizona State University Biophysics seminar, Tempe, USA (2019)
- UBC Math-bio seminar, Vancouver, Canada (2019)
- UBC Algorithms seminar, Vancouver, Canada (2019)
- Biological Chemistry seminar, Hebrew University of Jerusalem, Israel (2019)
- 1st annual Day of Theory, CZ Biohub, San Francisco, USA (2019)
- Carnegie Mellon Physics Colloquium, Pittsburgh, USA (2019)
- UofT mathematics seminar, Toronto, Canada (2019)
- UBC mathematics Colloquium, Vancouver, Canada (2019)
- UCI Biophysics Seminar, Irvine, USA (2019)
- Center for Theoretical Evolutionary Genomics (CTEG) seminar, Berkeley, USA (2018)
- APS March Meeting, Los Angeles, USA (2018)
- Dynamics of translation summer school, Erice, Italy (2017)
- 61st Biophysical Society meeting, New Orleans, USA (2017)

- New York Area Population Genetics workshop, New York, USA (2017)

Academic Service

- **Organizing** the *2020 workshop on Mathematical and computational challenges in Cryo-EM*, Pacific Institute of Mathematical Sciences (PIMS), Vancouver, Canada
- **Organizing** the *2018 workshop on Reverse methods for molecular dynamics in single cell*, at the Centro di Ricerca Matematica Ennio de Giorgi, Pisa, Italy (<http://www.crm.sns.it/event/425/>)
- **Organizing** the *2016 and 2017 Penn Symposium on Mathematical and Computational Biology* (<http://bio.math.upenn.edu/symposia.html>)
- **Organizing** the *Maths Bio seminar at Penn (2015-2017)*

- **Reviewer** for *Frontiers in Computational Neuroscience*, *Frontiers in Physics*, *Frontiers in Physiology*, *RNA Biology*, *PLoS Computational Biology*, *Physical Biology*
- **Guest editor** for *Physical Biology* Special issue on *Reverse methods for molecular dynamics in single cell* (Sept 2019)