

Can Chen

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EDUCATION

- 9/2016 – current UNIVERSITY OF MICHIGAN (UM)** Ann Arbor, MI
- Ph.D. in Applied & Interdisciplinary Mathematics (GPA: 4.00/4.00)
 - M.S. in Electrical & Computer Engineering (GPA: 4.00/4.00)
 - Research Interests: Control Theory, Data Science, Bioinformatics
 - Course Highlights: Functional Analysis, Nonlinear Programming, Fast Algorithm, Stochastic Control, Nonlinear Control, Feedback Control, Machine Learning, Deep Learning, Self-Driving Cars
 - Awards: Michigan Mathematics Graduate Fellowship (2017 – 2019), Rackham Travel Grant Award
- 9/2013 – 6/2016 UNIVERSITY OF CALIFORNIA, IRVINE (UCI)** Irvine, CA
- B.S. Major in Mathematics & Minor in Statistics, *Summa Cum Laude* (GPA: 3.84/4.00)
 - Course Highlights: Linear Algebra, Numerical Analysis, ODE, Probability, Data Analysis, Python
 - Awards: UCI Dean Honor List (2013 – 2016)

WORK EXPERIENCE

- 1/2018 – current LAB RESEARCHER IN BIOINFORMATICS** Ann Arbor, MI
(Genome + Cell) Reprogramming Lab, UM
- ✓ *machine learning* • Developed a mathematical theory of learning guided in the context of the immune system to create novel forms of machine learning parallel to neural network
 - ✓ *statistics*
 - ✓ *MATLAB* • Applied machine learning and statistics techniques to large time series data capturing the evolution of chromosome structure and gene expression (4D Nucleome) in MATLAB
 - ✓ *teamwork* • Cooperated with lab colleagues to invite students and friends of the Fields Medalist Dr. Steve Smale to his 90th birthday celebration conference
- 6/2019 – 7/2019 ALGORITHM ENGINEER SUMMER INTERN** Shanghai, CHINA
Department of Algorithms, UniData Technology Co., Ltd.
- ✓ *deep learning* • Adapted image recognition algorithms with Python Keras using convolutional neural network (CNN) and gated recurrent unit (GRN) for online registration captchas recognition
 - ✓ *image recognition*
 - ✓ *data crawler* • Crawled public accounts' information from commercial websites with help of the online registration captchas recognition to determine accounts' credibility for a mortgage company

RESEARCH PROJECTS

- 10/2019 – current TENSOR ENTROPY FOR UNIFORM HYPERGRAPHS** Ann Arbor, MI
Department of Mathematics, UM
- ✓ *entropy* • Proposed a new notion of entropy for uniform hypergraphs based on the higher-order singular value decomposition and established results on its lower and upper bounds
 - ✓ *hypergraphs*
 - ✓ *MATLAB* • Created simulated examples to demonstrate the proposed entropy is a measure of regularity for uniform hypergraphs and applied the idea to real world biological and engineering networks
 - Investigated the controllability and influenceability of dynamic uniform hypergraphs
- 5/2018 – current DATA-GUIDED CONTROL & MULTIWAY DYNAMICS** Ann Arbor, MI
Department of Mathematics, UM
- ✓ *systems theory* • Generalized classic notions of stability, reachability and observability for multilinear time invariant systems whose states, control inputs and outputs are tensors
 - ✓ *fast algorithm*
 - ✓ *Python/MATLAB* • Developed associated theoretical and computational framework for model reduction/identification using tensor decompositions and applied these techniques to real world biological datasets
- 10/2018 – 1/2020 ALLELE SPECIFIC GENOME ARCHITECTURE AND TRANSCRIPTION** Ann Arbor, MI
(Genome + Cell) Reprogramming Lab, UM
- ✓ *network theory* • Applied network centrality analysis on chromosome contact maps (Hi-C matrices) to extract their structural features and compared these features between maternal and paternal chromosomes
 - ✓ *model reduction*
 - ✓ *MATLAB* • Developed the notion of differential conformation to measure local structural changes and analyzed the relationship between differential conformation and differential gene expression

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COURSE PROJECTS

1/2019 – 4/2019 **REINFORCEMENT LEARNING IN STOCK TRADING GAMES** Ann Arbor, MI
Course Name: Deep Learning

- ✓ *Tensorflow*
- ✓ *deep learning*
- ✓ *reinforcement learning*
- Investigated two different trading strategies, a single-asset task and a portfolio management task, with deep reinforcement learning methods including deep Q-network and policy gradient
- Adapted associated reinforcement learning algorithms and tested their performance in stock market trading games under different market environments using Tensorflow

9/2018 – 12/2018 **MANIFOLD LEARNING IN DIFFERENTIATING CANCER CELLS** Ann Arbor, MI
Course Name: Machine Learning

- ✓ *manifold learning*
- ✓ *data visualization*
- ✓ *Python*
- Analytically reviewed and implemented two manifold learning methods, Laplacian Eigenmaps and t-Distributed Stochastic Neighbor Embedding (tSNE) in Python
- Applied both methods to a real world high-dimensional genomic dataset driven from a breast cancer research in UM and compared their performance

9/2017 – 12/2017 **ASYMPTOTICALLY EFFICIENT ADAPTIVE ALLOCATION RULES** Ann Arbor, MI
Course Name: Stochastic Control

- ✓ *MAB problems*
- ✓ *reinforcement learning*
- Critically investigated the multi-armed bandit (MAB) problems in the settings of multiple plays with Markovian rewards and switching costs
- Analyzed how the differences of basic assumptions in each settings impact on the optimal allocation rule design and revealed the structural similarities of the algorithms

PUBLICATIONS • *Multilinear Time Invariant System Theory*, Proceedings of SIAM Conference on Control and its Applications (2019), pp. 118-125

- *Multilinear Time Invariant Systems Theory and Model Reduction* (submitted)
- *Data-Guided Model Reduction for Multilinear Time Invariant Systems* (submitted)
- *Tensor Entropy for Uniform Hypergraphs* (submitted)
- *Higher-Order Dynamic Mode Decomposition with Control* (in progress)
- *Allele Specific Genome Architecture and Transcription through the Cell Cycle* (in progress)

CONFERENCES • *DMD Based Control of Multiway Dynamical Systems*, SIAM Conference on Applications on Dynamical Systems, Snowbird, Utah (2019)

- *Multilinear Time Invariant System Theory*, SIAM Conference on Control and its Applications, Chengdu, China (2019)

COMPUTER SKILLS

- Software: MATLAB, Python, Mathematica, SQL, R; MS Office, LaTeX (package: tikz)
- Python Packages: NumPy, PyTorch, Keras, Matplotlib, TensorLy, Pandas, Selenium, etc
- MATLAB Toolboxes: Control System Toolbox, Tensor Toolbox, TT-Toolbox, CVX

REFERENCES

- **Dr. Anthony Bloch**, Alexander Ziwet Collegiate Professor and Chair, Department of Mathematics, University of Michigan (abloch@umich.edu)
- **Dr. Indika Rajapakse**, Associate Professor, Department of Computational Medicine & Bioinformatics and Department of Mathematics, University of Michigan (indikar@umich.edu)
- **Dr. Amit Surana**, Technical Fellow, United Technologies Research Center (suranaa@utrc.utc.com)