Kulunu Dharmakeerthi

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My research lies at the intersection of statistics, optimization and machine learning. On the methodology front, I have investigated **causal ML** approaches for learning under **distribution shift**. Recently, I am exploring statistical and computational theory for **generative modeling**. More generally, I am interested in **optimal transport theory** and its utility in data science.

Education

University of Chicago — **Chicago, IL** — **(2026 expected)**
- **PhD in Statistics**

University of Cambridge — **Cambridge, UK** — **Sept 2020 – June 2021**
- **MAST - Tripos Part III (Mathematics)**

University of California, Berkeley — **Berkeley, CA** — **Sept 2018 – May 2019**
- GPA : 4.0/4.0

University of Melbourne — **Melbourne, Australia** — **Jan 2017 – Dec 2019**
- **Bachelor of Science.** Mathematics with specialization in Statistics.
- First Class Honours (First Class in all subjects)

Australian VCE Score: 99.65 ATAR

Awards

Cambridge-Australia Allen Award, The University of Cambridge, 2020
Full scholarship to study at The University of Cambridge. One full Allen scholarship given in Australia.
AMSI Research Scholarship, Australian Mathematical Sciences Institute, 2019
Award to support mathematics research at The University of Melbourne
Global Scholars Award , University of Melbourne, 2018;
Dean's Honours, University of Melbourne, 2017-
Academic Excellence Award, Consulate General of Sri Lanka, 2017

Research

Liang, T., Dharmakeerthi, K.*, and Koriyama, T., 2024. **Denoising Diffusions with Optimal Transport: Localization, Curvature, and Multi-Scale Complexity** *Under Review*

Dharmakeerthi, K.*, Hur, Y. and Liang, T., 2024. **Learning When the Concept Shifts: Confounding, Invariance, and Dimension Reduction.** *Under Review (Top Journal)*.

Sachs R.*, Dharmakeerthi, K. et al. **An Important Aspect of Modelling Chromosome Aberration induced in High Linear Energy Threshold Radiation Fields** (Working Paper).

Ongoing work: Statistical Theory for Diffusion, Causal Representation Learning, Non-linear Domain Adaptation.

Experience

Data Science Consultant — **University of Chicago** — **2021-2023**
- ***Team Leader***: guided PhD researchers in providing members of the University of Chicago research community with guidance on statistical methods and data analysis.
- Regression; modelling; inference; computation and simulation methods. Machine Learning approaches.
- ***Delivered services to over 20 different clients.*** Applications spanned sociology, economics, biology and public policy
- ***Contributed significantly to data analysis pipeline*** in multiple research projects.
- ***Acknowledged with Best Consultant Awards in consecutive years.***

Research Intern — **University of California, Berkeley** — **2020**
- ***Machine learning and synergy analysis*** for estimating chromosome aberration in high-LET mixed-beam radiation fields.
- Handling murine tumorigenesis ***data provided by NASA Space Radiation Laboratory***. Navigating unique issues stemming from experimental data (missingness, 0-inflation, etc.)
- Primarily involved in methods for ***estimating sub-model parameters, simulation methods for inference.***
- ***Helped deliver vital information about cancer risks associated with long-term space travel***.

Research Intern **Australian Math. Sci. Institute** **2019**

- ***3-month appointment to conduct research*** for the Australian Mathematical Sciences Institute.
- Mixture Modelling and genetic algorithms explored to generate ***adversarial test spaces for analyzing algorithm robustness.***
- Optimization procedures for generating new data that target ***robustness issues in common classifiers.***
- ***Allowed researchers to gain a deeper understanding of when/how to apply certain classification strategies.***

Favorite Course Projects

Improved Multi-modal Sampling With Anisotropic Annealing Strategies

- Theoretical insights from the sampling literature leveraged to design schemes for diffusion models better suited to handle multimodality. Demonstrable improvements on mixture distributions. Tools: Python (pandas, numpy, pytorch)

Modelling incident rates of Covid-19 via Spatial Gaussian Process

- Investigated patient data from the early part of the COVID-19 pandemic to understand spread of disease. Empirical Bayes approaches to detect at-risk localities. Spatial correlations harnessed for predictive power via Gaussian process methods. Tools: R

Efficacy of Ebola vaccination in Potentially Exposed Persons in the Democratic Republic of the Congo

- Identified which factors promote immunogenicity of rVSVGP Ebola vaccination in affected populations. E.g. generalized linear methods to understand relationship between antibody levels over time and patient characteristics. Tools: R

Solvers for a class of Nonconvex Quadratic Programming problems

- Designed augmented lagrangian and projected gradient methods to solve a class of constrained non-linear optimization problems. Convergence analysis and computational complexity. Tools: Matlab

Public Service

Educator **Berkeley Engineers and Mentors** **2018-2019**

- Created and delivered a science curriculum for primary and middle schools in Berkeley, California.

Educator **S.A.I.L Program** **2018**

- Taught and provided educational resources for the Sudanese Australian refugee community

Graduate Teaching

Teaching Assistant **University of Chicago** **2021-**

STAT 30100 (Mathematical Statistics), STAT 31700 (Probability), CSMC 25025 (Machine Learning/Large Scale Data Analysis)

Skills

Programming: R, Python (pytorch, numpy, pandas etc.)

Quantitative: Statistics, Probability, Data Analysis, Machine Learning, Optimization