

**University of California, Irvine  
Statistics Seminar**

***Deep Learning: A Bayesian Perspective***

**Nicholas Polson  
Professor of Econometrics and Statistics  
University of Chicago**

**Thursday, April 26, 2018  
4 p.m., 6011 Bren Hall  
(Bldg. #314 on campus map)**

Deep learning is a form of machine learning for nonlinear high dimensional pattern matching and prediction. By taking a Bayesian probabilistic perspective, we provide a number of insights into more efficient algorithms for optimisation and hyper-parameter tuning. Traditional high-dimensional data reduction techniques, such as principal component analysis (PCA), partial least squares (PLS), reduced rank regression (RRR), projection pursuit regression (PPR) are all shown to be shallow learners. Their deep learning counterparts exploit multiple deep layers of data reduction which provide predictive performance gains. Stochastic gradient descent (SGD) training optimisation and Dropout (DO) regularization provide estimation and variable selection. Bayesian regularization is central to finding weights and connections in networks to optimize the predictive bias-variance trade-off. To illustrate our methodology, we provide an analysis of international bookings on Airbnb. Finally, we conclude with directions for future research.