HAO NI

Oxford-Man Institute for Quantitative Finance
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CURRENT RESEARCH

My work is on the modeling of the evolution of noise-affected complex systems, using the theory of rough path and its applications. This post-doctoral research draws directly upon my PhD investigation of the expected signature of stochastic processes; my supervisor is Professor Terry Lyons and we have worked on combining the rough path theory with machine learning techniques for mining sequential data.

PROFESSIONAL EXPERIENCE

Senior Project Research Fellow   **09/2015 - Present**
Oxford-Man Institute for Quantitative Finance, Oxford University, UK
- Research Themes: change point problem, Gaussian processes, and its application in detection of structural change in financial time series
- Collaborate with commercial partner Man Group and machine learning group at Oxford University

Post-doctoral Research Fellow   **09/2012 - 08/2015**
Oxford-Man Institute for Quantitative Finance, Oxford University, UK
- Research Themes: machine learning, statistics and time series analysis
- Established a general model for the regression problem with sequential data stream as an input by introducing the signature of a stream as a novel feature set.
- Applied method to synthetic and real financial data, and implemented it in Matlab and Python.

Visiting Post-doctoral Fellow   **09/2012-05/2013**
Institute for Computational and Experimental Research in Mathematics (ICERM) and the Department of Applied Mathematics, Brown University, Providence, RI, USA. 01/2013-05/2013
- Research Themes: SPDE and the rough path theory

Graduate Research Assistant   **09/2011-09/2012**
Department of Mathematics, Oxford University

EDUCATION

Doctor of Philosophy in Mathematics, Oxford University   **10/2009- 11/2012**
Supervisor: Professor Terry Lyons
Thesis: The Expected Signature of a Stochastic Process

MSc in Mathematical and Computational Finance, Oxford University   **10/2008-06/2009**
Awarded with Distinction
Dissertation Advisor: Dr. Jan Obloj
Dissertation Title: Robust Hedging for Double Touch Barrier Option

MSc in Finance (Exchange Program), Ulm University, Germany   **09/2007-08/2008**
Ranked 1st in a class of 14
Dissertation Advisor: Prof. Dr. Ulrich Rieder
Dissertation Title: Portfolio Selection with Exponential Utility

BSc Applied Mathematics, Southeast University, China   **09/2004-06/2008**
Ranked 1st in a class of 80
Awarded outstanding student scholarship in every academic year

TEACHING EXPERIENCE

Oxford University, UK

- Lecturer, Introduction to Rough Path Theory (*Graduate Course*) **10/2014-12/2014**
- Tutor, Statistics and Financial Data Analysis (*Graduate Course*) **10/2014-12/2014**
- Teaching Assistant on the following graduate courses**:** **01/2010-09/2012**
  Stochastic Differential Equation
  Martingale through Measure Theory
  Mathematical Models of Financial Derivatives
- Tutor, Probability and Statistics (*Undergraduate Course*) **01/2010-06/2010**

Brown University, USA **01/2013-05/2013**
- Tutor, Operations Research: Probabilistic Models (*Undergraduate Course*)

RELEVANT WORK EXPERIENCE

Quantitative Analyst Intern, UBS, London, UK. **06/2011-09/2011**

Intern, Risklab, Allianz Global Investors, Munich, Germany **12/2009-01/2010**

Treasure Department Intern, Bank of China, Nanjing, China **08/2008-09/2008**

FUNDING/AWARDS

ERC (Grant Agreement No.291244 Esig), 2013-2015

Postdoctoral Fellowship, Semester Program in "Computational Challenges in Probability", ICERM, Brown University, 2012

Oxford-Man Institute of Quantitative Finance Student Scholarship, 2010-2012

Baden-Wuttemberg-STIPENDIUM Scholarship 2007-2008

Honorable Mentioned Prize, American Interdisciplinary Contest in Modeling (ICM), 2007

The National First Prize in CUMCM (China Undergraduate Mathematical Contest in Modeling), 2006

Outstanding Undergraduate Student Award, Southeast University, 2006 - 2007

Principal Scholarship, Southeast University, 2005.

INVITED TALKS/PRESENTATIONS

Learning from the past, predicting the statistics for the future, learning an evolving system (Poster), The Workshop on Computational Statistics and Machine Learning (NCSML), University of Warwick, September 3 – 4, 2015

Path Signatures and Regression Analysis, Workshop on Theory and Applications of Change-Point Analysis to Economics and Finance, University of Birmingham, July 24, 2015

Signatures and Regression Analysis, University of Oxford, the 38th Conference on stochastic processes and their applications, July 14, 2015

Expected signatures of stochastic processes, ICMS conference, Edinburgh, March 13, 2015

Rough path and regression analysis, Statistical Science Seminar, UCL, March 5, 2015

The signature based time series models, 3rd Annual ERC Berlin-Oxford Young Researchers Meeting on Applied Stochastic Analysis, January 27–29, 2015.

A Feature Set for Streams and a Demonstration on High-Frequency Financial Tick Data, the third ASE International Conference on Big Data Science and Computing, Tsinghua University, Beijing, China, August 4-7th, 2014.

Expected signature of the stopped Brownian motion, Berlin-Oxford Young Researchers Meeting on Applied Stochastic Analysis, at Weierstrass Institute, Berlin, December 11-13, 2013.

Learning from the past, predicting the statistics for the future, learning an evolving system using rough paths theory, Stochastic Analysis Seminar, Oxford University, UK, June 10, 2013.

A lecture on Rough paths and Cubature, Informal seminar, Department of Industrial Engineering and Operational Research, Columbia University, USA, April 17,2 013.

The expected signature of a diffusion process and its PDE, Uncertainty Quantification Workshop, ICERM, Brown University, USA, October 9-13 2012.

Expected signature of stochastic processes, Workshop for Rough Paths and PDEs, Mathematisches Forschungsinstitut Oberwolfach, Germany, August 19-25, 2012.

The 4th European Summer School in Financial Mathematics, ETH, Zurich, Switzerland, September 5-9, 2011.

Expected signature of Brownian motion upon the First exit time of a regular domain, Workshop for women researchers in probability, Bonn University, Germany, May 19-21, 2011.

Expected signature of Brownian motion upon the first exiting time of a regular domain, Young Researchers in Mathematics Conference, University of Warwick, Coventry, UK, April 14-16, 2011.

Expected signature of Brownian motion upon the first exit time of a domain, Stochastic Analysis Seminar, Oxford-Man Institute, Oxford, UK, January 24, 2011.

The Third Summer School in Financial Mathematics, Paris, France, August 23-27, 2010.

PUBLICATIONS

Lyons, T.; **Ni, H.**, Expected signature of Brownian motion up to the first exit time from a domain, *Annals of Probability*, 43(5): 2729-2762, 09, **2015**.

Ni, H.; Xu, W., Concentration and exact convergence rates for expected Brownian signatures, *Electronic Communications in Probability*, Vol.20, 1-11, **2015**.

Boedihardjo, H.; **Ni, H;** Qian, Z., Uniqueness of signature for simple curves, *Journal of Functional Analysis*, *267.6 1778-1806,* **2014**.

Lyons, T.; **Ni, H.**; Oberhauser, H., A Feature Set for Streams and a Demonstration on High-Frequency Financial Tick Data, *Proceedings of the 2014 International Conference on Big Data Science and Computing*, *(BigDataScience '14).* ACM, New York, NY, USA, Article 5. **2014.** DOI=10.1145/2640087.2644157 http://doi.acm.org/10.1145/2640087.2644157

Working Papers

Ni, H., A multi-dimensional stream and its signature representation, arXiv:1509.03346, **2015**.

Levin, D.; Lyons, T.; **Ni, H.**, Learning from the past, predicting the statistics for the future, learning an evolving system, arXiv:1309.0260, **2015**.

BOOK

Lyons, T.; **Ni, H.** ;Yang, D.; The Theory of Rough Paths, Imperial College Press (In Preparation)

PROGRAMMING SKILLS

C++, Matlab, Python, R

REFERENCES

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IEOR Department, Columbia University
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