Curriculum Vitae

Khanh Dao Duc

Contact Information

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Academic Positions

2019 -present **Department of Mathematics, University of British Columbia (UBC)**
Assistant Professor

Departments of Computer Science and Zoology, UBC
Associate member

2014-15 2017-19 **Computer Science Division, University of Berkeley, California**
Postdoctoral scholar Advisor: Yun Song

2015-17 **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
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

Honors, Awards and Fellowships

2021-22 **Peter Wall Scholars Program award** (cad 30k)

2020-25 **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

2020-22 **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*

2019-20 **UBC STAIR grant (**cad 25k, 1 year): co-PI Dr. Simcha Srebnik (UBC)

2018 **DSWeb SIAM 2018 Software Contest:** *Runner-up*

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)

2009-12 **PhD Fellowship** from Ecole Normale Supérieure, Lyon

2005-08 **Civil servant student ("Normalien")**, Ecole Normale Supérieure, Lyon

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

Postdoctoral scholars

- Cole Zmurchok 2021-

Graduate students

- Isabela do O (Zoology) 2021-
- Jalal Khouhak (Math) 2020-
- Aryan Tajmir Riahi (Computer Science, co-supervised with Anne Condon) 2020-

Undergrad/Research internship

- Nicolas Legendre, graduate research intern (Centrale-Supélec, France) Summer 21
- Jules Minone, graduate research intern (Ecole Polytechnique, France) Summer 21
- Artie Kushner, Research Assistant: Summer-Fall 2020
- Bingyue Zhu, Work and Learn International Student: Summer 20
- Xinpei Li, Work and Learn International Student: Summer 20
- Arthur Ecoffet, graduate research intern (Ecole Polytechnique, France) Summer 20
- Michael Resplandy, graduate research intern (Ecole Polytechnique, France) Summer 20
- *Mentor for the UBC undergraduate Research Experience Program 2019-20 (REX):* 6 mentees (two 4th year, one 3rd year, one 2nd year and two 1st year students)

Publications

In preparation / Preprints:

24. C. Legrand, **K. Dao Duc**, F. Fuorte, *Analysis of Ribosome Profiling Data*

23. B. Zhu, **K. Dao Duc,** Y.S. Song *Unraveling local association between codon usage bias and translation speed*

22. A. Ecoffet, F. Poitevin, **K. Dao Duc,** *Using a transport-based metric for continuous interpolation between cryo-EM density maps* (submitted)

21. 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:

20. W. Son,, D.D. Erdmann-Pham, **K. Dao Duc**, Y.S. Song, (2021) *EGGTART: A computational tool to quantify the dynamics of biophysical transport processes from the inhomogeneous l-TASEP* Biophysical Journal (accepted)

19. A. Ecoffet, F. Poitevin, **K. Dao Duc,** (2020) *MorphOT: Interpolation of conformational continuous trajectories with UCSF ChimeraX,* Bioinformatics (accepted)

18. F. Poitevin, A. Kushner, X. Li, **K. Dao Duc**, (2020) *Structural Heterogeneities of the Ribosome: New Frontiers and Opportunities for Cryo-EM,* Molecules, 25, 4262.

17. D.D. Erdmann-Pham, **K. Dao Duc,** Y.S. Song (2020), *The key parameters that govern translation efficiency,* Cell Systems, 10 (2), 183-192

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 - 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:

•CMS Annual Meeting, Montreal, Canada (2020)
•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 *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 *Physical Review E, 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)