Friday, December 9, 2022 (Hong Kong Time)		
	08:55 – 09:00	Xinyuan Song (The Chinese University of Hong Kong) Opening Remarks and Introduction to Guest Speakers
	09:00 – 09:40	Xiao-Li Meng (Harvard University) Statistical Learning with Low-resolution Information: There is No Free Lunch
	09:40 – 10:20	Grace Yi (University of Western Ontario) Boosting Learning of Censored Survival Data
	10:20 – 11:00	Yoonkyung Lee (The Ohio State University) Predictive Model Degrees of Freedom in Linear Regression
	11:00 – 11:40	Annie Qu (University of California, Irvine) Query-augmented Active Metric Learning
	11:40 – 12:20	Jianqing Fan (Princeton University) Factor Augmented Sparse Throughput Deep ReLU Neural Networks for High Dimensional Regression
Saturday, December 10, 2022 (Hong Kong Time)		
	08:55 – 09:00	Hoi Ying Wong (The Chinese University of Hong Kong) Opening Remarks and Introduction to Guest Speakers
	09:00 – 09:40	Neil Shephard (Harvard University)  Some Properties of the Sample Weighted Median of an In-fill Sequence with a

00.33 – 03.00	Opening Remarks and Introduction to Guest Speakers
09:00 – 09:40	Neil Shephard (Harvard University) Some Properties of the Sample Weighted Median of an In-fill Sequence with an Application to High Frequency Financial Econometrics
09:40 – 10:20	Alain Bensoussan (The University of Texas at Dallas) Stochastic Control and Limited Commitment
10:20 – 11:00	Ning Cai (The Hong Kong University of Science and Technology (Guangzhou)) Sensitivity Estimates with Computable Bias Bounds
11:00 – 11:40	Chi Seng Pun (Nanyang Technological University) Bayesian Estimation and Optimization for Learning Sequential Regularized Portfolios
11:40 – 12:20	Huyên Pham (Université Paris Cité) Actor-Critic Learning for Mean-field Control in Continuous Time
12:20 – 12:25	Phillip Yam (The Chinese University of Hong Kong) Closing Remarks  Management 2022

### **Contact Us**

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Date: 9-10 December 2022 (Fri-Sat) Time: 8:55am – 12:25pm (Hong Kong Time) Mode of Delivery: Online via ZOOM

**Organizing Committee Department of Statistics CUHK** 

# The Symposium on Statistics and Risk Management 2022

"On the occasion of celebrating the 40th anniversary of the Department of Statistics, the symposium will be held to gather internationally renowned scholars to present their state-of-the-art research topics in statistics and risk management in order to facilitate the exchange of ideas and research collaborations."



Statistics (9 Dec)

Risk Management (10 Dec)

Jianqing FAN **Princeton University** 

Yoonkyung LEE

The Ohio State University

Xiao-Li MENG **Harvard University** 

Annie QU

University of California Irvine

Grace Y. YI

**University of Western Ontario** 

Alain BENSOUSSAN

The University of Texas at Dallas

Ning CAI

The Hong Kong University of Science and Technology (Guangzhou)

Huyên PHAM

Université Paris Cité

Chi Seng PUN

Nanyang Technological University

**Neil SHEPHARD** 

**Harvard University** 







(852) - 3943 7931



https://cloud.itsc.cuhk.edu.hk/webform/view.php?id=13658309 Registration Deadline: 9 December 2022, 8:00am (Hong Kong Time)

**Programmme Information** https://www.sta.cuhk.edu.hk/symposium/2022/



Jianqing FAN

**Yoonkyung LEE** 

Xiao-Li MENG

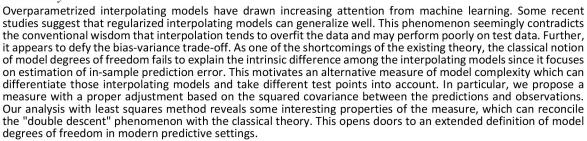
### Factor Augmented Sparse Throughput Deep ReLU Neural Networks for High **Dimensional Regression /** Princeton University

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.

This is a joint work with Yihong Gu.

## **Predictive Model Degrees of Freedom in Linear Regression /** The Ohio State

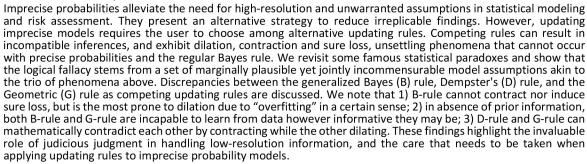
University



This is joint work with Bo Luan and Yunzhang Zhu.

# Statistical Learning with Low-resolution Information: There is No Free Lunch /

Harvard University



[This talk is based on the discussion article in Statistical Science: Gong and Meng (Statist. Sci. 36(2): 169-190 (May 2021). DOI: 10.1214/19-STS765) Judicious Judgment Meets Unsettling Updating: Dilation, Sure Loss, and Simpson's

#### **Query-augmented Active Metric Learning** / University of California Irvine

We propose an active metric learning method for clustering with pairwise constraints. The proposed method actively queries the label of informative instance pairs, while estimating underlying metrics by incorporating unlabeled instance pairs, which leads to a more accurate and efficient clustering process. In particular, we augment the queried constraints by generating more pairwise labels to provide additional information in learning a metric to enhance clustering performance. Furthermore, we increase the robustness of metric learning by updating the learned metric sequentially and penalizing the irrelevant features adaptively. Specifically, we propose a new active query strategy that evaluates the information gain of instance pairs more accurately by incorporating the neighborhood structure, which improves clustering efficiency without extra labeling cost. In theory, we provide a tighter error bound of the proposed metric learning method utilizing augmented queries compared with methods using existing constraints only. Furthermore, we also investigate the improvement using the active query strategy instead of random selection. Numerical studies on simulation settings and real datasets indicate that the proposed method is especially advantageous when the signal-to-noise ratio between significant features and irrelevant

#### **Boosting Learning of Censored Survival Data /** University of Western Ontario

Survival data frequently arise from cancer research, biomedical studies, and clinical trials. Survival analysis has attracted extensive research interests in the past five decades. Numerous modeling strategies and inferential procedures have been developed in the literature. In this talk, I will start with a brief introductory overview of classical survival analysis which centers around statistical inference, and then discuss a boosting method which focuses on prediction. While boosting methods have been well known in the field of machine learning, they have also been broadly discussed in the statistical community for various settings, especially for cases with complete data. This talk concerns survival data which typically involve censored responses. Three adjusted loss functions are proposed to address the effects due to right-censored responses where no specific model is imposed, and an unbiased boosting estimation method is developed. Theoretical results, including consistency and convergence, are established. Numerical studies demonstrate the promising finite sample performance of the proposed method.



Annie QU

Grace Y. YI



**Alain BENSOUSSAN** 

# Sensitivity Estimates with Computable Bias Bounds / The Hong Kong University of

**Stochastic Control and Limited Commitment /** The University of Texas at Dallas

The theory of investment and growth of firms has been an important source of stochastic control

problems. The issue of CEO compensation has been addressed more recently. A seminal paper has been

written by H. Ai and R. Li, with a model of CEO compensation under limited commitment. It leads to a

new type of stochastic control problem, where a stochastic constraint captures the limited

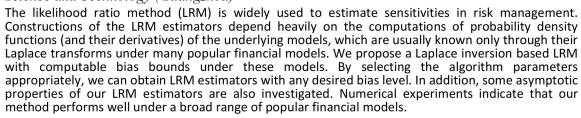
commitment. The authors introduce a Bellman equation, with unusual boundary conditions. Many

formal arguments are used in the proof, although the amount of intuition is impressive. The objective

of this work is to provide a rigorous and complete theory for this Bellman equation and to solve the

Science and Technology (Guangzhou)

corresponding stochastic control problem.



This is joint work with Ziyang Hao.



**Ning CAI** 

Huyên PHAM

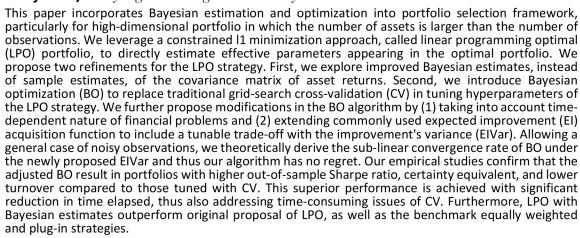


Chi Seng PUN

# Actor-Critic Learning for Mean-field Control in Continuous Time / Université Paris

We study policy gradient for mean-field control in continuous time in a reinforcement learning setting. By considering randomised policies with entropy regularisation, we derive a gradient expectation representation of the value function, which is amenable to actor-critic type algorithms where the value functions and the policies are learnt alternately based on observations samples of the state and modelfree estimation of the population state distribution. In the linear-quadratic mean-field framework, we obtain an exact parametrisation of the actor and critic functions defined on the Wasserstein space. Finally, we illustrate the results of our algorithms with some numerical experiments on concrete examples.

## Bayesian Estimation and Optimization for Learning Sequential Regularized **Portfolios /** Nanyang Technological University



This is a joint work with Godeliva Petrina Marisu.

## Some Properties of the Sample Weighted Median of an In-fill Sequence with an Application to High Frequency Financial Econometrics / Harvard University

Using an in-fill argument, the properties of the sample median of a sequence of events are established both for the case of a fixed period of time and for a period which shrinks as the sample size grows. The results are used to study the properties of the sample median of absolute returns under stochastic volatility. This estimator is invariant, asymptotically pivotal and a 1/2 breakdown estimator. In practice it has deep robustness to jump processes even when there are jumps of  $\alpha$ -stable type.



**Neil SHEPHARD** 

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