

A Formal Invitation to Purdue Statistics Alumni Association

Whitney Huang (Ph.D. 2017, under Dr. Hao Zhang)



10th International Purdue Symposium on Statistics, June 7, 2023



My Background

- ▶ Fourth year Assistant Professor at Clemson University
- ▶ Got a B.S. in Mechanical Engineering in Taiwan, switched to Statistics in graduate school, got PhD. in 2017 (*“Statistics of Extremes with Applications in Climate”* under the supervision of **Hao Zhang**)
- ▶ Did a SAMSI/CANSSI postdoc before moving to Clemson



**University
of Victoria**

- ▶ Currently served as an executive officer of Purdue Statistics Alumni Association (PSAA)

The Beginning of My Purdue Journey

- ▶ 2008 April: First visit of Purdue, met **Hao** in the elevator of math sci buliding
- ▶ 2010 August: Admitted to PhD program in **Industrial Engineering**
- ▶ 2011/2012: Switch to Purdue Statistics

Environmental Statistics Research

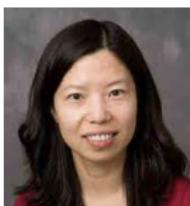
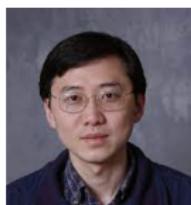


Environmental Statistics & Interdisciplinary Research

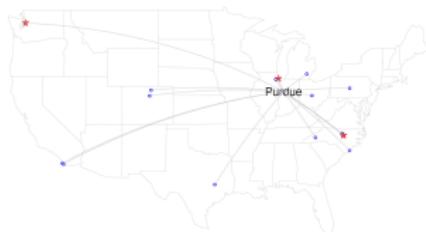
- ▶ Took spatial statistics with **Hao**, climate time series analysis with **Alexander Gluhovsky**, and functional data analysis with **Lingsong Zhang**
- ▶ Enjoyed working with **Hao**, **Tonglin Zhang**, **Bo Li**, **Juan Hu**, **Cheng Liu**, **Xian He**, **Yen-Ning Huang**, **Inkyung Choi**, **Kelly-Ann Dixon Hamil**, **Piyas Chakraborty**
- ▶ Interdisciplinary projects: **Songlin Fei** (Forestry and Natural Resources) and **Nelson Villoria** (Agricultural Economics)

Statistical Consulting Service (Founded 1970 by George McCabe)

Spent 5 wonderful semesters working with Bruce Craig, Michael Zhu, Jun Xie, Thomas Kuczek, Arman Sabbaghi, and Ce-Ce Furtner



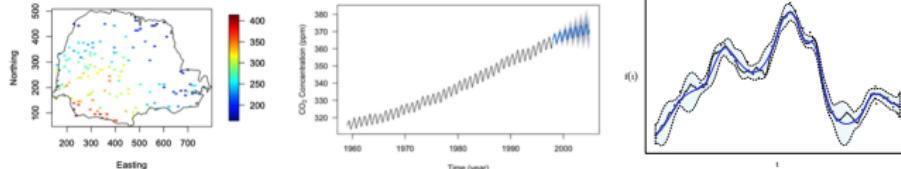
Statistical Methods for Atmospheric and Ocean Sciences (STATMOS)



- ▶ Organized weekly spatial statistics/statistical climatology seminar that hosted 25 external speakers from UChicago, PSU, TAMU, CSU, Argonne National Lab, NCSU, UMICH
- ▶ Two dissertation chapters on **statistics of climate extremes** written with **Michael Stein** and **Doug Nychka**, respectively

Overview of My Research

► Spatio-Temporal Statistics



► Extreme Value Analysis

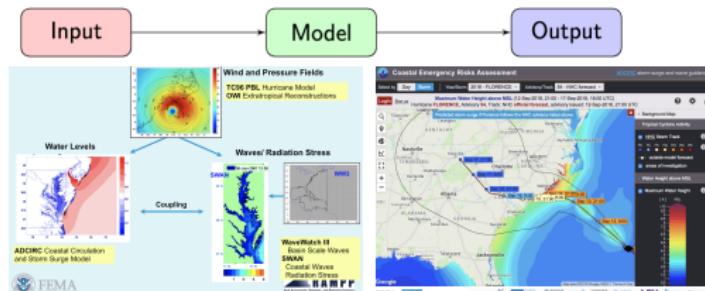


► Surrogate Modeling of Computer Experiments

$$\boldsymbol{x} \in \mathcal{X}$$

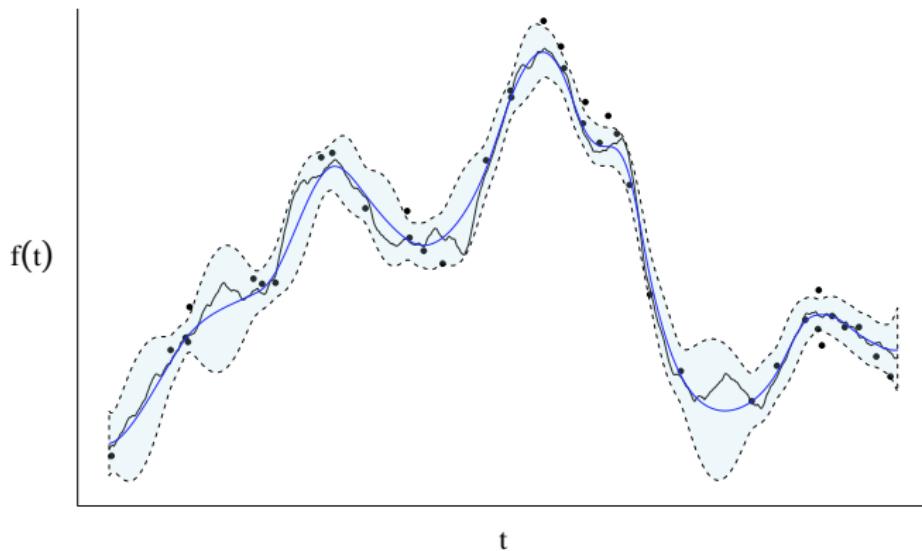
$$\eta : \mathcal{X} \mapsto \mathcal{Y}$$

$$\boldsymbol{y} = \eta(\boldsymbol{x})$$

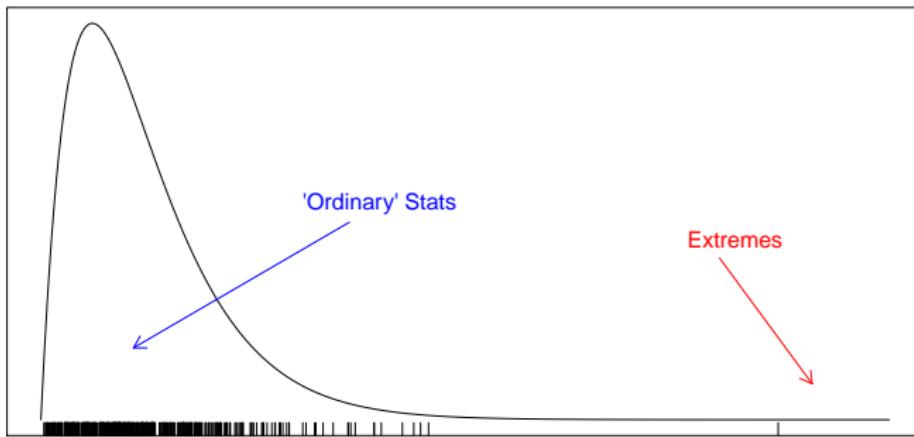


Gaussian Processes

$$f(t) \sim \text{GP}(m(t), K(t, t')), \quad t \in \mathcal{T}$$



Extreme Value Analysis



	Target	Theory	Distribution
Ordinary Stats	bulk distribution	CLT	Normal
Extreme Stats	tail distribution(s)	EVT	GEV/GPD

One of the Commonly Used Spatial Extremes Models

J. Appl. Prob. **14**, 732–739 (1977)

Printed in Israel

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EXTREME VALUES OF INDEPENDENT STOCHASTIC PROCESSES

BRUCE M. BROWN, *La Trobe University*
SIDNEY I. RESNICK*, *Stanford University*

Abstract

The maxima of independent Weiner processes spatially normalized with time scales compressed is considered and it is shown that a weak limit process exists. This limit process is stationary, and its one-dimensional distributions are of standard extreme-value type. The method of proof involves showing convergence of related point processes to a limit Poisson point process. The method is extended to handle the maxima of independent Ornstein–Uhlenbeck processes.

BROWNIAN MOTION; POISSON RANDOM MEASURES; EXTREMAL PROCESSES; WEAK CONVERGENCE; DOUBLE EXPONENTIAL DISTRIBUTION; ORNSTEIN–UHLENBECK PROCESS

- Bruce Brown (Ph.D. 1969 under Henry Teicher & Yuan Shih Chow)
- Sidney Resnick (Ph.D. 1970 under Marcel Neuts)

Some of Personal Selected Seminal Works

Inconsistent Estimation and Asymptotically Equal Interpolations in Model-Based Geostatistics

Hao ZHANG

It is shown that in model-based geostatistics, not all parameters in the Matérn class can be estimated consistently if data are observed in an increasing density in a fixed domain, regardless of the estimation methods used. Nevertheless, one quantity can be estimated consistently by the maximum likelihood method, and this quantity is more important to spatial interpolation. The results are established by using the properties of equivalence and orthogonality of probability measures. Some sufficient conditions are provided for both Gaussian and non-Gaussian equivalent measures, and necessary conditions are provided for Gaussian equivalent measures. Two simulation studies are presented that show that the fixed-domain asymptotic properties can explain some finite-sample behavior of both interpolation and estimation when the sample size is moderately large.

KEY WORDS: Equivalent measures; Generalized linear mixed model; Kriging; Matérn class; Minimum mean squared error; Model-based geostatistics; Prediction.

Robust Locally Weighted Regression and Smoothing Scatterplots

WILLIAM S. CLEVELAND*

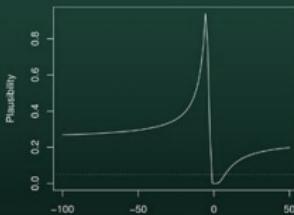
The visual information on a scatterplot can be greatly enhanced, with little additional cost, by computing and plotting smoothed points. Robust locally weighted regression is a method for smoothing a scatterplot, (x_i, y_i) , $i = 1, \dots, n$, in which the fitted value at x_i is the value of a polynomial fit to the data using weighted least squares, where the weight for (x_i, y_i) is large if x_i is close to x_0 and small if it is not. A robust fitting procedure is used that guards against deviant points distorting the smoothed points. Visual, computational, and statistical issues of robust locally weighted regression are discussed. Several examples, including data on lead intoxication, are used to illustrate the methodology.

KEY WORDS: Graphics; Scatterplots; Nonparametric regression; Smoothing; Robust estimation.

An early example of smoothing scatterplots is given by Ezekiel (1941, p. 51). The points are grouped according to x_i , and for each group the mean of the y_i is plotted against the mean of the x_i . More recently, Stone (1977) proves the consistency of a wide class of nonparametric regression estimates under very general conditions and presents a discussion and bibliography of methods that have appeared in the literature. Another method, which appeared after Stone's review, is that of Clark (1977), who proposes a technique for smoothing scatterplots in

Monographs on Statistics and Applied Probability 147

Inferential Models Reasoning with Uncertainty



Ryan Martin
Chuanhai Liu

CRC Press
Taylor & Francis Group
A CHAPMAN & HALL BOOK

- ▶ Attended several SAMSI programs
- ▶ 2017-2018 SAMSI Climate Program Postdoc, led the climate extremes working group and storm surge working group

What is SAMSI?

- Established in 2002
- Current NSF Funding Period: 2017 - 2020



CLIMATE PROGRAM OPENING WORKSHOP

Richard L. Smith, Director of SAMSI

The Statistical and Applied Mathematical Sciences Institute

National Institute of Statistical Sciences
Graduate Student Network

Four orange rectangular cards, each containing a portrait and a brief bio of a graduate student:

- Dr. Dayu Sun: Assistant Professor, Emory University, Department of Mathematics
- Dr. Whitney Huang: Assistant Professor, Clemson University, Department of Mathematics and Statistics
- Dr. Guillermo Basulto-Elias: Center for Transportation, Energy and Water Resources Education, Iowa State University
- Dr. Yibo Xu: Institutional Fellow, Clemson University, Department of Mathematics and Statistics

NISS Communications - 1st
National Institute of Statistical Sciences
3w - Edited - ④

NISS is one of the sponsors for The Interdisciplinary Workshop on Weather and Climate Extremes at Clemson University taking place May 16-18, 2023!
#extremechange #climatology #statistics #datascience #earthiscience ...see more

A promotional image for the "2023 CLEMSON CLIMATE EXTREMES WORKSHOP". It features a landscape photo of a lake and mountains in the background, with the workshop title overlaid in white text.

Workshop Sponsors

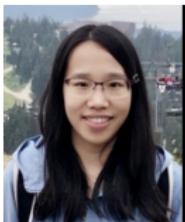


- ▶ Involved several NISS recent activities

Purdue Statistics Alumni Association (PSAA)

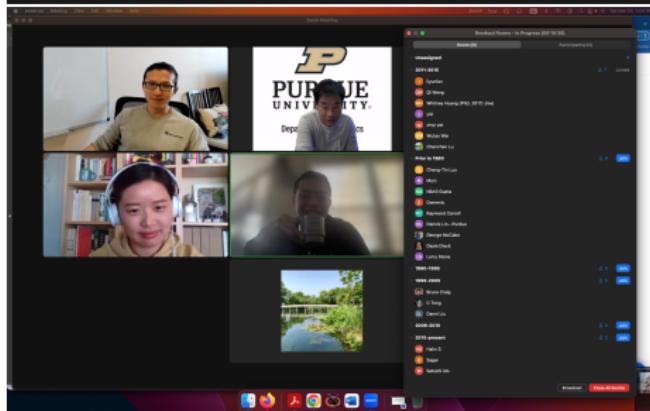
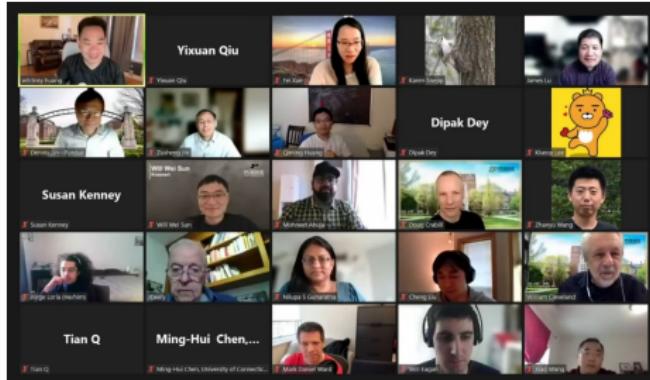


PSAA Committee Members



Name	Affiliation	Years in Purdue
Dipak Dey	University of Connecticut	1975-80 (M.S. 1977, Ph.D. 1980)
Jayson Wilbur	Preva Group	1997-2002 (M.S. 2000, Ph.D. 2002)
George McCabe	Purdue University	1970-present
Marcey Hoover	Purdue University	1990-1995 (M.S. 1993, Ph.D. 1995)
Kiseop Lee	Purdue University	1997-2002, 2016-present (M.S., Ph.D. 2002)
Fei Xue	Purdue University	2021-present
Whitney Huang	Clemson University	2011-2017 (Ph.D. 2017)

PSAA Spring Event



- ▶ March 26, 2022 (1st) and March 25, 2023 (2nd)
- ▶ Panelists: 2022: **Ming-Hui Chen, Bhramar Mukherjee, Bill Cleveland, Xiao Wang, Cheng Liu, Courtney Henry.** 2023: **Ray Carroll, Marcey Hoover, Domenic Reda**
- ▶ **It was fun and you should consider joining in the future!**

PSAA Social Media Sites

- ▶ **Linkedin:** <https://www.linkedin.com/groups/14019967/>
QR code ⇒



- ▶ **Facebook:** <https://www.facebook.com/groups/purdue.statistics>
QR code ⇒



- ▶ **Twitter:** <https://twitter.com/PurdueStats>
QR code ⇒



Purdue Statistics: A Journey Through Time

Sanvesh Srivastava and Rebecca W. Doerge

Since its modest inception as the Statistical Laboratory in 1947, the Department of Statistics, Purdue University has grown to one of the largest and most diverse in the country supported by a distinguished list of alumni, outstanding contributions in research, and major advances in statistical education. Its current (2011) size of 62 faculty, 125 graduate students, and almost 400 undergraduate students reflects its commitment to developing statistical sciences research for the present and the future, and to providing high quality education to students, both in statistics and in other disciplines. Historically, the Department of Statistics at Purdue University has been an important center for diverse areas of statistical research. Its strong presence in probability, theory, and education set the stage for its expansion in the mid-1990s. As the field of statistics expanded to include many interdisciplinary areas that require specialization (statistical genetics and bioinformatics, computational finance, machine learning, etc.), Purdue Statistics engaged in an aggressive program of hiring well-prepared faculty with diverse backgrounds who are playing leading roles in the development of the field as it expands its scope. Today, Purdue Statistics stands strong as the highest ranked department in the College of Science at Purdue University, and is enjoying its place among the top ranked departments in the United States.

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