

Curriculum Vitae

Khanh Dao Duc

Contact Information

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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

Academic Positions

- 2014-present** **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

Teaching Experience

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

Mathematics Instructor

Teaching undergraduate courses for international students

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)

Research Supervision:

Two undergraduate students and two graduate students (department of Mathematics and Computer Science division) of UC Berkeley, one undergraduate and one graduate student (Physics department) of Penn, and three undergraduate students of Ecole Normale Supérieure.

Honors, Awards and Fellowships

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 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

(The Ecole Normale Supérieure is a type of publicly funded higher education in France. A portion of the student body who are French civil servants are called “Normaliens”. They are selected by a difficult examination, with only 3% of candidates eventually admitted (source: Wikipedia)).

Publications

Preprints:

18. W. Son, **K. Dao Duc**, D.D. Erdmann-Pham, Y.S. Song, *CIVET : A computational tool to quantify the dynamics of biophysical transport processes from the inhomogeneous l-TASEP* (submitted)
17. D.D. Erdmann-Pham, **K. Dao Duc**, Y.S. Song, *The key parameters that govern translation efficiency* (under review in *PNAS*), arXiv : 1803.05609, biorXiv 440693

Publications in peer reviewed journals:

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* (accepted), bioRxiv : 357970
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 (2014): 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

In Preparation:

- **K. Dao Duc**, Y. Huang, Y.S. Song, *Local selection of slow synonymous codons promotes SRP binding in yeast*
- Y. Sun, **K. Dao Duc**, Q. Zeng, H. Luo, *Genome evolution of Prochlorococcus links to the Neoproterozoic glaciations and the Permian-Triassic ocean euxinia*

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

Invited talks:

- *Differences in the path to exit the ribosome across the three domains of life*, 2018, Center for Theoretical Evolutionary Genomics (CTEG) seminar, Berkeley, USA
- *Theoretical analysis of the distribution of isolated particles in the TASEP : Application to mRNA translation rate estimation*, 2018, APS March Meeting, Los Angeles, USA

- *Probabilistic modeling and inference of translation dynamics using ribosome profiling data*, 2017, Dynamics of translation summer school, Erice, Italy
- *Quantitative analysis and modeling of translation using ribosome profiling data : How biophysical properties of the ribosome exit tunnel and the nascent polypeptide modulate the elongation rate*, 2017, 61st Biophysical Society meeting, New Orleans, USA
- *Identification and quantitative analysis of the major determinants of translation elongation rate variation*, 2017, New York Area Population Genetics workshop, New York, USA
- *Stochastic models in biology*, 2015, Biophysics seminar, Ecole Normale Supérieure, Paris
- *Stochastic modeling and analysis of telomere length dynamics across cell divisions*, CTEG seminar, 2014, Berkeley, USA

Poster presentations:

- *Hydrodynamic limit of the TASEP and application to translation*, 2018, Biology and Mathematics in the Bay Area 12, Stanford, USA
- *Differences in the ribosome exit tunnel across the three domains of life*, 2018, SMBE, Yokohama, Japan
- *The evolution of the ribosome exit tunnel and its impact on translation dynamics*, 2018, 62nd Biophysical Society meeting, San Francisco, USA
- *Probabilistic modeling and inference of the translation dynamics using ribosome profiling data*, 2017, The Biology of Genomes Meeting, Cold Spring Harbor, USA

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 *Frontiers in Computational Neuroscience*, *Frontiers in Physics*, *Frontiers in Physiology*, *RNA Biology*, *PLoS Computational Biology*
- **Guest editor** for *Physical Biology* (upcoming special issue)

Other Research Experiences

2007 South African Centre for Epidemiological Modelling and Analysis, Stellenbosch, South Africa

Summer Research Intern (3 months)

Research subject: Mathematical modeling of the HIV immune response

2006 French Research Institute for Development (IRD), Bondy, France

Summer Research Intern (3 months)

Research subject: Aggregation methods for prey predator systems