

# Aditya Krishna Menon

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📄 <http://scholar.google.com.au/citations?user=li4mEfcAAAAJ>

## Experience

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**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 *Data61*** Jun 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

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**PhD in Computer Science *University of California, San Diego*** Sep 2007 – May 2013

*Thesis title:* Latent feature models for dyadic prediction

*Supervisor:* Charles Elkan

**BSc Honours in Computer Science *The University of Sydney*** Mar 2003 – 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

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**Best Technical Contribution Award *Conference on Fairness, Accountability, and Transparency*** 2018

**Research Excellence Award *Intelligent Transport Systems Australia*** 2014 – 2015

**Jacobs Fellowship *University of California, San Diego*** 2007 – 2009

**Allan Bromley Prize *The University of Sydney*** 2007

**University Medal *The University of Sydney*** 2007

## Research Interests

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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 Publications

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**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.

## Industrial Projects

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**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 frequentist & Bayesian 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** *Data61 and Unisys* Jan 2017 - Mar 2017

- Worked to enhance Unisys’ border risk-assessment platform, planned to be deployed in hundreds of airports
- 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 a long-term engagement with client, and favourable media coverage

## Teaching Experience

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**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

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*Fluent:* python + scientific toolkit (numpy, scipy, sklearn), MATLAB

*Working knowledge:* C, C++, Java