Aditya Krishna Menon

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Experience

Fellow *Australian National University* Jan 2018 – Present

- Analysing different means of imposing "fairness" constraints on classifiers, and their resulting tradeoffs
- Designing algorithms to predict popularity of content on social media, e.g., videos on YouTube
- Performing academic duties, including co-supervision of two PhD students

Senior Research Scientist *CSIRO Data61* Jul 2016 – Dec 2017

- Published research on theoretical & applied machine learning topics, e.g., Bregman divergences, point processes, recommender systems
- Led machine learning for industrial projects on transport congestion management and border security
- Performed academic duties at the Australian National University, including co-supervision of two PhD students

Researcher *National ICT Australia (NICTA)* May 2013 – Jun 2016

- Published research on theoretical & applied machine learning topics, e.g., bipartite ranking, label noise, recommender systems
- Involved in machine learning for industrial projects on solar energy forecasting and urban mobility
- Performed academic duties at the Australian National University, including co-supervision of two PhD students, and lecturing

Data Scientist Intern *LinkedIn* Jun 2012 – Sep 2012

- Worked on end-to-end system for using machine learning to automate search log analysis

Research Intern *Microsoft Research New England* Jun 2011 – Sep 2011

- Worked on using machine learning to automatically infer user's intent for repetitive text processing tasks

Research Intern *Yahoo! Labs Bangalore* Jun 2010 – Sep 2010

- Worked on estimating the clickthrough rate of ads on webpages using collaborative filtering

Education

PhD in Computer Science *University of California, San Diego* Mar 2013
Thesis title: Latent feature models for dyadic prediction
Supervisor: Charles Elkan

BSc (Advanced) Honours in Computer Science *The University of Sydney* May 2007
First Class Honours, University Medal, & Allan Bromley Prize for best thesis in Computer Science
Thesis title: Random projections and applications to dimensionality reduction
Supervisor: Sanjay Chawla

Awards

Best Technical Contribution Award *Conference on Fairness, Accountability, and Transparency* 2018
Research Excellence Award *Intelligent Transport Systems Australia* 2014 – 2015
Awarded to Advanced Data Analytics in Transport team
Student Travel Award *International Conference on Data Mining* 2010
Jacobs Fellowship *University of California, San Diego* 2007 – 2009
University Medal *The University of Sydney* 2007
Allan Bromley Prize *The University of Sydney* 2007
Continuing Undergraduate Scholarship *The University of Sydney* 2004 – 2006
Talented Student Program *The University of Sydney* 2003 – 2005

Research Interests

Weakly-supervised learning (e.g., learning from label noise, positive and unlabelled learning)
Classification with real-world constraints (e.g., class imbalance, fairness)
Matrix factorisation & applications (e.g., collaborative filtering, link prediction)

Selected Academic Research Publications

The cost of fairness in binary classification. Aditya Krishna Menon and Robert C. Williamson. In *Conference on Fairness, Accountability, and Transparency (**FAT**)*, 2018. Best Technical Contribution.

Explicates how the inherent tradeoff between accuracy and fairness depends on the alignment of the distributions for each task. To achieve this, we show that the Bayes-optimal fairness-aware classifiers involve *instance-dependent* thresholding of the class-probability.

Making deep neural networks robust to label noise: a loss correction approach. Giorgio Patrini, Alessandro Rozza, Aditya Krishna Menon, Richard Nock, Lizhen Qu. In *Computer Vision and Pattern Recognition (**CVPR**)*, 2017.

Shows that when the input labels to a deep network are subject to random noise, we can estimate the noise rate and subsequently re-weight our loss function to account for uncertainty in the provided labels. This yields a simple, architecture-independent robustification procedure.

Linking losses for density ratio and class-probability estimation. Aditya Krishna Menon and Cheng Soon Ong. In *International Conference on Machine Learning (**ICML**)*, 2016.

Establishes a formal reduction between the density ratio and class-probability estimation problems. This is done via a novel identity for Bregman divergences, and justifies using methods like logistic regression to estimate covariate shift levels between train and test sets.

AutoRec: autoencoders meet collaborative filtering. Suvash Sedhain, Aditya Krishna Menon, Scott Sanner, Lexing Xie. In *International Conference on World Wide Web (**WWW**)*, 2015.

Introduces a new means of predicting user ratings for content, wherein a non-linear autoencoder is applied to each row of the rating matrix. This simple approach was shown to outperform matrix factorisation, which has long been the *de-facto* approach to collaborative filtering.

Bayes-optimal scorers for bipartite ranking. Aditya Krishna Menon and Robert C. Williamson. In *Conference on Learning Theory (**COLT**)*, 2014.

Explicates a subtlety in using surrogate losses for bipartite ranking, owing to an implicit restriction on the function class. Establishes that for a broad class of surrogates, we nonetheless have consistency and surrogate regret bounds via a reduction to pairwise classification.

Selected Industrial Research Projects

Inverse problems for road traffic *NICTA and Transport for NSW* Aug 2013 - Dec 2014

- Worked with a diverse team including transportation scientists and research engineers
- Developed learning algorithms to solve an inverse problem central to transport science
- Implemented algorithms in `python` and `MATLAB`, and engaged with engineers to integrate into live demos
- Work culminated in team receiving 2014 & 2015 Intelligent Transport Systems Research award, and publication in top transport journal

Loss functions for solar energy forecasting *NICTA and Australian Renewable Energy Agency* Jun 2013 - Jul 2016

- Worked on designing performance measures for forecasting of energy output from distributed solar panels
- Demonstrated viability of measures from class-imbalance literature to measure detection rate of "ramp" events
- Engaged with and presented findings to stakeholders in industry and government
- Project was positively received by sponsoring government agency, and awarded additional funds to continue research

Anomaly detection for border protection *CSIRO Data61 and Unisys* Jan 2017 - Mar 2017

- Worked to enhance Unisys' border risk-assessment platform
- Designed machine learning algorithms for detecting anomalies in cargo and passenger data
- Set overall modelling and implementation strategy, and oversaw work of research engineer
- Work culminated in continued engagement with client, and favourable media coverage

Teaching Experience

Lecturer *Australian National University* Jul – Aug 2013 – 2016

COMP2610: Information Theory

Teaching assistant *University of California, San Diego* Jan – Mar 2009 – 2012

COMP101: Algorithms; COMP250A: Probabilistic Reasoning and Decision-Making; COMP250B: Learning

Programming Languages

Proficient: `python` + scientific toolkit (`numpy`, `scipy`, `sklearn`), `MATLAB`
Familiar: `C`, `C++`, `Java`