



**ICSTA**  
2021

**PROCEEDINGS OF THE 3<sup>rd</sup>  
INTERNATIONAL CONFERENCE ON  
STATISTICS: THEORY AND APPLICATIONS  
(ICSTA'21)**

**July 29 - 31, 2021 | ~~PRAGUE, CZECH REPUBLIC~~ | Virtual Conference**

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# WELCOME MESSAGE FROM THE CONFERENCE CHAIR

**On behalf of the International Academy of Science, Engineering and Technology (International ASET Inc.), the organizing committee would like to welcome you to the 3<sup>rd</sup> International Conference on Statistics: Theory and Applications (ICSTA'21).**

Due to the evolving COVID-19 outbreak and corresponding issues in border entry in European countries, the 3<sup>rd</sup> International Conference on Statistics: Theory and Applications (ICSTA'21) which was supposed to be held in Prague, Czech Republic will be held **virtually** instead on **July 29 – 31, 2021**.

The goal of ICSTA'21 is to gather scholars from all over the world to present advances in the relevant fields and to foster an environment conducive to exchanging ideas and information. This conference will also provide an ideal environment to develop new collaborations and meet experts on the fundamentals, applications, and products of the mentioned fields.

In the third meeting of this conference, two Plenary Speakers and five keynote speakers will share their expertise with the aim of exposing participants to a wide spectrum of applications, and to foster crosspollination of ideas and develop new research interests. In addition, approximately 15 papers will be presented from professors, students, and researchers across the world.

We thank you for your participation and contribution to the 3<sup>rd</sup> International Conference on Statistics: Theory and Applications (ICSTA'21). We wish you a very successful and enjoyable experience.

**Dr. Gangaram Ladde**  
**University of South Florida, USA**  
*Conference Chair*  
*ICSTA'21*

**Dr. Noelle Samia**  
**Northwestern University, USA**  
*Conference Co-Chair*  
*ICSTA'21*

# ABOUT ICSTA'21

**The 3<sup>rd</sup> International Conference on Statistics: Theory and Applications (ICSTA'21) aims to become the leading annual conference in fields related to Statistics: Theory and Applications.** The goal of ICSTA'21 is to gather scholars from all over the world to present advances in the fields related to Statistics: Theory and Applications and to foster an environment conducive to exchanging ideas and information. This conference will also provide an ideal environment to develop new collaborations and meet experts on the fundamentals, applications, and products of the mentioned fields.

ICSTA is an international conference will be held yearly. This conference focus on all aspects Statistics: Theory and Applications. ICSTA Will be held this year virtually due to COVID-19 pandemic.

**ICSTA** is an acronym for **I**nternational , **S**tatistics: **T**heory and **A**pplications.

The proceedings are published in Ottawa, Canada.

All papers were peer-reviewed

The congress proceedings is published under an ISSN and ISBN number

Each paper is assigned a unique DOI number by [Crossref](#)

The proceedings is permanently archived in [Portico](#) (one of the largest community-supported digital archives in the world)

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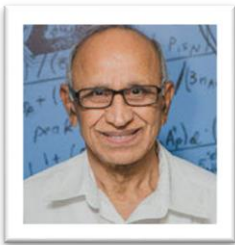
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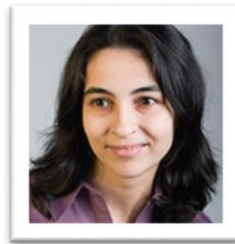
# SCIENTIFIC COMMITTEE

We would like to thank the following for accepting to act as a member of the Scientific Committee for the ICSTA'21 Conference:



**Dr. Gangaram Ladde**

University of South Florida, USA  
Conference Chair



**Dr. Noelle Samia**

Northwestern University, USA  
Conference Chair

## Scientific Committee Members

- **Dr. Mylène Bédard**, University of Montreal, Canada
- **Dr. Noelle Samia**, Northwestern University, USA
- **Dr. Dalia Chakrabarty**, Loughborough University, UK
- **Dr. Sujay Datta**, University of Akron, USA
- **Dr. Rosario Delgado de la Torre**, Universitat Autònoma de Barcelona, Spain
- **Dr. Dirk Husmeier**, University of Glasgow, UK
- **Dr. Esra Kurum**, University of California, Riverside, USA
- **Dr. Hosam M. Mahmoud**, George Washington University, USA
- **Dr. Krzysztof Podgórski**, Lund University, Sweden
- **Dr. Jiahua Chen**, University of British Columbia, Canada
- **Dr. Faming Liang**, Purdue University, USA
- **Dr. Michael Evans**, University of Toronto, Canada

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# PLENARY & KEYNOTE SPEAKERS

The Plenary and keynote information for the 3rd International Conference on Statistics: Theory and Applications (ICSTA'21) is as follows:

## Plenary Speakers



[Dr. William S. Cleveland](#)  
Prdue University, USA



[Dr. Jaline Gerardin](#)  
Northwestern University, USA

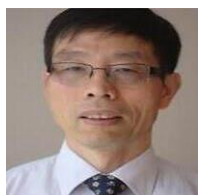
## Keynote Speakers



[Dr. Michael Evans](#)  
University of Toronto, Canada



[Dr. Jacob M Schauer](#)  
Northwestern University, USA



[Dr. Jiahua Chen](#)  
University of British Columbia,  
Canada



[Dr. Faing Liang](#)  
Purdue University, USA



[Dr. Xiaoming Huo](#)  
Georgia Institute of Technology,  
USA

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# ICSTA'21 PLENARY LECTURE



**Titles:** On the Analytic Power of Divide & Recombine (D&R)

**Dr. William S. Cleveland, Purdue University, USA**

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William S. Cleveland (Bill) received a B.A. in math from Princeton; his thesis advisor was Willy Feller, a famous probabilist. He received a PhD in Statistics from Yale; his advisor was Leonard Jimmie Savage who had resurrected Bayesian statistics by proving it was the optimal approach to statistical decision making. Manny Parzen and Marvin Zelen invited Bill to spend a summer at the Statistics Department of SUNY at Buffalo. Bill then moved on to the Statistics Department at Bell Labs in 1971.

For more information please visit:

<https://2021.icsta.net/keynote-speakers/>



**Titles:** Mathematical Modeling to Inform Policy

**Dr. Jaline Gerardin, The University of Texas at Dallas, USA**

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Jaline Gerardin is Assistant Professor of Preventive Medicine at Northwestern University. Her group uses quantitative methods to support decision-making around policies to manage infectious disease, focusing on malaria and COVID-19.

# ICSTA'21 KEYNOTE LECTURE



**Titles:** On the Analytic Power of Divide & Recombine (D&R)

**Dr. William S. Cleveland, Purdue University, USA**

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Michael Evans is a Professor of Statistics at the University of Toronto. He received his Ph.D. from the University of Toronto in 1977 and has been employed there ever since with leaves spent at Stanford University and Carnegie Mellon University. He is a Fellow of the American Statistical Association, has served as an Associate Editor of JASA Theory and Methods 1991-2005, an Associate Editor of the Canadian Journal of Statistics 1999-2006, 2017-present, an Associate Editor of the journal Bayesian Analysis 2005-2015 and an Editor 2015-present and is a subject matter Editor for the online journal FACETS. He served as President of the Statistical Society of Canada 2013-2014. His research has been concerned with multivariate statistical methodology, computational statistics, and the foundations of statistics.

For more information Please visit:

<https://2021.icsta.net/keynote-speakers>



**Titles:** Distributed Learning of Finite Gaussian Mixtures

**Dr. Jiahua Chen, University of British Columbia, Canada**

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Dr. Jiahua Chen received his Master's degree from the Institute of System's Science in Academia Sinica in Jan 1985 under the supervision of Professor Ping Cheng, and Ph. D. degree from the University of Wisconsin-Madison in July 1990 under the supervision of Professor Jeff Wu.

For more information Please visit:

<https://2021.icsta.net/keynote-speakers>



# ICSTA'21 KEYNOTE LECTURE



**Titles:** Identification of Underlying Partial Differential Equations from Noisy Data with Splines

**Dr. Xiaoming Huo, Georgia Institute of Technology, USA**

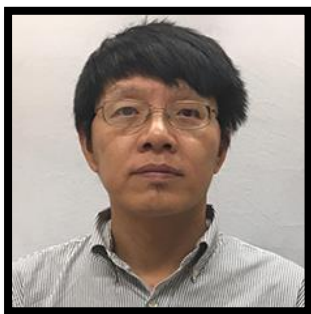
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Dr. Huo received the B.S. degree in mathematics from the University of Science and Technology, China, in 1993, and the M.S. degree in electrical engineering and the Ph.D. degree in statistics from Stanford University, Stanford, CA, in 1997 and 1999, respectively. Since August 1999, he has been an Assistant/Associate/Full Professor with the School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta. He represented China in the 30th International Mathematical Olympiad (IMO), which was held in Braunschweig, Germany, in 1989, and received a golden prize. Statistics – Statistics, since April 2021.

For more information Please visit:

<https://2021.icsta.net/keynote-speakers>



**Titles:** Consistent Sparse Deep Learning: Theory and Computation

**Dr. Faming Liang, Purdue University, USA**

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Faming Liang is Distinguished Professor of Statistics at Purdue University. He is ASA fellow, IMS fellow, and the winner of Youden prize in 2017. Faming has wide research interests, including Monte Carlo methods, machine learning, bioinformatics, high-dimensional statistics, and big data.

# ICSTA'21 KEYNOTE LECTURE



**Titles:** Statistical Challenges for Studying Replication  
**Dr. Jacob M Schauer, Northwestern University, USA**

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Jacob Schauer is an assistant professor in the Biostatistics Division of the Department of Preventive Medicine at Northwestern University's Feinberg School of Medicine. His applied research concerns interpretable machine learning for medical diagnoses, as well as various issues in medical social sciences, including health disparities and health literacy. His methodological work focuses on approaches to studying replication, incomplete data meta-analyses, and data privacy. Prior to joining Feinberg, Jacob completed his PhD in statistics from Northwestern University in 2018 and worked as a postdoctoral fellow at the Institute for Policy Research at Northwestern from 2018 to 2020.

# LIST OF PAPERS

The following papers were presented at the 3<sup>rd</sup> International Conference on Statistics: Theory and Applications (ICSTA'21).

## Statistics Theory and Applications

**Titles:** Statistical Analysis of Measurements in Exact and Inexact Sciences: An Open Problem

**Authors:** Lia Queiroz do Amaral, Universidade de São Paulo, Brazil

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**Titles:** The Concept of Statistical Evidence

**Authors:** Michael Evans

[View Paper](#)

**Titles:** Graph Neural Network Emulation of Cardiac Mechanics

**Authors:** David Dalton, Alan Lazarus Arash Rabbani, Hao Gao, Dirk Husmeier

[View Paper](#)

Robustness of Gaussian Mixture Reduction for Split-and-Conquer

**Authors:** Qiong Zhang, Jiahua Chen

[View Paper](#)

**Titles:** Inference in Cardiovascular Modelling Subject to Medical Interventions

**Authors:** L. Mihaela Paun, Agnieszka Borowska, Mitchel J. Colebank, Mette S. Olufsen and Dirk Husmeier

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# LIST OF PAPERS

## Statistics Theory and Applications

**Titles:** Estimation of Parameters of Logistic Regression with Missing Covariates via Joint Conditional Likelihood Method

**Authors:** Phuoc-Loc Tran, Truong-Nhat Le, Shen-Ming Lee, and Chin-

[View Paper](#)

**Titles:** Change Point Analysis and Clustering Examined Through Chicago Crime During COIVD-19

**Authors:** Mena Whalen, Joseph Feinglass, Noelle Samia

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**Titles:** Prediction Model for the Result of Percutaneous Coronary Intervention in Coronary Chronic Total Occlusions

**Authors:** Maria Ganopoulou, Ioannis Kangelidis, Georgios Sianos, Lefteris Angelis

[View Paper](#)

**Titles:** Generalized Functional Responses in Habitat Selection Fitted by Decision Trees and Random Forests

**Authors:** Shaykhah Aldossari, Dirk Husmeier, Jason Matthiopoulos

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# LIST OF PAPERS

The following papers were presented at 3<sup>rd</sup> International Conference on Statistics: Theory and Applications (ICSTA'21).

## Statistics Theory and Applications

**Titles:** Combining Time Series and Sentiment Analysis for Stock Market Forecasting

**Authors:** Hsiao-Chuan Chou, Kandethody M. Ramachandran

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**Titles:** Sufficient Dimension Reduction with Deep Neural Networks for Phenotype Prediction

**Authors:** Siqi Liang, Wei-Heng Huang, Faming Liang

[View Paper](#)

**Titles:** The Impact of Entity Resolution on Observed Social Network Structure

**Authors:** Abby Smith

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**Titles:** Stochastic Version of EM Algorithm for Nonlinear Random Change-Point Models

**Authors:** Hongbin Zhang, Binod Manandhar

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# SPONSORS

International ASET Inc. would like to thank the following sponsors for their support of ICSTA'21:



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# ICSTA'22

The 4<sup>th</sup> International Conference on Statistics: Theory and Applications (ICSTA'22) will be held on July 28, 2022 - July 30, 2022 | Prague, Czech Republic.



For inquiries and to obtain further information on the conferences, please visit our website please visit our [website](https://www.2022.icsta.net)  
You can also email [info@icsta.net](mailto:info@icsta.net) or call us at: +1-613-834-9999

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# ETHICS & MALPRACTICE

## Publication Ethics and Publication Malpractice Statement

The following statement is mainly based on the [Code of Conduct and Best-Practice Guidelines for Journal Editors](#) (Committee on Publication Ethics, 2011).

### Scientific Committee

#### ***Scientific Committee***

Scientific committees consisting of experts in the fields are established. The committees oversee the peer-review and publication process. To see the scientific committee members, please follow the link below.

#### **[Scientific Committee](#)**

#### ***Equality and Decisions***

One or more reviewer, scientific committee member, or chair, (internal or external), are responsible for evaluating the relevance of the submitted manuscripts to the proceedings, technical and scientific merit, originally, and impact. These evaluations are to be carried out regardless of ethnicity, religion, gender, sexual orientation, political beliefs, and institutions. Successive to peer-review, the Chair has full authority and is solely responsible for the published content and the process thereof.

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# ETHICS & MALPRACTICE

## Reviewers

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### ***Promptness***

Reviewers should promptly notify the chair(s) if they are unable or unqualified to carry out their reviewing duties. Reviewers should do their best to provide the reviews to the chair(s) as promptly as possible, and within the designated time-frame.

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Reviewers must not share the contents of the manuscripts they receive for review, regardless of their decision to review or contents of the review, directly or indirectly, with anyone other than the person who has assigned the review.

### ***Fairness***

Reviewers should review manuscripts fairly and objectively, with supporting evidence or arguments, regardless of personal feelings or biases.

### ***Thoroughness***

Reviewers should thoroughly read, understand, and provide constructive feedback with the aim of improving the manuscript. Reviewers should aim to identify and report technical issues, irregularities, mistakes, missing citations, and similarity to other published work.

### ***Conflicts of Interest***

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# ETHICS & MALPRACTICE

## Authors

### ***Authorship***

Only persons who have significantly contributed to the work and the manuscript can be named authors on a paper. These contributions include the idea/concept, design, experiments, evaluation, analysis, drafting or revision of the manuscript, and others. Authors must all have agreed to be named as such and for the manuscript to be submitted. Anyone who has contributed based on the above, but the level of contribution is not significant, may appear in the acknowledgement section of the manuscript.

### ***Accuracy, Originality, and Plagiarism***

Authors should describe their work and the results of their work accurately and in full. The level of provided accuracy and detail should be such that a reader can replicate the work independently. Inaccurate, incomplete, fraudulent, and misleading statements are considered unacceptable and unethical. Direct or indirect use of other people's work is not allowed, unless properly cited. Previous works that have influenced the current work should also be cited. Presenting someone else's work as one's own is strictly prohibited and is considered plagiarism.

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# ETHICS & MALPRACTICE

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Authors must notify the chair(s) at the time of submission, if any factor outside the scope of the research has influenced any step of the work and manuscript writing. Examples of such factors include but are not limited to funding, grants, advisory and consultancy, stock ownership, current or past employment, and memberships, among others. All funding sources should be disclosed in the manuscript.

## ***Animal and Human Subjects***

Works involving human and/or animal subjects must ensure that the work has abided by institutional guidelines, and pre-approved by required bodies. Moreover, consent must be acquired from participants, and privacy of subjects must be ensured. All of the above must be specified with clear statements in the manuscript.

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Unethical/plagiarism issues mostly result in a retraction, while unintended mistakes will mostly result in the publication of an erratum.

# ETHICS & MALPRACTICE

## **Publisher**

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### ***Schedule***

This conference proceeding accompanies the conference, meaning a new proceedings will be published every year for the corresponding annual conference of this series.

# CONTACT US

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