

Department of Statistics Archive of Statistics Seminars - Michaelmas Term 2022

Friday 14 October, 3-4pm - Kean Ming Tan (University of Michigan)

[Website](#)

This event will take place in the Leverhulme Library COL 6.15.

Title - Convolution-Type Smoothing Approach for Quantile Regression

Abstract - Quantile regression is a powerful tool for learning the relationship between a response variable and a multivariate predictor while exploring heterogeneous effects. However, the non-smooth piecewise linear loss function introduces challenges to the computational aspect when the number of covariates is large. To address the aforementioned challenge, we propose a convolution-type smoothing approach that turns the non-differentiable quantile piecewise linear loss function into a twice-differentiable, globally convex, and locally strongly convex surrogate, which admits a fast and scalable gradient-based algorithm to perform optimization. In the low-dimensional setting, we establish nonasymptotic error bounds for the resulting smoothed estimator. In the high-dimensional setting, we propose the concave regularized smoothed quantile regression estimator, which we solve using a multi-stage convex relaxation algorithm. Theoretically, we characterize both the algorithmic error due to non-convexity and statistical error for the resulting estimator simultaneously. We show that running the multi-stage algorithm for a few iterations will yield an estimator that achieves the oracle property. Our results suggest that the smoothing approach leads to a significant computational gain without a loss in statistical accuracy.

Biography - Kean Ming Tan is currently an assistant professor at the Department of Statistics at University of Michigan. Previously, he was an assistant professor at the School of Statistics at University of Minnesota, and a postdoctoral research associate supervised by Han Liu and Tong Zhang. He joined the University of Washington in 2011 for his PhD degree, under the supervision of Daniela Witten. Kean is a statistician working on statistical machine learning methods for analyzing complex data sets. He develops multivariate statistical methods such as probabilistic graphical models, cluster analysis, discriminant analysis, and dimension reduction to uncover patterns from massive data set. He also works on topics related to robust statistics, quantile regression, non-convex optimization,

and data integration from multiple sources. More recently, he is involved in applying instrumental variable to models with unmeasured confounders.

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Friday 21 October, 3-4pm - David Kaplan (University of Wisconsin)

[Website](#)

This event will take place in the Leverhulme Library COL 6.15.

Title - Bayesian Methods for Borrowing Historical Information With Applications to the Analysis of Large-Scale Assessments

Abstract - TBC

Biography - David Kaplan is the Patricia Busk Professor of Quantitative Methods in the Department of Educational Psychology at the University of Wisconsin – Madison. Dr. Kaplan holds affiliate appointments in the University of Wisconsin’s Department of Population Health Sciences and the Center for Demography and Ecology. Dr. Kaplan’s program of research focuses on the development of Bayesian statistical methods for education research. His work on these topics is directed toward applications to large-scale cross-sectional and longitudinal survey designs. Dr. Kaplan is an elected member of the National Academy of Education and serves as the chair of its Research Advisory Committee; a recipient of the Samuel J. Messick Distinguished Scientific Contributions Award from the American Psychological Association (Division 5); a past-President of the Society for Multivariate Experimental Psychology; a fellow of the American Psychological Association (Division 5); a recipient of the Alexander Von Humboldt Research Award; an Honorary Research Fellow in the Department of Education at the University of Oxford., a fellow of the Leibniz Institute for Educational Research and Information and the Leibniz Institute for Educational Trajectories; and was a Jeanne Griffith Fellow at the National Center for Education Statistics. Dr. Kaplan received his Ph.D. in education from UCLA in 1987.

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Monday 24 October, 3-4pm - Jianqing Fan (Princeton University)

[Website](#)

This event will take place in the Leverhulme Library COL 6.15.

Title - Factor Augmented Sparse Throughput Deep ReLU Neural Networks for High Dimensional Regression

Abstract - We introduce a Factor Augmented Sparse Throughput (FAST) model that utilizes both latent factors and sparse idiosyncratic components for nonparametric regression. The FAST model bridges factor models on one end and sparse nonparametric models on the other end. It encompasses structured nonparametric models such as factor augmented additive model and sparse low-dimensional nonparametric interaction models and covers the cases where the covariates do not admit factor structures. Via diversified projections as estimation of latent factor space, we employ truncated deep ReLU networks to nonparametric factor regression without regularization and to more general FAST model using nonconvex regularization, resulting in factor augmented regression using neural network (FAR-NN) and FAST-NN estimators respectively. We show that FAR-NN and FAST-NN estimators adapt to unknown low-dimensional structure using hierarchical composition models in nonasymptotic minimax rates. We also study statistical learning for the factor augmented sparse additive model using a more specific neural network architecture. Our results are applicable to the weak dependent cases without factor structures. In proving the main technical result for FAST-NN, we establish new a deep ReLU network approximation result that contributes to the foundation of neural network theory. Our theory and methods are further supported by simulation studies and an application to macroeconomic data. (Joint work with Yihong Gu)

Biography - Jianqing Fan, is a statistician, financial econometrician, and data scientist. He is Frederick L. Moore '18 Professor of Finance, Professor of Statistics, and Professor of Operations Research and Financial Engineering at the Princeton University where he chaired the department from 2012 to 2015. He is the winner of The 2000 COPSS Presidents' Award, Morningside Gold Medal for Applied Mathematics (2007), Guggenheim Fellow (2009), Pao-Lu Hsu Prize (2013) and Guy Medal in Silver (2014). He got elected to Academician from Academia Sinica in 2012.

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Monday 31 October, 3.15-4.15pm - Esther Ruiz Ortega (Universidad Carlos III de Madrid)

[Website](#)

This event will take place in the Leverhulme Library COL 6.15.

Title - Modelling and forecasting intervals of minimum/maximum temperature in the Iberian Peninsula

Abstract - In this paper, we propose a novel methodology to model and forecast intervals of minimum and maximum temperature based on fitting state space models to center and log-range temperature. In doing so, we allow the center and log-range temperature to be related and to obtain measures of the uncertainty associated with estimates of the temperature trend and dispersion. The methodology is first implemented separately to intervals of minimum and maximum temperature observed monthly in four locations in the Iberian Peninsula chosen to represent different climate conditions. Namely, we consider temperatures in Barcelona, Coruña, Madrid and Seville. Second, given that, at each location, center and log-range temperature are shown to be unrelated, we fit a multivariate dynamic factor model to extract potential commonalities among center (log-range) temperature observed at a large number of locations in the Iberian Peninsula.

Biography - As of January 2020, the database RePEc/IDEAS places Esther Ruiz ORtega in the top 2.4% among female world economists (352 out of 14683) and in the top 2.4% among economists in Spain (56 out of 2310). Furthermore, she is in the top 5% authors worldwide according to several criteria as, for example, Number of Distinct Works, Number of Citations and Record of Graduates.

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Friday 11 November, 3-4pm - Wolfgang Polonik (University of California)

[Website](#)

This event will take place in the Leverhulme Library COL 6.15.

Title - Topologically penalized regression on manifolds

Abstract - We study a regression problem on a compact manifold. In order to take advantage of the underlying geometry and topology of the data, we propose to perform the regression task on the basis of eigenfunctions of the Laplace-Beltrami operator of the manifold that are regularized with topological penalties. We will discuss the approach and the penalties, provide some supporting theory and illustrate the performance of the methodology on some data sets, illustrating the relevance of our approach in the case where the target function is “topologically smooth”. This is joint work with O. Hacquard, K. Balasubramanian, G. Blanchard and C. Levrard.

Biography - Wolfgang Polonik is a professor at the Department of Statistics, University of California, Davis. He received his Ph.D. degree from Ruprecht-Karls-Universität Heidelberg in 1992. His areas of interest cover Nonparametric Statistics, Shape constraints, modality, Nonstationary Time series and Empirical process theory. Currently, he is specialized in Topological Data Analysis.