Duc P. Truong

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Education

Southern Methodist University — Dallas, Texas
Ph.D. in Computational and Applied Mathematics, Advisor: Dr. Andrea Barreiro
Thesis: Cell Assembly Detection in Low Firing-Rate Spike Train Data — 08/2016–08/2020

California State University Fullerton — Fullerton, California
M.A.in Applied Mathematics — 08/2014–05/2016

Cornell University — Ithaca, New York
M.A.in Economics — 08/2011–12/2013

California State University Fullerton — Fullerton, California
B.A.in Economics — 08/2007–05/2011

Research Interest

- Develop matrix/tensor factorization models with applications in machine learning, deep learning acceleration, PDE solvers, and others.
- Collaboration to design a data analysis pipeline for specific data analysis tasks.
- Develop computational models with applications in biology, neuroscience, and economics.

Research in Progress

- Tensor based partial differential equation solvers with application in plasma physics.
- Tensor based algorithms for high dimensional integrals.
- Machine learning pipeline for classifying conotoxins.

Scientific Positions

Los Alamos National Laboratory — Los Alamos, New Mexico
Postdoctoral Research Associate, CCS3 Division — 11/2020 –current

Research Experience

Los Alamos National Laboratory — Los Alamos, New Mexico
Project: Smart Tensor AI Platform — 11/2020–9/2021

- Develop tensor factorization models, Boolean tensor factorization models
- The platform has been successfully applied to different large datasets in different fields.
- **The project won two R&D100 awards in 2021.**

Los Alamos National Laboratory — Los Alamos, New Mexico
Applied Machine Learning Research Fellow — 06/2019–08/2019

- Tensor Factorization
- Developed a method to finnd latent dimension of a tensor factorization model to analyze asymmetric pairwise relationship data, with application in economic trade data.

University of Texas, Southwestern — Dallas, Texas
Research Assistant — Summer 2017, Spring 2018

- Fear Conditioning

– Collaborating with experimentalists to analyze hippocampus neuronal activities.

California State University, Fullerton Fullerton, California
Research Assistant Spring 2015–Spring 2016

– Biomimetic Pattern Recognition

– Developed Biomimetic Pattern Recognition algorithm which improves classification accuracy in five cancer DNA-microarray datasets.

Publications

[1] D. DeSantis, E. Skau, **D. P. Truong**, and B. Alexandrov, "Factorization of binary matrices: Rank relations, uniqueness and model selection of boolean decomposition", *ACM Transactions on Knowledge Discovery from Data (TKDD)*, 2022.

[2] J. Guo, **D. P. Truong**, A. Barreiro, D.-T. Lin, and W. Xu, "Distinct hippocampal neuronal reactions reveal different neuronal codes for memory generalization", *bioRxiv*, 2021.

[3] G. Manzini, E. Skau, **D. P. Truong**, and R. Vangara, "Nonnegative tensor-train low-rank approximations of the Smoluchowski equation", *Accepted to 13th International Conference on "Large-Scale Scientific Computations"*, 2021.

[4] **D. P. Truong**, E. Skau, D. Desantis, and B. Alexandrov, "Boolean matrix factorization via nonnegative auxiliary optimization", *IEEE Access*, vol. 9, pp. 117 169–117 177, 2021.

[5] **D. P. Truong**, E. Skau, V. I. Valtchinov, and B. S. Alexandrov, "Determination of latent dimensionality in international trade flow", *Machine Learning: Science and Technology*, vol. 1, no. 4, p. 045 017, 2020.

[6] S. Nguyen, C. Deleage, S. Darko, A. Ransier, **D. P. Truong**, D. Agarwal, A. S. Japp, V. H. Wu, L. Kuri-Cervantes, M. Abdel-Mohsen, *et al.*, "Elite control of hiv is associated with distinct functional and transcriptional signatures in lymphoid tissue CD8+ T cells", *Science translational medicine*, vol. 11, no. 523, 2019.

[7] C. H. Lee and **D. P. Truong**, "Cancer classification using the extended biomimetic pattern recognition", in *2016 IEEE Conference on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB)*, IEEE, 2016, pp. 1–6.

Quantitative Skills

- **Progamming:** MATLAB, Python, Machine Learning Libraries (Scikit-learn, Tensorflow, Pytorch, Tensorly), Tensor Factorization Toolboxes, C++, Linux, R.
- **Mathematics:** Dynamical Systems, Numerical ODE/PDE Methods, Numerical Linear Algebra, Iterative Methods, Mathematical Modelling, Matrix/Tensor Factorization Algorithms
- **Scientific Computing:** Python MPI, C++ OpenMP, C++ MPI, Linux Computing Clusters.
- **Data Science:** Statistical Learning, Dimensionality Reductions, Classification/Clustering Methods, Matrix/Tensor Factorization Methods, Latent Variable Models, Time Series Analysis.

Software Implementation

- **PyDNMFk:** Python Distributed Non Negative Matrix Factorization with determination of hidden features. https://github.com/lanl/pyDNMFk
- **pyDRESCALk:** Python Distributed Non Negative RESCAL with determination of hidden features https://github.com/lanl/pyDRESCALk
- **pyDNTNK:** Python Distributed Non-Negative Tensor Networks https://github.com/lanl/pyDNTNK

Awards and Honors

- Participation in SmartTensor AI Platform - 2021 R&D100 Award 2021

- University Ph.D. Fellowships, Southern Methodist University 2016–2020
- Academic Achievement Award - Graduate Level, Math Dept., CSU Fullerton 2016
- Economics Faculty Student Achievement Award, Econ Dept., CSU Fullerton 2011
- Honor Dean's List, CSU Fullerton Spring 2008–Fall 2010
- Community Service Award, The Music Teacher's Association of California 2010

Extracurricular Activities

- Math Dept. Graduate Student Assembly Representative, Southern Methodist University 2017–2019
- Graduate Student Seminar Organizer, SMU Math department 2017–2019
- Mathematics Teaching Assistant, Southern Methodist University 2016–2020
  Math Biology, Calculus I-II
- Economics Teaching Assistant, Cornell University 2012-2013
  Introduction to Microeconomics, Intermediate Macroeconomics