IMS Bulletin

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IMS Election Results

We are delighted to announce the 2019 election results and introduce the newly elected members of IMS Council. The next President-Elect is Regina Liu, and the five new members of Council are: Edwin Perkins, Gesine Reinert, Christian Robert, Qi-Man Shao and Alastair Young. All of them will serve a three-year term, starting at the IMS meeting at JSM Denver in July 2019.

Regina Liu

The amendment also passed.

The new Council members will be joining 10 other Council members: **Peter Hoff, Greg Lawler, Antonietta Mira, Axel Munk** and **Byeong Park** will serve another year; **Christina Goldschmidt, Susan Holmes, Xihong Lin, Richard Lockhart** and **Kerrie Mengersen** another two. **Jean Bertoin, Song Xi Chen, Mathias Drton, Elizaveta Levina** and **Simon Tavaré** will be stepping down after their three-year terms on Council.

Council is also made up of the Executive Committee members and Editors. From the coming IMS meeting, the Executive Committee will be **Susan Murphy** as President, **Xiao-Li Meng** as Past President, **Regina Liu** as President-Elect, **Zhengjun Zhang** as Treasurer, **Ming Yuan** as Program Secretary, and **Edsel Peña** as Executive Secretary. Alison Etheridge will leave the Exec. The Editors are **Francois Delarue** and **Peter Friz** (*Annals of Applied Probability*), **Amir Dembo** (*Annals of Probability*), **Karen Kafadar** (*Annals of Applied Statistics*), **Richard Samworth** and **Ming Yuan** (*Annals of Statistics*), **Cun-Hui Zhang** (*Statistical Science*) and **T.N. Sriram** (Managing Editor).

Thanks to all the Council candidates, to the outgoing members of the committees, and to all of you who voted.

Ed Perkins

Christian Robert

Alastair Young

Gesine Reinert

Qi-Man Shao

IMS Members' News

American Philosophical Society elects David Donoho as member

The American Philosophical Society has announced its newest class of members, among whom is David L. Donoho, Professor of Statistics and Anne T. and Robert M. Bass Professor in the Humanities and Sciences at Stanford University.

David Donoho has made fundamental contributions to theoretical and computational statistics, as well as to signal processing and harmonic analysis. His algorithms have contributed significantly to our understanding of the maximum entropy principle, of the structure of robust procedures, and of sparse data description. His research interests include "the mathematics of statistical inference and theoretical questions arising in applying harmonic analysis to various applied problems." They have ranged from data visualization to problems in scientific signal processing, image processing, and inverse problems.

David Donoho

The American Philosophical Society, the oldest learned society in the United States, was founded in 1743 by Benjamin Franklin for the purpose of "promoting useful knowledge." The Society's activities reflect the founder's spirit of inquiry, provide a forum for the free exchange of ideas, and convey the conviction of its members that intellectual inquiry and critical thought are inherently in the public interest.

IMS Special Lectures in 2020

Each year the IMS selects special named and medallion lectures. In 2020, there will be the Wald and Blackwell lectures, and eight medallion lectures, as well as two joint IMS/BS lectures, the Doob and Schramm lectures.

At next year's Joint Statistical Meetings (August 1–6, 2020, in Philadelphia, PA) there will be three Medallion Lectures: Susan Holmes, Roger Koenker and Paul Rosenbaum.

The IMS lecturers at the 2020 Bernoulli–IMS World Congress in Probability and Statistics (August 17–21, 2020, at Seoul National University, Seoul, Korea) are as follows: the Wald Lecturer will be Martin Barlow; the Blackwell Lecture will be given by Gábor Lugosi, and the five IMS Medallion Lectures will be given by Gérard Ben Arous, Andrea Montanari, Elchanan Mossel, Laurent Saloff-Coste and Daniela Witten. The IMS Presidential Address will be given by Susan Murphy. There are also two named IMS/BS Lectures: the Doob Lecture, which will be given by Nicolas Curien, and the Schramm Lecture, given by Omer Angel.

Also at the World Congress, there will be five Bernoulli Society named lectures. Persi Diaconis will give the Kolmogorov Lecture, Alison Etheridge the Bernoulli Lecture, Massimilliano Gubinelli the Lévy Lecture, Tony Cai the Laplace Lecture and Sara van der Geer will give the Tukey Lecture.

Nominate now for Wald, Le Cam, Medallion lectures in 2021/2022

You can nominate a special lecturer for future years: we are accepting nominations for the Wald Lecturer in 2021 and 2022; the Le Cam Lecturer in 2021; and the Medallion Lecturers in 2022. Submit your nomination (by October 1, 2019) at https://www.imstat.org/ims-special-lectures/nominations/

More Members' News

The 25th Pfizer/ASA/UConn Distinguished Statistician Colloquium honors Arthur Dempster

This year's speaker at the 25th Pfizer Distinguished Statistician Series will be Professor
Arthur P. Dempster from Harvard University. The colloquium will take place on October
23, 2019, in Storrs, CT. The interview will be conducted by Nan
Laird (Harvard University), Ruobin Gong (Rutgers University), and
Peng Ding (University of California, Berkeley).

The lecture and the interview are open to the public: see the
meeting announcement on page 24.

The Distinguished Statistician Colloquium series ran from
1978 until 2012 and was renewed in 2018. The colloquium series
has featured C.R. Rao, Bradley Efron, D.R. Cox, and many more.
For a complete list, see https://stat.uconn.edu/pfizer-colloquium/.

Arthur Dempster

The purpose of the Colloquium is to provide a forum for a distinguished statistician to
share and disseminate their unique perspective and work in the theory and/or application
of statistics. Starting from 2018, the series has been co-sponsored by Pfizer, the American
Statistical Association, and the Department of Statistics at the University of Connecticut.

Dipak Dey, Chair of the selection committee, thanks Pfizer and the ASA for their
generous financial support. He also thanks the members of the selection committee: Dan
Meyer and Demissie Alemayehu from Pfizer, Ron Wasserstein and Nancy Flournoy from
the ASA, Joseph Glaz and Ming-Hui Chen from UConn (Professor Chen also represents
the New England Statistical Society, NESS).

Charles Bordenave gives Medallion Lecture in Brisbane [*pictured with Ruth Williams*]

Wald Lecture Previews: Trevor Hastie

Trevor Hastie is the John A Overdeck Professor of Statistics at Stanford University. Prior to joining Stanford University in 1994, he worked at AT&T Bell Laboratories for nine years, where he helped develop the statistical modeling environment popular in the R computing system. He received a BSc (Hons) in statistics from Rhodes University in 1976, an MSc from the University of Cape Town in 1979, and a PhD from Stanford in 1984. In 2018 he was elected to the National Academy of Sciences. Trevor's main research contributions have been in applied statistics, particularly in the fields of data statistical modeling, bioinformatics and machine learning; he has published over 200 articles and written six books in this area: *Generalized Additive Models* (with R. Tibshirani, 1991), *Elements of Statistical Learning* (with R. Tibshirani and J. Friedman, 2001; 2nd edn 2009), *An Introduction to Statistical Learning, with Applications in R* (with G. James, D. Witten and R. Tibshirani, 2013), *Statistical Learning with Sparsity* (with R. Tibshirani and M. Wainwright, 2015) and the IMS Monograph, *Computer Age Statistical Inference* (with Bradley Efron, 2016). He has also made contributions in statistical computing, co-editing (with J. Chambers) a large software library on modeling tools in the S language (*Statistical Models in S*, 1992), which form the foundation for much of the statistical modeling in R. His current research focuses on applied statistical modeling and prediction problems in biology and genomics, medicine and industry. Trevor's Wald Lectures will be delivered at JSM Denver, July 27–August 1, 2019.

Statistical Learning with Sparsity

This series of three talks takes us on a journey that starts with the introduction of the lasso in 1996 by Rob Tibshirani, and brings us to date on some of the vast array of applications that have emerged. In 2015 I published a research monograph by the same name with Rob Tibshirani and Martin Wainwright (*Statistical Learning with Sparsity; the Lasso and Generalizations*, Hastie, Tibshirani, Wainwright, Chapman and Hall, 2015). These talks will focus on some of the topics from this book.

The community of people that have worked on sparsity and high-dimensional statistical inference is by now very large (the lasso paper alone has over 28K citations!) My work with my colleagues and students has concentrated on applied methodology, and in particular algorithms and software for employing these powerful tools. All the applications I present are accompanied by software (mostly in R) that my students and I actively support and improve.

There are three Wald lectures, and they focus on different applications.

Wald Lecture I

I motivate the need for sparsity with wide data, and then chronicle the invention of lasso and the quest for good software. After some early starts, my colleagues and I have settled on an algorithm known as coordinate descent, which is surprisingly efficient for fitting a sequence or path of sparse models. Along with our so-called strong rules for hedging the active set, our glmnet package in R (also python and matlab) has remained popular. Several examples will be given, culminating with a special adaptation of glmnet called snpnet for fitting lasso models for polygenic traits using GWAS (truly massive data). I end with a survey of some active areas of research not covered in the remaining two talks.

Wald Lecture II

With real applications, we often encounter missing data, typically regarded as a nuisance. Depending on the application, we have different ways of sweeping the problem under the rug, some more natural than others. With principal components and the SVD, there is a natural way of accommodating NAs, which appears to have been in the statistical folklore for a long time. Matrix completion re-emerged during the Netflix competition as a way to compute a low-rank SVD in the presence of a large amount of missing data, and for imputing missing values. I discuss some aspects of this problem, and describe several algorithms for finding a path of solutions. Here sparsity comes in two forms: sparsity in the entries in the observed matrix, and sparsity in the singular values of the solutions. I illustrate with applications in a variety of areas, including recommender systems and the modeling of sparse longitudinal multivariate data.

Wald Lecture III

As the sparsity literature has progressed over the years, some ingenious extensions have been proposed. One of these is the group lasso (Yuan and Lin, 2007 *JRSS B*), which selects for groups of variables. I briefly outline three projects that have employed these ideas; two concerning generalized additive model selection, and one for selecting interactions in a linear model. Then, in a different direction, the graphical lasso builds sparse inverse covariance matrices to capture the conditional independencies in multivariate Gaussian data. I discuss this approach and extensions, and then illustrate its use for anomaly detection and imputation with high-dimensional data.

Medallion Lecture Preview: Liza Levina

Liza Levina is the Vijay Nair Collegiate Professor of Statistics at the University of Michigan, as well as affiliated faculty at the Michigan Institute for Data Science and the Center for the Study of Complex Systems. She received her PhD in Statistics from UC Berkeley in 2002, and has been at the University of Michigan since. She is well known for her work on high-dimensional statistical inference and statistical network analysis. Her current application interests are focused on neuroimaging. She is a recipient of the ASA Noether Young Scholar Award, a fellow of the ASA and the IMS, a 2016 Web of Science Highly Cited Researcher, and an invited speaker at the 2018 International Congress of Mathematicians. She has served the IMS in multiple capacities and is currently a council member and a co-chair of the IMS Task Force on Data Science. Liza Levina will deliver her Medallion Lecture at JSM Denver, July 27–August 1, 2019.

Hierarchical communities in networks

Network data have become increasingly common in many fields, with interesting scientific phenomena discovered through the analysis of biological, social, ecological, and various other networks. Among various network analysis tasks, community detection (the task of clustering network nodes into groups with similar connection patterns) has been one of the most studied, due to the ubiquity of communities in real-world networks and the appealing mathematical formulations that lend themselves to analysis. For the most part, community detection has been formulated as the problem of finding a single partition of the network into some "correct" number of communities. However, it is both well known in practice and supported by theory that nearly all the algorithms and models proposed for this type of community detection do not work well when the number of communities is large. We argue that for large networks, a hierarchy of communities is preferable to such a partition, since multiple partitions at different scales frequently make more sense in real networks, and the hierarchy can be scientifically meaningful, like an evolutionary tree. A hierarchical tree, with larger communities subdivided into smaller ones, offers a natural and very interpretable representation of community structure, and simplifies the problem of estimating the potentially large number of communities from the entire network. In addition, a hierarchy gives us much more information than any "flat" partition, by indicating how close communities are through their tree distance. Finally, recursive splitting is more computationally efficient, and, as we show, in some settings is more accurate. In particular, we show that even when the full community structure corresponding to the leaves of the tree is below the recovery threshold, we can still consistently recover the top levels of the tree as long as they are well separated, giving us partial but accurate information where a flat partition method would fail.

Many existing algorithms for hierarchical clustering can be modified to apply to networks. We adopt a simple top-down recursive partitioning algorithm, once popular in the clustering literature. It requires two tools that, in turn, can be chosen among many existing methods: an algorithm to partition a given network into two, and a stopping rule to decide whether there is more than one community in a given subnetwork. Given these two tools, the recursive (bi-)partitioning algorithm proceeds by starting with all nodes in one community, applying the stopping rule to decide whether a split is needed, applying the splitting algorithm to split into two communities if so, and continuing to apply this to every resulting subnetwork until the stopping rule indicates there are no further splits to make. This class of algorithms can be made model-free and tuning-free, and is computationally efficient, with the computational cost growing logarithmically in the number of communities rather than linearly, which is the case for most flat partition methods. We implement recursive partitioning by using regularized spectral clustering as the splitting rule, and the Bethe-Hessian estimator of the number of communities as the stopping rule, although any other consistent method can be used instead.

We analyze the algorithm's theoretical performance under a natural framework for this setting, the binary tree stochastic block model. Under this model, we prove that the algorithm correctly recovers the entire community tree under mild growth assumptions on the average degree, allowing for sparse networks. Further, the assumptions to recover each level of the tree, which we make explicit, get strictly stronger as we move down the tree, illuminating the regime where recursive partitioning can correctly recover mega-communities at the higher levels of the hierarchy even when it cannot recover every community at the bottom of the tree. We show that in practice recursive partitioning outperforms "flat" spectral clustering on multiple performance metrics when the number of communities is large, and illustrate the algorithm on a dataset of statistics papers, constructing a highly interpretable tree of statistics research communities.

This is joint work with Tianxi Li (Univ. Virginia), Lihua Lei (UC Berkeley), Sharmodeep Bhattacharyya (Oregon State Univ.), Purnamrita Sarkar (Univ. Texas, Austin), and Peter J. Bickel (UC Berkeley). The manuscript is available at arXiv:1810.01509.

Medallion Lecture Preview: Yee Whye Teh

Yee Whye Teh is a Professor of Statistical Machine Learning at the Department of Statistics, University of Oxford and a Research Scientist at DeepMind. He was programme co-chair for AISTATS 2010 and ICML 2017. His research interests span across machine learning and Bayesian statistics, including probabilistic methods, Bayesian nonparametrics and deep learning.

Yee Whye's Medallion lecture will be delivered at the Joint Statistical Meetings in Denver, July 27–August 1, 2019. A longer version of this article appears on the Bulletin website: **http://bulletin.imstat.org**.

On Statistical Thinking in Deep Learning

Historically, machine learning has its roots in pattern recognition and connectionist systems whose intelligent behaviours are learnt from data. In the 90s, the community started realising the widespread connections with statistics, which led to a period when statistical approaches flourished and became the dominant framework for both theoretical foundations and methodological developments. In the last decade, with the growing popularity of deep learning, this coming together with statistics has started to unravel, and the research frontier moved from statistical learning to artificial intelligence, from graphical models to neural networks, and from Markov chain Monte Carlo to stochastic gradient descent.

In this new era, what is the role of statistical thinking in advancing the state-of-the-art in machine learning? It is my belief, and that of many others, that statistical thinking continues to play an important role in machine learning. The deep theoretical roots of statistics and probability have continued to nourish our understanding of learning phenomena; in unsupervised learning, generative modelling continue to be a popular paradigm; and the deep concern for uncertainty and robustness prevalent in statistics is now being increasingly felt as machine learning techniques are applied in the real world. In the following I will illustrate how statistical thinking has helped with two inter-related examples from my own research.

Meta Learning and Neural Processes

While much of machine learning excels for large datasets, there is increasing interest in systems that can learn efficiently from much less data. For example, in few-shot image classification, with just a few example images of each class, we would like a system that can generalise well to classifying other images. Meta learning is an idea whereby if our system has seen many examples of such few-shot image classification tasks (each with its own small dataset), we might conceivably expect there to be sufficient information spread across tasks for a system to learn to generalise sensibly from few examples.

While most recent approaches to meta learning are based on the idea of optimising learning algorithms, an interesting alternative, which we call neural processes, considers it from the statistical perspectives of hierarchical Bayes and stochastic processes (Garnelo et al., 2018a,b; Kim et al., 2019; Galashov et al., 2019). The idea is that in order to learn effectively from small datasets, prior knowledge is necessary, which from a Bayesian perspective takes the form of the prior distribution. In case of image classification and supervised learning, each task corresponds to a function, and the prior of interest is a distribution over functions, i.e. a stochastic process. While standard approaches in Bayesian nonparametrics might posit simple prior distributions that enable tractable posterior computation, we instead propose to use neural networks to directly learn the predictive distributions induced by the stochastic process from data.

Viewing meta learning from a statistical perspective has allowed us to better understand the underlying learning phenomena. This has in turn allowed us to make links with other ideas like Bayesian nonparametrics and Gaussian processes, and motivated new approaches which better handle uncertainty (Garnelo et al., 2018b) and learn more accurately (Kim et al., 2019), as well as new applications of meta learning in Bayesian optimisation and sequential decision making (Galashov et al., 2019).

Probabilistic Symmetries and Neural Networks

In neural processes, the central function being learnt has a form $y = f(x, \mathcal{D}^{\text{train}})$, of an output y given an input x and an iid training set $\mathcal{D}^{\text{train}} = \{(x_i^{\text{train}}, y_i^{\text{train}})\}_{i=1}^n$. The question is, how should we choose the architecture of our neural network used to learn it? Specifically, the function should be invariant with respect to permuting the indices of $\mathcal{D}^{\text{train}}$. We enforced this permutation invariance explicitly by choosing a specific neural architecture,

$$f(x, \{(x_i^{\text{train}}, y_i^{\text{train}})\}_{i=1}^n) = h\left(x, \sum_{i=1}^n g(x_i^{\text{train}}, y_i^{\text{train}})\right)$$

where both g and h are neural networks.

By construction the function is invariant to permutations of the dataset, since addition is commutative. However, there are other commutative operators, for example element-wise product, max, or min. This raises the following questions: Which operator is best? Are there other neural architectures or function classes that have

this permutation invariance property? And can we characterise all permutation-invariant functions?

In Bloem-Reddy and Teh (2019), we developed a general framework to answer these questions using tools from probabilistic symmetries and statistical sufficiency. The core idea is that an invariance means that some information is ignorable. The rest of the information then forms an adequate statistic for computing the function, and we can identify what the adequate statistic is. In the case of permutation invariance this is the empirical measure, and the implication is that the form we chose above is the natural one.

We have generalised this result in a few ways. Firstly, we can generalise to invariance under the action of some compact group. The results are structurally the same, except that the empirical measure is replaced by an appropriate adequate statistic called a maximal invariant. We have also derived analogous results for a different notion of symmetry called equivariance, where transformations of the input lead to output that is transformed in the same way.

References

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Medallion Lecture Preview: Helen Zhang

Hao Helen Zhang is a Professor in the Department of Mathematics at the University of Arizona, as well as a faculty member of Statistics Graduate Interdisciplinary Program (GIDP). Helen Zhang obtained a PhD in Statistics from University of Wisconsin at Madison in 2002. She was assistant and associate professor of Statistics at North Carolina State University from 2002–11. Her research areas include statistical machine learning, high-dimensional data analysis, nonparametric smoothing, and biomedical data analysis. With Bertrand Clarke and Ernest Fokoué, she is the author of the book *Principles and Theory for Data Mining and Machine Learning*. Helen is currently Editor-in-Chief of ISI's *Stat,* and Associate Editor of *Journal of the Royal Statistical Society Series B, Journal of the American Statistical Association*, *Journal of Computational and Graphical Statistics*, and *Statistical Analysis and Data Mining*. She is a Fellow of IMS and ASA, and an elected member of the International Statistical Institute.

Helen's Medallion lecture will be delivered at the Joint Statistical Meetings in Denver, July 27–August 1, 2019.

Breaking the Curse of Dimensionality in Nonparametrics

The "curse of dimensionality" refers to sparse phenomena of high-dimensional data and associated challenges in statistical analysis. Traditional nonparametric methods provide flexible modeling tools to discover nonlinear and complex patterns in data, but they often experience theoretical and computational difficulties when handling high-dimensional data. In the modern computer age, rapid advances have occurred in nonparametrics to break the curse of dimensionality and enable sparse, efficient, and interpretable function estimation for high dimensional regression and classification problems. A variety of state-of-the-art nonparametric methods, theory, and scalable algorithms have been developed to extract low intrinsic dimension from data and accommodate high-dimensional data analysis more effectively.

In this talk, I will survey some recent works of nonparametric methods in model selection, dimension reduction, curve estimation, and inferences for high dimensional regression, classification, and density estimation problems. Related issues and open challenges will be discussed as well. In addition, there is intrinsic connection between nonparametric and statistical machine learning. The talk will also highlight a variety of nonparametric machine learning algorithms widely used in modern data science.

Recent papers: two IMS-supported journals

Bayesian Analysis

Bayesian Analysis is an electronic journal of the International Society for Bayesian Analysis. It seeks to publish a wide range of articles that demonstrate or discuss Bayesian methods in some theoretical or applied context. The journal welcomes submissions involving presentation of new computational and statistical methods; critical reviews and discussions of existing approaches; historical perspectives; description of important scientific or policy application areas; case studies; and methods for experimental design, data collection, data sharing, or data mining. The Editor-in-Chief is Michele Guindani. Access papers at **http://projecteuclid.org/euclid.ba**

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Brazilian Journal of Probability and Statistics

The *Brazilian Journal of Probability and Statistics* is an official publication of the Brazilian Statistical Association and is supported by the IMS. The Journal publishes papers in applied probability, applied statistics, computational statistics, mathematical statistics, probability theory and stochastic processes. The Editor is Enrico Colosimo. Access papers at **http://projecteuclid.org/euclid.bjps**

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President's Column: Practice what we preach. Work for what we wish for.

Xiao-Li Meng writes his final President's Column, before handing on the gavel to the next IMS President, Susan Murphy, at JSM…

Photo: Martha Stewart

It has been so long since I was quarantined by the joy of learning as a student, a form of joy whose purity many of us only recognize decades after we lost our innocence. I was therefore in debt to the organizers of the 2019 IEEE Data Science Workshop (DSW: https://2019.ieeedatascience.org/). They provided me the opportunity to experience that joy again; on a breezy, refreshing Sunday I limbered up with "Large-scale Optimization for Machine Learning" in the morning and tangoed with "Tensors in Data Science" in the afternoon.

However, a real "aha" moment came during the welcome reception that evening. A dean and an ex-president of IEEE's Signal Processing Society (SPS) delivered welcoming remarks, and reminded the mixed audience of engineers, applied mathematicians, computer scientists, and statisticians that the mission of SPS has long been about "generation, transformation, extraction, and interpretation of information." Isn't that pretty much what Data Science (DS) is about? After all, who would care much about data if they don't ultimately lead to actionable or at least understandable information?

I share much of my fellow statisticians' and probabilists' frustration that our consistent and substantial contributions to DS have generally not been properly recognized. But this remark reminded me that we are still the luckier ones. What is the percentage of the Venn diagrams on data science you can find online that include "signal processing" either as a participating discipline or a skill set? So far that percentage from my search is smaller than the probability that my mother country would win the 2026 world cup. The OR (Operations Research) community is in a similar situation; its contributions to optimization methods, which are the bread and butter of machine learning, are essentially infinite compared to the attention the community has received in the media frenzy over DS or AI.

No matter how frustrated, or even outraged, any individual group or discipline in DS is, there is no DS deity we can blame for unfairly favoring some groups over others. If anything is to blame, it is our long and collective failure to communicate with and learn from each other. Period.

The good news is that this period is about to end. There is an increasing awareness that it is much more effective to engage in outreach than in outrage, so to speak. That computer scientists and statisticians were invited to IEEE DSW represents the SPS's effort. That the ACM and IMS reached out to each other last year is another such indication. As I wrote in my second President's column, this outreach resulted in the establishment of the IMS task force, co-chaired by Liza Levina (Michigan) and David Madigan (Columbia), on the partnership with ACM, the world's largest computing society with nearly 100,000 members. I am very happy to report that this effort is now expanding to a much larger-scale collaboration by multiple disciplines, as encouraged by NAS (National Academies of Sciences, Engineering, and Medicines), and with ACM and IMS as its co-leading organizations.

Specifically, the first ACM-IMS Interdisciplinary Summit on the Foundations of Data Science was held on June 15, 2019 in the grandiose Palace Hotel of San Francisco, just prior to the ACM award ceremony, which conferred the latest Turing Award to the "Fathers of the deep learning revolution." The Summit co-chair, Columbia computer scientist Jeannette Wing, concluded her opening remarks [*which you can watch on the Livestream at* https://www.acm.org/data-science-summit/livestream—*see screenshot below*] by emphasizing that,

"*While today's event focuses primarily on computer science and statistics, I want to acknowledge that the foundations of data science also draw on other fields—for example, signal processing from Electronic*

Engineering, optimization from Operation Research, analysis from Applied Mathematics, and more. David and I expect that the future events in the foundations of data science will reach out to these fields."

A panel on Robustness and Stability in Data Science at the ACM-IMS summit. L–R: moderator Ryan Tibshirani, panelists Xiao-Li Meng, Bin Yu, Richard J. Samworth, Aleksander Madry

The joint leadership of ACM and IMS in reaching out to many disciplines is a *Big Deal.* I am deeply grateful to the ACM leadership team, especially its Executive Director and CEO, Vicki Hanson, to the Summit co-chairs, Jeannette Wing and David Madigan, and to all the members of the Steering Committee, which include IMS representatives Chris Holmes (Oxford), Ryan Tibshirani (CMU), and Daniela Witten (UW), for having formally kicked off this joint effort in less than eight months. The first joint Summit was a great success by almost all measures. And it is about this "almost" qualification that I am writing to ask for your help, urgently.

As you will see from the program of the Summit [*on the next page*], it was an extremely well-crafted program in terms of coverage of the topics and representatives of the presenters. Indeed, the six-hour program packed with keynotes and panel debates was very inspiring and intense, so much so that one panel triggered the fire alarm—you can search for the recording to see how long we had to leave the auditorium. However, while the auditorium was packed with about 250 participants, the size of the IMS registered audience was smaller than the number of statisticians on the program.

I realize that the membership ratio of ACM to IMS is about 25:1, and hence the ratio at the Summit was not completely out of proportion. Nevertheless, if IMS truly wants to be a leading voice in DS, we have to move our collective feet to where our mouths say we want to be. We cannot keep complaining that we don't have a seat at the table but not show up in numbers when we are invited or, worse, when we're the co-hosts. The matter is very simple. If we don't take these seats reserved for us, many others will. And few would keep reserving seats for those who don't show up, no matter how important they are.

Of course, the IMS leadership needs to be more creative in finding ways to encourage members to attend such outreach events. For that, I am particularly grateful to David Madigan, together with Jeannette Wing, for leading the effort to secure an NSF (US National Science Foundation) grant which sponsored over 35 students and young researchers' attendance at the Summit. It is telling is that all of these funds were taken within 24 hours of the award announcement, almost surely by CS students and young researchers.

This last observation makes me particularly appreciate a new

emphasis by another IMS task force, co-chaired by Joseph Blitzstein (Harvard) and Deborah Nolan (Berkeley), which was inspired by Jon Wellner's 2017 Presidential Address, *Teaching Statistics in the age of data science.* Its general task is as hard to accomplish as it is easy to state: **to determine what the PhD curriculum for statistics should be, in the age of data science.** The task force is charged with complimenting the work done at the NSF's 2018 "Statistics at a Crossroads" workshops, one of which focused on PhD education. The complementary roles IMS can play are in (at least) two dimensions: going beyond the United States, and going deeper into probability. Its membership therefore reflects these dimensions: David Aldous (Berkeley), Emmanuel Candès (Stanford), Antonietta Mira (Università della Svizzera Italiana), Guy Nason (Bristol), Richard Samworth (Cambridge), Nike Sun (MIT), Qi-Man Shao (Southern University of Science and Technology of China), and Harrison Zhou (Yale). I am extremely grateful to this most prominent task force, which has been working diligently via monthly conference calls: no small feat considering the wide range of the time zones! (I will leave this as a trivia question: what is the optimal call time the task force identified?)

The task force is working on a report that consists of four major parts:

International Training: Compare and contrast the programs in different countries, using various metrics, such as median length of program, number of required courses, topic breadth in required courses, and the depth of professional development.

Resources: Create, curate, and share course materials on emerging topics that are not easy to find a textbook-style reference, and work out how to incentivize such efforts.

Leadership: Develop more PhD students into outstanding communicators and ambassadors for the importance of statistics and statistical thinking, in an era where the general public often hears about AI and ML but may have little understanding the critical roles statistics plays, or even what it is.

Probability: Update the probability curriculum to better reflect the statistical and data scientific challenges students are

starting to encounter, addressing the old debate on how much measure theory to include in the core probability course, and recent questions about the roles of CS and DS in the probability curriculum.

I am particularly grateful for and pleased to see the task force's emphasis on building leadership while one is still a student. It is not a secret that for too long "leadership" has not been viewed as an essential skill, and in some faculty members' minds it was (and perhaps still is) even a distraction, subtracting from one's scholarship. The end result is that our profession simply does not have enough "outstanding communicators and ambassadors" out there to explain —and promote the importance of—what we do. Promotion is not a dirty word as long as we have substance to be promoted, and we absolutely do. The lack of general leadership training in statistics is hurting us in real terms, including in our pockets. At the latest NAS Committee on Applied and Theoretical Statistics (CATS) meeting I attended, representatives from NSF reminded the committee once again of a painful reality: the suggestions regarding what kinds of DS research the NSF should fund come almost exclusively from outside of the statistical community.

This was why I invited Juan Meza, the Director of the Division of Mathematical Sciences at NSF, to write to us directly last November [http://bulletin.imstat.org/2018/11/seeking-novelty-in-data-sciences/]. Meza told us about the **Harnessing the Data Revolution** initiative and asserted that, as DS evolves, "new strategies, methods, and theory will be needed to address all of the complex data issues arising." He concluded with a call to action for statisticians and probabilists: "And who better to do this than those who have already contributed so much to data sciences?" But apparently such messages need to be repeated periodically, as we are simply a shy profession, especially compared to CS which has a much faster-paced and action-oriented culture.

Regardless of whether or not we feel our fellow disciplines are moving too aggressively, no one can hear us if all we do is to complain to each other that others don't hear us. If we want to be a leading voice in the DS era, we must go out, communicate with other disciplines, speak to funding agencies, talk to the general public, etc. That is, we must work for what we wish for, just as we should always practice what we preach.

This is my departing wish as the IMS President. I look forward to thanking you in person for your trust in me when I see you at an ACM symposium or an AMS meeting or an IEEE workshop or an INFORMS conference.

Until then, please consider giving one presentation to your favorite high school. Thank you!

ACM–IMS Interdisciplinary Summit on the Foundations of Data Science
June 15, 2019, San Francisco

Program

9:00-9:05 AM – Introduction, **Jeannette Wing**, Columbia University

9:05-9:40 AM – Keynote Talk: *"Making the Black Box Effective: What Statistics Can Offer,"* **Emmanuel Candès**, Stanford University, with introduction by **David Madigan**, Columbia University

9:40-10:20 AM – Panel: *Deep Learning, Reinforcement Learning, and Role of Methods in Data Science.* Moderator: **Joseph Gonzalez**, University of California Berkeley. Panelists: **Shirley Ho**, Flatiron Institute, **Sham Kakade**, University of Washington, **Suchi Saria**, Johns Hopkins University, **Manuela Veloso**, J.P. Morgan AI Research, Carnegie Mellon University

10:20-10:35 AM – Break

10:35-11:15 AM – Panel: *Robustness and Stability in Data Science.* Moderator: **Ryan Tibshirani**, Carnegie Mellon University. Panelists: **Aleksander Madry**, Massachusetts Institute of Technology, **Xiao-Li Meng**, Harvard University, **Richard J. Samworth**, University of Cambridge, The Alan Turing Institute, **Bin Yu**, University of California, Berkeley

11:15-11:55 AM – Panel: *Fairness and Ethics in Data Science.* Moderator: **Yannis Ioannidis**, National and Kapodistrian University of Athens. Panelists: **Joaquin Quiñonero Candela**, Facebook, **Alexandra Chouldechova**, Carnegie Mellon University, **Andrew Gelman**, Columbia University, **Kristian Lum**, Human Rights Data Analysis Group (HRDAG)

11:55 AM-1:00 PM – Lunch

1:00-1:35 PM – Keynote Talk: *"Deep Learning for Tackling Real-World Problems,"* **Jeffrey Dean**, Google, with introduction by **Suchi Saria**, Johns Hopkins University

1:35-2:10 PM – Keynote Talk: *"Machine Learning: A New Approach to Drug Discovery,"* **Daphne Koller**, insitro, with introduction by **Kristian Lum**, Human Rights Data Analysis Group

2:10-2:20 PM – Break

2:20-2:55 PM – Panel: *Future of Data Science.* Moderator: **David Madigan**, Columbia University. Panelists: **Michael I. Jordan**, University of California, Berkeley, **Jeannette Wing**, Columbia University

2:55-3:00 PM – *Closing Remarks:* **David Madigan** and **Jeannette Wing**, Columbia University
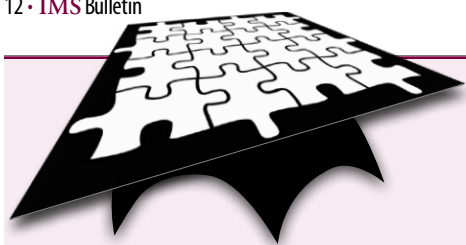
Student Puzzle Corner 25

Here's Anirban DasGupta's latest puzzle. He says: *All of us were told as undergraduates, or perhaps Masters students, that an essential property of a point estimator is that it be consistent. And indeed, we usually or even always select estimators that are consistent. We are going to ask a provocative question in this month's puzzle:* **is there consistency in the real world?** *The problem posed asks you to show that, in fact, what we believe to be consistent, when computed, is not.*

Where does the unavoidable inconsistency in the real world come from? Although the human body is an amazing machine, it is not a perfect one. The practical inconsistency comes from human limitations in the precision of a measurement. This inconsistency is incurable and a large sample won't fix it. Here is the exact problem of this month.

Suppose we have an iid sequence of exponential random variables $X_1, X_2, \cdots$ with mean λ. Suppose the values are rounded off using an often-used rule: an observation X is written down as zero if X≤0.005, as 0.01 if X is between 0.005 and 0.015, as 2.00 if it is between 1.995 and 2.005, and so on. Call this recorded value Y and consider the mean $\bar{Y}$ for a sample of size n.

(a) Prove that $\bar{Y}$ is not a consistent estimator of λ.

(b) Find in closed form a parametric function $h(\lambda)$ such that $\bar{Y}$ is a consistent estimator of $h(\lambda)$.

(c) Derive an asymptotic expansion to one term, or if you can, two terms, for $h(\lambda)-\lambda$, as $\lambda\to\infty$.

Deadline: September 5, 2019

Solution to puzzle 24

Contributing Editor Anirban DasGupta writes on the previous puzzle: Congratulations to the *four* student members who sent in correct answers—some more complete than others. They are Prakash Chakraborty, Purdue University; Sihan Huang, Columbia University; Kumar Somnath, The Ohio State University; and Andrew Thomas, Purdue University.

Prakash Chakraborty   *Sihan Huang*   *Kumar Somnath*   *Andrew Thomas*

Now for the solution. Denote the number of steps required to reach the point (n, n) by S_n. The quickest that the particle can reach the point (n, n) is in $2n$ steps, which happens if exactly n heads and n tails are produced in $2n$ tosses of our fair coin. This has probability $\binom{2n}{n}/2^{2n}$.

Next, for any given integer $k \geq 1$, $P(S_n = 2n + k) = \binom{2n+k-1}{n-1} 2^{-2n-k+1}$. Thus,

$$\mu_n = E(S_n) = 2n + \sum_{k=1}^{\infty} k \binom{2n+k-1}{n-1} 2^{-2n-k+1} = 2n \left(1 + \left(\binom{2n}{n}/2^{2n}\right)\right),$$

with a little bit of calculation. In particular, $\mu_3 = {}^{63}/_8 = 7.875$, and on using Stirling's series for $n!$, we get

$$\mu_n = 2n + \frac{2\sqrt{n}}{\sqrt{\pi}} - \frac{1}{4\sqrt{n\pi}} + O(n^{-3/2}).$$

Remembering Larry Brown

Paul Shaman wrote these remarks, edited and expanded from his comments at the dinner on November 30th, during the posthumous tribute to Larry Brown held November 30–December 1, 2018, at University of Pennsylvania.

The Penn Department of Statistics is now in its 88th year. Over this period of time it has experienced many changes, and one of these was especially transformative. I'm referring to Larry joining the Department in 1994. In addition to his strength and accomplishments as a researcher, he brought to the Department an exceptionally high level of excellence in teaching and mentoring.

During his career Larry was the dissertation adviser for 37 students, with 21 of them completing their degrees at Penn during the years 1998–2016. [*Fourteen of those 21 were present at the event, as well as many others who benefited from Larry's teaching, advice, and collaboration.*]

In 2011 Larry received a Provost's Award for Distinguished PhD Teaching and Mentoring at the University of Pennsylvania. Comments submitted at the time included: *"all you could hope for in an adviser"; "has a special way of finding important problems that highlight the talents of each of his doctoral students"; "willing to advise any student, weak or strong"; "he somehow manages to bring out their full potential. Getting to know each and every one of them, he consistently manages to come up with a fertile new research direction that is suitably tailored to their interests and talents. … In this way, he provides the perfect preparation for an academic research career, giving his students the confidence and self-resourcefulness that is so critical for success"; "devotes endless amount of attention and time to each of his students, and by doing so, he truly portrays what academics is about: nurturing young minds to investigate new problems and come up with solutions."*

At the December 15–17, 2010 conference in honor of his 70th birthday, Larry's students presented him with a plaque that read, in part: *"Happy Birthday Larry! We love you! We thank you! For teaching us how to be successful as a professional and a human; for inspiring us to achieve our full potential; for taking care of us; … and for being such a great role model for us."*

Larry's devotion to guidance and mentoring was always accompanied by personal modesty.

I want to conclude by talking about intercollegiate athletics at Cal Tech. Larry played basketball at Cal Tech, first on the freshman team and then three years on the varsity. One of his teammates, Mike Perlman, provided some information about the team.

As we all know, Cal Tech is not an athletic powerhouse. However, during Larry's tenure on Cal Tech basketball, the team did experience a respectable number of wins. In 1959–1960, it recorded 6 wins and 15 losses. Mike wrote: "Besides Larry, who was an intense competitor, the team featured Fred Newman, who was a first-rate player—he held many conference scoring records. Another name you may know is Roger Noll, who became a well-known economist." [Noll is now an emeritus Professor of Economics at Stanford.] In 1960–1961 the team had 8 wins and 12 losses. "I'm not certain, but there may not have been as good a record since—the Legendary Losing Streaks began sometime after that," Mike added.

In recent years Cal Tech teams have experienced very long losing streaks— articles have appeared in the press when these streaks have been broken. On several occasions, I talked to Larry after reading such news. One such event occurred on February 22, 2011. Cal Tech basketball defeated Occidental 46–45 in its final game of the season. In doing so, it scored the final nine points, and the winning basket was the first of two free throws, with three seconds left. The second attempt missed, and a desperation shot from halfcourt by Occidental did not connect. This win ended a 310-game losing streak. I had a lot of fun talking to Larry about this!

But there was a far worse losing streak, which occurred in baseball. On March 31, 2017, Cal Tech defeated Pomona–Pitzer 4–3 with a walk-off win. It had not won in the SCIAC previously since 1988—a span that included 587 games. I went to talk to Larry again. He said, "Oh, I once played baseball for Cal Tech." As he explained, the team was short-handed for a game. The first baseman was his roommate and persuaded him to fill in for a game. It's just another example of how cooperative and helpful Larry always was.

Lawrence D. Brown (1940–2018), Miers Busch Professor and Professor of Statistics at The Wharton School, University of Pennsylvania, had a distinguished academic career with groundbreaking contributions to a range of fields in theoretical and applied statistics. He was an IMS Fellow, Wald Lecturer, and a former IMS President. Moreover, he was an enthusiastic and dedicated mentor to many graduate students. Larry's firm dedication to research, teaching and service sets an exemplary model for generations of new statisticians. Therefore, the IMS is introducing a new award in his honor: the **IMS Lawrence D. Brown PhD Student Award**. This annual travel award will be given to three PhD students, who will present their research at a special invited session during the IMS Annual Meeting. The winners of the inaugural 2020 award will be announced in a future issue.

Donations are welcome, through **https://www.imstat.org/contribute-to-the-ims/** under "IMS Lawrence D. Brown Ph.D. Student Award Fund."

Obituary: Joel Zinn

1946–2018

Texas A&M University

Joel Zinn

We mark the passing of Dr. Joel Zinn, Professor Emeritus of Mathematics, Texas A&M University, on December 5, 2018, at his home in Westlake Village, California. He was 72 years old.

Joel was born on March 16, 1946, in Brooklyn, New York. His family said, about Joel's early attraction to the subject, "He fell in love with mathematics at an early age, determining in the sixth grade that it would become his life's work." Having graduated from high school at 16, Joel earned his bachelor's degree in mathematics from Queens College. While there, he met Michele; they married in 1968 and moved to Madison, Wisconsin, for Joel to pursue his PhD in Mathematics under Jim Kuelbs. Joel's early career took him to the University of Minnesota, University of Massachusetts and Michigan State; in 1981, he became Associate Professor at Texas A&M, where he would remain for 36 years, becoming Professor Emeritus in 2007.

By 1978, Joel had published five papers, three as sole author. Topics included 0–1 laws, stable measures, translation of measures on vector spaces, recurrence in stationary sequences. During '78–'81, he published 13 more papers on topics including: probability on L^p spaces, stable laws, iterated logarithm laws on Banach spaces, weighted empirical logarithm, limit theorems in Banach spaces, and random sets.

Many mathematicians will have shared the experience of having been caught up in a mathematical question, thrilled to the point where they lost track. Joel spent a lot of time in such a world, making his choices, innovating mathematical results. Excellence is about getting particular things done and bearing up when something doesn't work. Working with others is in many cases essential if progress is to be made. It can be a highly efficient and supportive culture.

Joel was earning a reputation for steady production of fundamental research published in top journals, working and communicating with an impressive list of strong researchers. Joel co-authored 22 publications with Evarist Giné (who passed away in 2015).

As of today, Joel's most highly cited publication is the 61-page 1984 *Annals of Probability* Special Invited Paper, co-authored with Giné: "Some limit theorems for empirical processes." In some important parts, it was their improvement of basic results underpinning existing proofs that made the difference. When structuring the paper, they adopted spare, non-ambiguous notation and a narrative of examining years of advances on this topic by luminaries in probability theory, some of it unpublished work by Le Cam. Their treatment of details, old and new, is refreshing, accurate, author credited, and powerful. They had discovered ways to get a handle on the performance of empirical probabilities of events used as estimates of their actual probabilities, for all events in unusually large classes of events. Such results were particularly needed to support the role of Bootstrap in complex problems. Not to be overlooked are passages that give one the feel of being in the same room with lots of people you admire.

As the list of Joel Zinn's different co-authors expanded, so too did the scope of his research topics. Most remained in the category of basic research, partly because fundamentals he continually worked were designed to punch through roadblocks standing in the way of developing broadly applicable mathematical formulas. His later topics included: uniform convergence of weighted kernel density estimators, various laws of iterated logarithm, a central limit theorem for empirical processes involving time dependent data, and when is the Student t-statistic asymptotically standard normal?

Another highly cited publication is Joel's 1990 paper, again co-authored with Evarist Giné: "Bootstrapping general empirical measures." Building on the '84 paper, it was timely, represented an important commitment of probability talent, and genuinely extended the role of Bootstrap to complex probability models of current interest today. These results, not so many years after Bootstrap burst forth, elevated yet another part of probability to a higher level of mathematical maturity, clarity, generality, and leadership.

Joel's many substantive publications, including his co-authorship (with V. Koltchinskii, R. Nickl, S. van de Geer and J. Wellner) of an obituary for Evarist Giné, often share elements of acute clarity, precise notation, wonderful narratives, and complete airing of important strengths and weaknesses of component parts.

Considering the pace of development, it seems that much of our precious Probability is carried around in the heads of those in the network of knowledgeable persons working that ground, many of whom are close at hand from shared academic ancestry. Like art and music, our subject will change over time. What is timeless is the value of colleagues like Joel Zinn who leave things in proper order for those who follow.

We close with a Toast: *To Probabilists, Joel Zinn, et al.*

Raoul LePage, Michigan State University

OBITUARY: David Hinkley

1944–2019

DAVID HINKLEY, who died peacefully at his home in California on 11 January 2019, made important and broad-ranging contributions to statistical theory and methods.

David was born on 10 September 1944 in Kent, England. After leaving school he studied mathematics and statistics at the University of Birmingham, where he was taught by John Nelder, David Wishart and Henry Daniels, who suggested that he undertake a PhD at Imperial College London under the supervision of David Cox. Imperial was then a rapidly expanding hub for statistical activity, and by the time David had published his first article, he had been appointed to a junior lecturership. He received his doctorate in 1969 and then spent the years 1969–71 at Stanford University. He married Betty Blake in 1970, and their daughter Sara was born in 1971, just before their return to London, where, amid many other projects, David worked with David Cox on *Theoretical Statistics*, published in 1974.

This book was arguably the first modern treatment of the foundations and theory of statistics and remains a landmark. Its scope, its illustration of statistical principles through a series of compelling examples highlighting the strengths and weaknesses of different approaches to inference, its emphasis on likelihood and its even-handedness have given it lasting influence on subsequent generations of students and scholars. Although its eschewal of technicalities and dogma infuriated some reviewers, it was immediately recognised as a major contribution.

David was now established as an outstandingly broad, able and productive scholar, and in 1973, shortly after the birth of their son Steve, the family moved to the University of Minnesota. During this period David became interested in the jackknife, a harbinger of his later work on resampling methods. Re-reading Fisher's work led, in 1978, to the publication of an article joint with Bradley Efron that introduced what is now called the Efron–Hinkley ancillary. The observed information and its expectation are often regarded as essentially interchangeable, but Fisher had realised that the former could play the role of an approximate ancillary statistic, so inferences that condition upon its value are more relevant to the particular dataset under study. This paper, and David's advocacy of conditional inference, played an important role in stimulating the subsequent blossoming of small-sample asymptotics.

In 1983, David moved to the University of Texas at Austin, where his interests in resampling expanded to the bootstrap, culminating in the 1997 publication of his book *Bootstrap Methods and their Application*, joint with Anthony Davison. This gave a broad perspective on when and how bootstrap methods might be safely applied, touched on many topics not previously addressed in the bootstrap literature, and quickly became a standard reference.

In 1989, he moved from Austin to lead the new Department of Statistics at the University of Oxford, which grew rapidly in size and as a focus for statistical activity. David found the broader Oxford environment difficult, however, and in 1995 moved to the University of California, Santa Barbara, from where he retired in 2014.

A distinctive, upright figure and brilliant lecturer, David illuminated any topic to which he turned. His broad vision, lucidity, excellent judgement and the esteem in which he was held made him a natural candidate for leadership roles. He served on national committees in the US and UK,
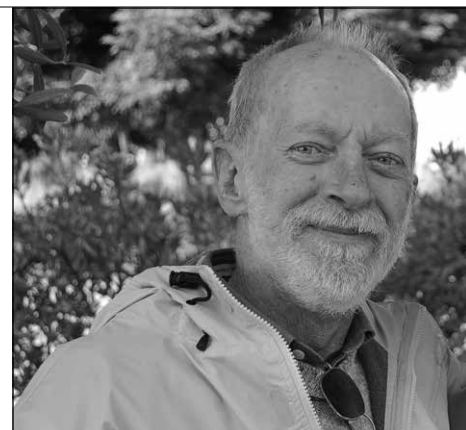
David Hinkley

Courtesy of Sara Hinkley

and was editor of the *Annals of Statistics* and of *Biometrika*, as well as associate editor of other major journals. In addition to his major publications, he edited several books that remain worthwhile reading.

His honours included the COPSS Presidents' Award in 1984 and fellowships of the American Statistical Association, the American Association for the Advancement of Science and the Institute of Mathematical Statistics; he gave two IMS Medallion Lectures.

David and Betty divorced in 1991; she died in 2015. He is survived by Sara and Steve, his four grandchildren—who delighted him and with whom he spent happy times watching soccer matches and visiting the US national parks and California coast—an elder sister and other family in the UK. His brother died in 2011.

David listened to BBC radio each evening, and was anguished by recent political events. He was a generous, stimulating and enduringly supportive mentor for younger colleagues, and they and his students, friends and family will miss his penetrating clarity, his lively and wide-ranging intellect, his wry humour, and his passions for soccer, nature and classical music.

I thank Sara Hinkley and Allan Stewart-Oaten for their help in preparing this obituary.

Anthony Davison, ETH Zurich

Meeting report: Modern Applied Probability

Modern Applied Probability: a workshop in celebration of Sergey Foss's 65th birthday, was held May 15–17, 2019, at the International Center for Mathematical Sciences, at The Bayes Centre in Edinburgh, UK. Takis Konstantopoulos reports:

This workshop was organized by two former students (Denis Denisov, University of Manchester, and Seva Shneer, Heriot-Watt University) and a colleague (Burak Buke, University of Edinburgh) of Sergey Foss [*pictured left*]. Held over three days, it was full of interesting lectures, discussions and a collection of reminiscences from the past. It gave everyone an opportunity to discuss the achievements of Sergey in the area of applied probability and related fields, as well as exchange ideas and form new collaborations.

Talks were given by Venkat Anantharam, Søren Asmussen, François Baccelli, Onno Boxma, Mikhail Chebunin, Denis Denisov, István Gyöngy, Jennie Hansen, Takis Konstantopoulos, Dima Korshunov, Artem Kovalevskii, Günther Last, Nelly Litvak, Masakiyo Miyazawa, Ilya Molchanov, Thomas Mountford, Zbigniew Palmowski, Kavita Ramanan, Tomasz Rolski, Sasha Stolyar, Vitali Wachtel, Sergei Zuyev, and Bert Zwart (CWI). The workshop was also attended by a number of researchers and graduate students.

As usual, ICMS provided excellent facilities for the meeting. Situated in the top floor of the Bayes Centre and with a magnificent view of Arthur's Seat [*below*],

it inspired the participants [*right*] to further exchange thoughts, ideas, and even jokes, during the frequent coffee breaks.

Sergey's career started at Novosibirsk State University, where he finished his PhD in 1982 under the supervision of Boris Rogozin. The Novosibirsk school is known for the numerous contributions in theoretical and applied probability, including random walks, large deviations, asymptotic and limit theorems, and a variety of applications including queueing theory and communication systems. The Sobolev Institute of Mathematical Sciences, like the whole of Akademgorodok (a campus in the middle of Siberia, in the vicinity of its capital, Novosibirsk), was a very productive place for mathematicians from 1957 onwards, when it was established by Mikhail Lavrentyev and Sergey Khristianovich. Akademgorodok provided, during Soviet times, an almost idyllic place for scientists to do their work without the hustle and bustle of a big city or a for-profit organization. Hard times followed after the collapse of Soviet Union but, nowadays, there is a very positive trend in the university and, in particular, the Sobolev Institute. Sergey works hard to promote this trend. While he is a professor at Heriot-Watt University in Edinburgh, he

also holds a position in Novosibirsk and shares his time between the two.

In the late 1980s, Sergey established a firm relationship with French applied probabilists and computer scientists and spent considerable amount of time in INRIA, first in Sophia–Antipolis and later in Paris. He worked closely with François Baccelli, establishing, *inter alia*, conditions for stability of general stochastic queueing networks driven by stationary and ergodic inputs.

His contributions are numerous in the area of probability and its applications. To mention just a few: recurrence criteria for oscillating random walks, ergodicity conditions for multi-class and multi-server queues and queueing networks, renovation theory for stochastic recursive sequences (initially developed by Alexander Borovkov, the director of the Probability Section at Novosibirsk since 1962), coupling from the past (or perfect simulation), the saturation rule for stability of networks, state-dependent polling systems, the development of heavy tailed distribution theory (including an in-depth understanding of the "big single jump" principle), subexponentiality and local subexponentiality, stochastic ordered graphs and last passage percolation, and many others. He has co-authored

a few books, including his monograph, *"An Introduction to Heavy-Tailed and Subexponential Distributions"* jointly with Dima Korshunov and Stan Zachary.

Sergey has been an extremely energetic person. He has organized dozens of workshops and conferences, mostly in the UK and Russia. One of his major achievements was the co-organization of the semester-long program on "Stochastic Processes in Communication Sciences" at the Newton Institute for Mathematical Sciences, Cambridge, UK, during the first half of 2010. That event attracted a huge number of probabilists, mathematicians, applied probabilists, computer scientists and engineers from around the world and formed the basis of many collaborations.

As a mathematician, Sergey always enjoys understanding the basis of many complicated arguments, until they become "trivial". He is an intuitionist. Whenever and wherever he encounters the seed of an interesting probabilistic truth, he will tirelessly nurture it. At the same time, he has developed over the years a taste for applied research. Queueing theory (or what was known, during Soviet times, theory of mass service) played an important role throughout his career. But he has also been interested in communication networks, and, most recently, in energy systems.

The talks at ICMS event were, in a sense, a little window in Sergey's mathematical landscape and interests. This landscape consists of valleys, tall mountains, oceans of unfathomable depth, easy trails and impenetrable forests; in other words,

it is anything but boring, and always varied. We all enjoyed talks on unimodular random graphs, on reflected processes, on scale functions for Lévy-driven systems, on self-decomposability of point processes, on networks, on heavy-tails, on greedy server particle systems, on a new version of Itô's formula, on mean field approximations, on combinatorial probability, on applications on energy systems, on insurance control in Bayesian context, and others.

As a colleague, a collaborator and a friend of Sergey Foss, I wish him a happy birthday.

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Find details of the conference program at https://www.icms.org.uk/sergey65.php

Recent papers: *Probability and Mathematical Statistics*

Probability and Mathematical Statistics is an open-access, IMS-affiliated journal. The purpose of the journal is to publish original contributions to the theory of probability and mathematical statistics. It was founded in 1980 and its establishment was a result of the initiative of the Wrocław probability and statistics communities. Access papers at **http://www.math.uni.wroc.pl/~pms/publications.php**

Volume 39, No 1, January 2019

Anirban's Angle: Earth's temperature data

Anirban DasGupta takes a look at NASA's temperature data from the last 100 years:

The best scientists and the best human minds have been deliberately looking at extensive global and local temperature and climate data for the past several hundred years in search of an answer to one of mankind's most acute and climacteric questions: is Earth's climate and temperature profile slowly changing in a hostile and ominous direction for the continuity of our planet's well-being? The National Academies of the US have written several detailed reports and draft reports on it (2013, 2015, 2016, 2017). Most of us are aware of the debates; but have we all personally looked at real data and tried to understand what it says? My intention here today is to satiate a personal curiosity: if we take US government's global earth temperature data for the last fifty or hundred years, and pass them through a large battery of established statistical tests for stability, what do these tests show? Are the results mutually contradictory? Are they in fact more or less unanimous in their conclusions? Should I be seriously suspicious of the conclusions they reach? If so, why? I am writing this column as an observer and a reporter, and trying to not filter data through my personal lens or to interpret on behalf the reader.

The data used here is NASA's global average land-ocean temperature data for the 100-year period 1919–2018, available at giss.nasa.gov. The temperature data are reported with the 30-year period 1951–80 as the base, i.e., as deviations by year from the base period average, in the unit of 0.01ºC. Thus, a data value written as 12 means that the average land-ocean temperature of earth in that year was 0.12ºC above the average of the base period. The base period was chosen by NASA. In the sequel, I write t to denote the years, and x_t the average temperature in year t. Here are the most basic summary statistics: mean of the series is 15.17, the median is 7, the variance is 1019.92, and the correlation between t and x_t is 0.8966. It is quite interesting that temperature is so positively correlated with time as time moves forward. The 100 values of x_t are listed chronologically in the box [*right*] for transparency as well as ease of verification and further analysis, if the reader desires.

Deviations from the base period 1951–80 in units of 0.01ºC:

−26, −26, −18, −28, −25, −26, −21, −9, −20, −19, −34, −14, −9, −16, −29, −14, −20, −16, −4, −3, −3, 12, 18, 5, 7, 21, 9, −7, −4, −10, −11, −18, −7, 1, 7, −14, −14, −20, 4, 7, 3, −2, 6, 4, 7, −20, −10, −5, −2, −7, 7, 3, −9, 1, 16, −8, −2, −11, 17, 6, 16, 27, 33, 13, 31, 16, 12, 18, 33, 41, 29, 44, 41, 22, 24, 31, 44, 33, 47, 62, 39, 40, 53, 62, 60, 53, 67, 62, 64, 51, 63. 70, 58, 62, 65, 73, 87, 99, 90, 82.

The hypothesis tested by a battery of tests is that earth's average land-ocean temperature has been stable during the last 100 years. A rigorous statement is that the null hypothesis is that the sequence is iid from some distribution on the real line that has a density. Thus, no specific form of the density is assumed; we do not need to.

First, a time plot of the data; the *x*-axis represents the years chronologically, and the *y*-axis the corresponding temperatures (in hundredths of a degree).

Earth Ave. Temp. Data 1919–2018
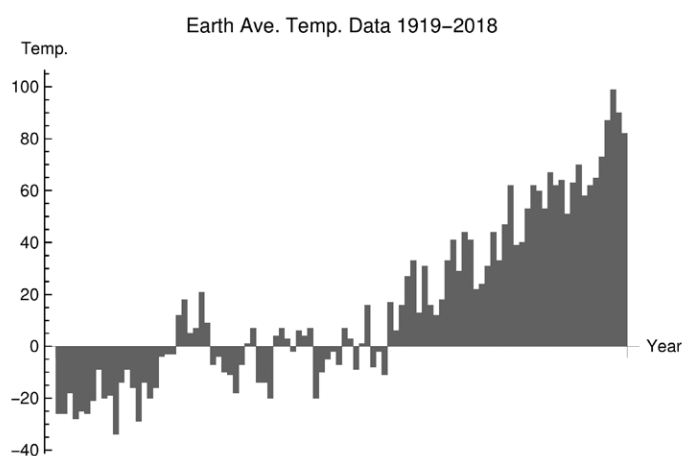
And a histogram of the temperatures:

Histogram of Earth's Ave. Temp. 1919–2018
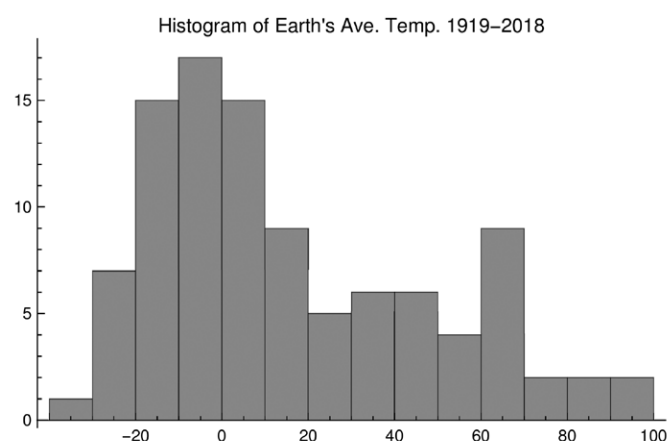
The histogram looks more like a bimodal mixture distribution than one homogeneous unimodal distribution.

And these are the tests that I conducted:

(a) Test based on $U = U_n$, the number of upper records in the data; here $n = 100$ is the size of the dataset.

(b) Test based on $L = L_n$, the number of lower records in the data.

(c) Test based on $R = R_n$, the number of plus-runs or minus-runs in the data (a plus-run being an uninterrupted string of data values larger than the median of the data set).

As climate change melts sea ice, the US Geological Survey projects that two-thirds of the polar bear population will disappear by 2050, caused by malnutrition or starvation due to habitat loss.

Andreas Weith/Wikimedia

(d) Bartel's rank test based on the statistic $M = \sum_{t=1}^{n-1} (r_{(t+1)} - r_t)^2$, where r_t is the rank of the data value x_t for year t among all the data. Thus, the minimum data value has rank one.

(e) Test based on the interarrival time lags D_r between successive upper records. For example, the 18th upper record was observed in 2015, and the 19th upper record was observed in 2016; and so, $D_{19} = 1$.

(f) A Kolmogorov–Smirnov test for equality of the temperature distribution in the first sixty years, 1919–78, and the last forty years, 1979–2018.

The tests in (a), (b), (c), (d), and (f) are based on the asymptotic distributions of the corresponding test statistics; these asymptotic distributions except in (f) are all normal and the asymptotic means and variances are known. Actually, even the exact means and variances are known for the record statistics U_n, L_n and the run statistic R_n. The asymptotic distribution of the Kolmogorov–Smirnov two sample statistic is classic through the Donsker invariance principle and the theory of Brownian bridges. For case (e), the exact distribution of the record interarrival time D_r is known as an explicit combinatorial sum obtained through equating coefficients in generating functions. (All of these are quite classic, but I provide references at the end.)

The table [*below*] shows the values of the test statistics and the associated two-sided *p*-values for each test based on the 100 data values.

For the record interarrivals test, the *p*-values for the interarrival times of the *r*th upper record for *r* = 2, 5, 8, 11, 14, 17, 19 are, respectively, 0.14, 0.03, 0.004, 0.0005, 6.1×10^{-5}, 3.0×10^{-5}, and 1.9×10^{-6}. We note that the interarrival times demonstrate much lower *p*-values for the recent upper records and conventional *p*-values for the early upper records. Traditionally, the credibility of a null hypothesis has been questioned when the *p*-value is small, 0.001 already regarded as small by many. I ask the readers to interpret these findings as they wish.

I can think of a number of possible objections raised against this report, e.g.,

1. *p*-values are not meaningful and they should not be computed.
2. We already know that the sequence is not iid, but perhaps stationary.
3. The data should have covered a shorter time period.
4. One should look at many NASA data sets, not just the average land-sea temperature data set.

References

Let me close with some references: Arnold, Balakrishnan and Nagaraja, 1998; Bickel and Doksum, 2015; DasGupta, 2011; Del Barrio, Deheuvels and van de Geer, 2007; Gibbons and Chakraborti, 1992; Haigh, 2013; Katzenbeisser, 1990; Nevzorov, 2000; Port, 1993; Renyi, 1962; Resnick, 1973; Shorack and Wellner, 2009; Shorrock, 1973; Strawderman and Holmes, 1970.

Post a comment on theBulletin website: http://bulletin.imstat.org

Statistic	Mean	Var	Obs. value	z	*p*-value
Upper records	5.19	3.56	19	7.32	2.48×10^{-13}
Lower records	5.19	3.56	2	−1.69	0.091
Median Runs	50.98	27.73	18	−6.63	3.36×10^{-11}
Bartel's Rank	166650	2.7356×10^8	15897	−9.095	9.57×10^{-20}
Kolmogorov-Smirnov			0.9167		3.08×10^{-18}

IMS meetings around the world
Joint Statistical Meetings: 2019–2023

IMS sponsored meeting
IMS Annual Meeting @ JSM 2019
July 27–August 1, 2019. Denver, CO, USA.
w http://ww2.amstat.org/meetings/jsm/2019/
We hope you'll join us in Denver for the 2019 IMS Annual Meeting, in conjunction with JSM. With more than 6,500 attendees (including over 1,000 students) from 52 countries, and over 600 sessions, it's a busy few days! The theme this year is *"Statistics: Making an Impact."*

Registration and housing are now open: book soon!

IMS sponsored meetings: JSM dates for 2020–2024

JSM 2020 **August 1–6, 2020** **Philadelphia, PA**	**IMS Annual Meeting @ JSM 2021** **August 7–12, 2021, Seattle, WA**	**2022 Joint Statistical Meetings** **August 6–11, 2022** **Washington DC**	**IMS Annual Meeting @ JSM 2023** **August 5–10, 2023** **Toronto, ON, Canada**	**JSM 2024** **August 3–8, 2024** **Portland, Oregon**

IMS sponsored meeting
Bernoulli/IMS 10th World Congress in Probability and Statistics [*see poster on following pages*]
August 17–21, 2020. Seoul, South Korea
w http://www.wc2020.org
Program chair: Siva Athreya; Local chair: Hee-Seok Oh. The 10th World Congress in Probability and Statistics (WC2020), jointly organized by the Bernoulli Society and IMS, will be hosted by Seoul National University. We are expecting to attract more than 900 experts from over 40 countries.

This upcoming World Congress will take a comprehensive look at the latest developments in statistics and probability as well as the current trends emerging from all associated fields. A special lecture series will document a variety of modern research topics with in-depth uses and applications of these disciplines as they relate to science, industrial innovation, and society as a whole.

As the largest city in South Korea, dynamic Seoul is a bewitching mix of ancient and modern structures, packaged in a surprisingly compact metropolis that has earned it the designation of a UNESCO City of Design. The nation's capital has a cutting-edge cityscape of glass, steel and futuristic skyscrapers, which tower over traditional wooden houses with tiled roofs and mazes of cobbled alleys in village-like districts. See poster on next pages.

IMS co-sponsored meeting
INDSTATS2019: "Innovations iN Data and Statistical Sciences"
December 26–30, 2019. Mumbai, India
w http://www.intindstat.org/IISA2019
The aim of INDSTATS2019 is to engage leading experts and junior members in all topics related to statistics and data sciences. The four and half days of vibrant conference activities will consist of pre-conference short courses (on Dec 26th), plenary talks by eminent speakers, invited sessions, contributed sessions, panel discussions and student paper competitions. Past IISA annual conferences in India and the US have attracted over 300 participants, across academia, industry, government, regulatory agencies and non-profit organizations. Specific topics include probability and statistics, survival analysis, personalized medicine, big data and machine learning methodology, econometrics, Bayesian statistics, clinical trial data and innovations, high-dimensional data analysis, etc.

At a glance:
forthcoming IMS Annual Meeting and JSM dates

2019
IMS Annual Meeting @ JSM: Denver, July 27–August 1, 2019

2020
JSM: Philadelphia, **August 1–6, 2020**

IMS Annual Meeting/ 10th World Congress: Seoul, South Korea, **August 17–21, 2020**

2021
IMS Annual Meeting @ JSM: Seattle, **August 7–12, 2021**

2022
IMS Annual Meeting: TBC

JSM: Washington, **August 6–11, 2022**

2023
IMS Annual Meeting @ JSM: Toronto, **August 5–10, 2023**

ENAR

IMS sponsored meeting
ENAR dates, 2020–2022
March 22–25, 2020: in Nashville, TN

w www.enar.org/meetings/future.cfm
The 2020 ENAR/IMS meeting will be
in Nashville (and the following year in
Baltimore, and then Houston in 2022).
Featuring a *Fostering Diversity in Biostatistics*
workshop, connecting underrepresented
minority students interested in biostatistics
with professional biostatisticians in aca-
demia, government and industry.

IMS sponsored meetings

ENAR/IMS 2021	ENAR/IMS 2022
March 14–17, 2021	**March 27–30, 2022**
Baltimore, MD	**Houston, TX**

IMS co-sponsored meeting   *UPDATED*
Statistics and the Life Sciences: Creating a Healthier World
November 15, 2019
Boston University School of Public Health

w https://www.bu.edu/sph/news-events/signature-programs/deans-symposia/statistics-and-the-life-sciences-creating-a-healthier-world/
We are globally connected like never before, in nearly all aspects of our lives. While this
fact has numerous implications, from the perspective of public health it leaves us uniquely
poised to potentially overcome major challenges that have to date been out of reach. These
include aging traits such as cognitive decline and Alzheimer's disease, pulmonary disease
such as COPD and asthma, and cardiovascular diseases. Significant progress on any and
all of these problems will be data intensive, with statistics a key element at the core. The
goal of this workshop is to stage the statistical challenges and progress towards solutions in
a handful of emerging and mission-critical areas of the health sciences with global impact.
Specifically, focus will be on the following three areas: digital health, machine learning in
causal inference, and networks for public health. Ultimately, the idea is to bring together
a gathering of representatives from statistics and related domain areas, in an agile and
interactive format, and use a web-based dissemination platform to bring broad visibility to
these topics.

Please register now, via the website above.

IMS co-sponsored meeting   *NEW*
Third International Conference on Mathematics and Statistics
February 6–9, 2020. American University of Sharjah, UAE

w https://www.aus.edu/conferences/the-third-international-conference-on-mathematics-and-statistics
The aim of the conference is to offer a forum for researchers and scientists working in the fields of pure mathematics, applied mathematics,
mathematics education and statistics to come together, discuss new research developments and network with one another. AUS-ICMS was
initiated by the Department of Mathematics and Statistics at the American University of Sharjah (AUS). AUS is one of the high caliber
young universities in the Arabian Gulf region. AUS-ICMS incarnates the spirit of research fostered by AUS. Previously held in 2010 and
2015, over 250 researchers from many different countries participated in the conferences. High quality theoretical and applied work was
presented at the conference through keynote lectures, special and contributed sessions. AUS-ICMS benefited from cooperating with the
American Mathematical Society (AMS).

The technical program of the third AUS-ICMS will include keynote lectures delivered by renowned mathematicians, special sessions
and contributed papers. Papers presented will be published in a book of abstracts and carefully selected and invited papers will be pub-
lished in special issues of internationally refereed journals yet to be determined. IMS Rep on Program Committee: Stephen Chan

IMS co-sponsored meeting
Design and Analysis of Experiments
October 17–19, 2019. Knoxville, TN

w https://haslam.utk.edu/dae2019
The purpose of the Design and Analysis of Experiments (DAE) conference series, of which this is the 10th, is to provide support and
encouragement to junior researchers in the field of design and analysis of experiments, and to stimulate interest in topics of practical rele-
vance to science and industry. The meetings also attract top-notch senior researchers, and emphasize interaction between them and junior
researchers. DAE 2019 will focus on emerging areas of research in experimental design, as well as novel innovations in traditional areas. A
feature of the DAE series is **pairing of senior and junior researchers** for mentoring purposes and DAE 2019 at UT will follow this tradi-
tion. There will be 10 invited sessions, each with three speakers, two poster sessions, and opportunities to lead or participate in roundtable
discussions as well. **Travel support** may be available for students and junior researchers who received their doctorate degrees after 2014.

BERNOULLI - IMS

10th WORLD CONGRESS in PROBABILITY and STATISTICS

www.wc2020.org

HOSTED BY   Seoul National University

ORGANIZED BY   Bernoulli Society
Institute of Mathematical Statistics

SUPPORTED BY   KOREA TOURISM ORGANIZATION   SEOUL METROPOLITAN GOVERNMENT

AUGUST 17-21, 2020

Seoul National University
Seoul, Korea

MARCH 31, 2020
Abstract Submission Deadline

APRIL 15, 2020
Abstract Acceptance Notifications

MAY 31, 2020
Early-bird Registration Deadline

WELCOME MESSAGE

Dear Colleagues and Friends,

On behalf of the local organizing committee, it is with great delight that we welcome you to Seoul National University in Seoul, South Korea for the 10th World Congress in Probability and Statistics (WC2020), jointly organized by the Bernoulli Society and IMS, from August 17 to 21, 2020. We are expecting to attract more than 900 experts from over 40 countries.

Held every four years, the congress is a worldwide event covering all branches of statistics and probability. This includes the latest scientific breakthroughs in theoretical, methodological, applied and computational statistics and probability, as well as stochastic processes.

We believe WC2020 will bring transformation and further advancement to the scientific level and quality of the study of statistics and probability.

As the largest city in South Korea, dynamic Seoul is a bewitching mix of ancient and modern structures, packaged in a surprisingly compact metropolis that has earned it the designation of a UNESCO City of Design.

We look forward to seeing you in Seoul, Korea.

Sincerely,

Hee-Seok Oh
Chair of the Local Organizing Committee
Department of Statistics, Seoul National University

SEOUL, KOREA

The Korean Peninsula extends about 1,000 km from the Asian continent into the Pacific Ocean with more than 3,000 islands dotting the coastline. Mountains cover almost 70 percent of the land mass, making the country one of the most mountainous regions in the world and offering abundant forest resources. Administratively, Korea consists of nine provinces with 77 small cities and 88 counties.

With a history stretching back more than two thousand years, Seoul is also a rising global star as one of the world's most wired cities, ranked first in technology readiness. In Seoul you will experience millennia of royal palaces and historic sites among a futuristic backdrop of some of the world's most innovative and daring architecture, such as the chicly designed Dior building or recently inaugurated Seoullo 7017.

MAIN SPEAKERS

Named Lectures

Kolmogorov Lecture
Persi Diaconis (Stanford University)

Bernoulli Lecture
Alison Etheridge (University of Oxford)

Levy Lecture
Massimiliano Gubinelli (University of Bonn)

Laplace Lecture
Tony Cai (University of Pennsylvania)

Tukey Lecture
Sara van de Geer (ETH Zurich)

Wald Lecture
Martin Barlow (University of British Columbia)

Blackwell Lecture
Gabor Lugosi (Pompeu Fabra University)

Doob Lecture
Nicolas Curien (Université Paris-Sud Orsay)

Schramm Lecture
Omer Angel (University of British Columbia)

IMS Medallion Lectures
Gerard Ben Arous (New York University)
Andrea Montanari (Stanford University)
Elchanan Mossel (MIT)
Laurent Saloff-Coste (Cornell University)
Daniela Witten (University of Washington)

Public Lecture
To be named

IMS Presidential Address
Susan Murphy (Harvard University)

Other meetings and events around the world

25th Pfizer/ASA/UConn Distinguished Statistician Colloquium: Arthur Dempster *NEW*
October 23, 2019
University of Connecticut, Storrs, CT, USA

w https://events.stat.uconn.edu/pfizer/

This year's speaker at the 25th Pfizer Distinguished Statistician Series will be Prof. Arthur P. Dempster from Harvard University [*see members' news on page 3*]. The colloquium will take place on October 23rd, 2019, in Storrs, CT. The interview will be conducted by Nan Laird (Harvard University), Ruobin Gong (Rutgers University), and Peng Ding (University of California, Berkeley).

The lecture and the interview are open to the public. The reception and banquet require registration. For inquiries about attending the event, please contact the chair of the local organizing committee, Haim Bar, at haim.bar@uconn.edu.

Announce your meeting!

Send the details to bulletin@imstat.org

4th IMA International Conference on Flood Risk *NEW*
September 12–13, 2019
Swansea, UK

w https://ima.org.uk/11325/4th-ima-international-conference-on-flood-risk/

As in the recent publication of the IPCC AR5 report, flood risks have been again highlighted as one of the most perceivable indicators when it comes to the understanding of climate change impact. Research on flood risk has never been ampler, yet we still witness the growing causalities of severe flooding around globe on a yearly basis. The stark resemblance of the consequences between the two catastrophic flooding events in both Japan and Indonesia 2018, exposes a bitter reality that there are still knowledge gaps where both the academia and the practitioners need to fill, with no exception for even the developed world.

Continuing from the successful series of previous IMA Conferences on Flood Risk, the IMA is planning its 4th international conference on this topic in 2019 to bring together engineers, mathematicians and statisticians working in the field. The conference intends to be used as a forum for participants to meet and exchange their views on important technical issues, new and emerging methods and technologies in assessing flood risks in a world that is being altered by the climate change and moving towards an uncertain future. The emphasis will be on new developments in mathematical modelling methods, statistical techniques in assessing flood risks, especially on quantification of flood risks with a non-stationary climate and modelling uncertainty. Methods and application of assimilating new data from cutting-edge new type of observations will be among the topics for discussion.

The conference will be of interest to flood defence practitioners; flood defence managers; statisticians, mathematicians, civil engineers. Invited Speakers Prof Michael Bruen, University College Dublin, Ireland Prof Guoqing Wang, Nanjing Hydraulic Research Institute, China Dr Judith Wolf , National Oceanography Centre, UK.

Registration is now open via https://my.ima.org.uk/

Fifth International Researchers, Statisticians and Young Statisticians Congress *NEW*
October 18–20, 2019
Kusadasi, Turkey

w https://www.irsysc2019.com/

Our aim is to bring together experts who are doing research in the field of Statistics during this two-day congress and to share our experiences in theoretical and practical fields with each other and with our students. In this context, the scientific committee of the congress is composed of scientists working in the sciences such as Statistics, Biostatistics, Industrial and Management Engineering, Econometrics, Actuarial and Data Mining, as well as experts in their fields. The language of the Congress is Turkish and English.

We look forward to meeting you in Kusadası, the beautiful resort of the Aegean.

Second IMA Conference on
Inverse Problems From Theory To Application
September 4–6, 2019
London, UK

w https://ima.org.uk/11329/2nd-ima-conference-on-inverse-problems-from-theory-to-application/

An inverse problem refers to a situation where the quantity of interest cannot be measured directly, but only through an action of a nontrivial operator of which it is a parameter. The corresponding operator, also called forward operator, stems from a physical application modelling. Prominent examples include: Radon and Fourier transforms for X-ray CT and MRI, respectively or partial differential equations e.g. EIT or DOT.

The prevalent characteristics of inverse problems is their ill-posedness i.e. lack of uniqueness and/or stability of the solution. This situation is aggravated by the physical limitations of the measurement acquisition such as noise or incompleteness of the measurements. Inverse problems are ubiquitous in applications from bio-medical, science and engineering to security screening and industrial process monitoring. The challenges span from the analysis to efficient numerical solution.

This conference will bring together mathematicians and statisticians, working on theoretical and numerical aspects of inverse problems, as well as engineers, physicists and other scientists, working on challenging inverse problem applications. We welcome industrial representatives, doctoral students, early career and established academics working in this field to attend.

Topic list:
• Imaging
• Inverse problems in partial differential equations (Memorial Lecture for Slava Kurylev)
• Model and data driven methods for inverse problems
• Optimization and statistical learning
• Statistical inverse problems

Invited Speakers: Julie Delon (MAP5, Paris Descartes University); Markus Haltmeier (University of Innsbruck); Mike Hobson (University of Cambridge); Matti Lassas (University of Helsinki); Gabriel Peyre (DMA, École Normale Supérieure); and Michael Unser (EPFL)

Registration is now open: see website above.

Induction Course for New Lecturers
in the Mathematical Sciences 2019
September 18–19, 2019
Cambridge, UK

w https://ima.org.uk/11361/induction-course-for-new-lecturers-in-the-mathematical-sciences-2019/

Through a community initiative supported by the Institute of Mathematics and its Applications, the Isaac Newton Institute for Mathematical Sciences and the Heads of Departments of Mathematics Sciences (HoDoMS) and endorsed by the Royal Statistical Society, the Operational Research Society and the London Mathematical Society, we are delighted to announce that in September 2019 the two-day Induction Course for lecturers new to teaching mathematics and statistics within Higher Education will once again take place.

The Induction Course for New Lecturers in the Mathematical Sciences has been designed by the mathematics community so that it is ideally suited for anyone who is new to or has limited experience teaching mathematics or statistics within UK higher education. It will be delivered by individuals with significant experience of teaching in the mathematical sciences and will focus upon the specific details and issues that arise in mathematics and statistics teaching and learning within higher education including topics such as:
• Lecturing.
• Supporting student learning.
• Making teaching interactive.
• Assessment, examinations and feedback.
• Linking teaching and research.
• Using technology to enhance teaching and learning.
• Using examples and mathematical problem solving.
Additionally, there will be significant opportunities for delegates to discuss their own ideas, challenges and experiences with the session facilitators so that individual queries can be answered.

In the past, attendance has been recognised as contributing towards some introductory institutional programmes in learning and teaching for new staff, and for the 2019 Induction Course certification will be provided through the Institute of Mathematics and its Applications relative to the UK Professional Standards Framework for Teaching and Supporting Learning in Higher Education.

More meetings around the world

International Symposium on Nonparametric Statistics 2020   *NEW*
June 15–19, 2020
Paphos, Cyprus

w http://cyprusconferences.org/isnps2020/

We are pleased to announce that the next International Symposium on Nonparametric Statistics (ISNPS) will be held in Paphos, Cyprus, from 15–19 June 2020. In the tradition of the successful ISNPS conferences in Chalkidiki (2012), Cadiz (2014), Avignon (2016) and Salerno (2018), this meeting will bring together new and established researchers to consider a broad range of topics from nonparametric and semiparametric statistics. The venue is the Azia Hotel & Spa, a five-star boutique Hotel situated in a quiet location on the coast, half an hour from Paphos international airport and 15 minutes from the town centre, shops and nightlife.

The conference will bring forth recent advances and trends in several areas of nonparametric statistics, in order to facilitate the exchange of research ideas, promote collaboration among researchers from all over the world, and contribute to the further development of the field. The program will include plenary talks, special invited talks, invited talks, contributed talks and posters on all areas of nonparametric statistics.

Meeting organizer's to-do list

To do
Set date
Sort venue
Book speakers
Advertise in IMS Bulletin!

Fourth Bangkok Workshop on Discrete Geometry, Dynamics and Statistics   *NEW*
January 6–10, 2020
Bangkok, Thailand

w http://thaihep.phys.sc.chula.ac.th/BKK2020DSCR/

The workshop will focus on mathematical physics of discrete systems, and in particular its applications to random geometries. Real-life motivations for such studies range from attempts to quantize gravity to problems in condensed matter physics to mathematical modelling of cooperative phenomena in macroscopic communities. Some concrete directions include:

1) Discrete random geometries with applications to gravity quantization,
2) Discrete mathematical models in equilibrium and and non-equilibrium statistical physics (the Ising model and its relatives, percolation, lattice gases, etc),
3) Random matrix and tensor models,
4) Random graphs and dynamics of complex networks,
5) Topics in lattice gauge theory (especially with emphasis on analytic approaches),
6) Conformal field theories (especially with connections to the above subjects),
7) Discrete dynamics (cellular automata, spin chains, etc).

The talks are expected to be informal and interactive, with a substantial pedagogical component.

There will be no registration fees for the upcoming workshop. Please fill the form on the meeting website in order to register. General inquiries may be directed to Oleg Evnin oleg.evnin@gmail.com.

2nd International Conference on Applied Statistics (ICAS) 2019
December 27–29, 2019   *NEW*
Dhaka, Bangladesh

w https://www.isrt.ac.bd/icas2019

The Second International Conference on Applied Statistics (ICAS) 2019 will be held during December 27-29, 2019 at the Senate Building, University of Dhaka, Bangladesh. The conference is going to be organized by the Institute of Statistical of Research and Training (ISRT), University of Dhaka, Bangladesh. The theme of the conference is *Emerging Challenges in a Data-Centric World*.

Deadline for submission of abstracts is October 15, 2019 and for registration is December 20, 2019.

For information contact: conference@isrt.ac.bd.

Employment Opportunities around the world

Hong Kong

The Chinese University of Hong Kong

Research Assistant Professors

https://jobs.imstat.org/job//48591714

Macau

Department of Mathematics, University of Macau (UM)

Assistant/Associate Professorship in Statistics

https://jobs.imstat.org/job//49213132

Switzerland: Lausanne

EPFL

Professorship In Statistics

https://jobs.imstat.org/job//47120981

United States: San Diego, CA

University of California, San Diego

HDSI - Assistant Professor: Data Science - Multiple Areas

https://jobs.imstat.org/job//48817674

United States: Storrs, CT

University of Connecticut

Assistant Professor in Residence, Department of Statistics

https://jobs.imstat.org/job//48617896

United States: Washington, DC

National Institute of Statistical Sciences (NISS)

Research Associate

https://jobs.imstat.org/job//49318440

United States: University Park, PA

Penn State University

Tenure Track Faculty Positions

https://jobs.imstat.org/job//49212272

United States: College Station, TX

Texas A&M University, Department of Statistics

Head of Statistics

https://jobs.imstat.org/job//49318621

香 港 中 文 大 學
The Chinese University of Hong Kong

Applications are invited for:-

Department of Statistics

Research Assistant Professors

(Ref. 1900010T)

Applications are invited for the post of Research Assistant Professors in the Department of Statistics.

Applicants should have (i) a PhD degree in in statistics or a related field; and (ii) high-quality research outputs in all areas of statistics. The appointees will (a) participate in independent and joint research programmes; (b) apply for external research grants; (c) teach course(s) at undergraduate and/or postgraduate levels; and (d) provide service at departmental, faculty and/or university levels.

Appointments will initially be made on contract basis for up to three years commencing as soon as possible, renewable subject to performance and mutual agreement. Applications will be considered on a continuing basis until the posts are filled.

Applicants please upload a cover letter, a full curriculum vitae, a statement of research interests, copies of up to five recent publications, as well as the names and e-mail addresses of at least three referees to whom the applicants' consent has been given for their providing references, by January 15, 2020.

Application Procedure

The University only accepts and considers applications submitted online for the posts above. For more information and to apply online, please visit http://career.cuhk.edu.hk.

International Calendar of Statistical Events

IMS meetings are highlighted in maroon with the *ims* logo, and new or updated entries have the *NEW* or *UPDATED* symbol. Please submit your meeting details and any corrections to Elyse Gustafson: **erg@imstat.org**

August 2019

ims July 27–August 1: Denver, CO, USA. **IMS Annual Meeting at JSM 2019 w** https://ww2.amstat.org/meetings/jsm/2019/

August 17–19: St. Louis, USA. **4th Workshop on Higher-Order Asymptotics and Post-Selection Inference (WHOA-PSI) w** https://www.math.wustl.edu/~kuffner/WHOA-PSI-4.html

August 18–23: Kuala Lumpur, Malaysia. **ISI2019: 62nd International Statistical Institute World Statistics Congress 2019 w** http://www.isi2019.org/

September 2019

NEW September 4–6: London, UK. **2nd IMA Conference on Inverse Problems From Theory To Application w** https://ima.org.uk/11329/2nd-ima-conference-on-inverse-problems-from-theory-to-application/

NEW September 12–13: Swansea, UK. **4th IMA International Conference on Flood Risk w** https://ima.org.uk/11325/4th-ima-international-conference-on-flood-risk/

NEW September 18–19: Cambridge, UK. **Induction Course for New Lecturers in the Mathematical Sciences 2019 w** https://ima.org.uk/11361/induction-course-for-new-lecturers-in-the-mathematical-sciences-2019/

September 20–21: Ann Arbor, MI, USA. **U-M Statistics: 50th Anniversary Symposium w** https://sites.lsa.umich.edu/stats-50th-anniversary/

September 22–26: Hannover, Germany. **29th European Safety and Reliability Conference (ESREL 2019) w** https://esrel2019.org/

September 23–25: Washington DC. **ASA Biopharmaceutical Section: Regulatory-Industry Statistics Workshop w** https://ww2.amstat.org/meetings/biop/2019/

October 2019

October 3–5: Bellevue, WA, USA. **2019 Women in Statistics and Data Science Conference w** https://ww2.amstat.org/meetings/wsds/2019

October 10–12: Grand Rapids, USA. **3rd International Conference on Statistical Distributions and Applications (ICOSDA 2019) w** http://people.cst.cmich.edu/lee1c/icosda2019/

ims October 17–19: Knoxville, TN, USA. **Design and Analysis of Experiments w** https://haslam.utk.edu/dae2019

NEW October 18–20: Kusadasi, Turkey. **5th International Researchers, Statisticians and Young Statisticians Congress w** https://www.irsysc2019.com/

NEW October 23: Storrs, CT, USA. **25th Pfizer/ASA/UConn Distinguished Statistician Colloquium: Arthur Dempster w** https://events.stat.uconn.edu/pfizer/

November 2019

NEW November 4–5: Boston, MA, USA. **Quantitative Challenges in Cancer Immunology and Immunotherapy w** https://www.hsph.harvard.edu/2019-pqg-conference/

ims November 15: Boston, MA, USA. **Statistics and the Life Sciences: Creating a Healthier World w** https://www.bu.edu/sph/news-events/signature-programs/deans-symposia/statistics-and-the-life-sciences-creating-a-healthier-world/

December 2019

ims December 2–6: Mérida, México. **XV CLAPEM: Latin American Congress of Probability and Mathematical Statistics** **w** http://clapem2019.eventos.cimat.mx/

ims December 26–30: Mumbai, India. **IISA conference, INDSTATS2019: "Innovations in Data and Statistical Sciences"** **w** http://www.intindstat.org/IISA2019

NEW December 27–29: Dhaka, Bangladesh. **2nd International Conference on Applied Statistics (ICAS) 2019** **w** https://www.isrt.ac.bd/icas2019

January 2020

January 6–8: San Diego, CA, USA. **International Conference on Health Policy Statistics (ICHPS) w** http://ww2.amstat.org/meetings/ices/2020/index.cfm

NEW January 6–10: Bangkok, Thailand. **4th Bangkok Workshop on Discrete Geometry, Dynamics and Statistics** **w** http://thaihep.phys.sc.chula.ac.th/BKK2020DSCR/

February 2020

NEW *ims* February 6–9: American University of Sharjah, UAE. **Third International Conference on Mathematics and Statistics** **w** https://www.aus.edu/conferences/the-third-international-conference-on-mathematics-and-statistics

February 20–22: Sacramento, CA, USA. **Conference on Statistical Practice 2020 w** https://ww2.amstat.org/meetings/csp/2020/

March 2020

ims March 22–25: Nashville, TN, USA. **ENAR Spring Meeting** **w** http://www.enar.org/meetings/future.cfm

June 2020

June 15–18: New Orleans, LA, USA. **Sixth International Conference on Establishment Statistics (ICES-VI)** **w** http://ww2.amstat.org/meetings/ices/2020/

NEW June 15–19: Paphos, Cyprus. **International Symposium on Nonparametric Statistics 2020 w** http://cyprusconferences.org/isnps2020/

NEW *ims* June 21–24 [tentative]: Anchorage, Alaska, USA. **2020 WNAR/IMS/JR (Japanese Region) meeting w** http://wnar.org/page-18098

June 22–26: Sydney, Australia. **International Statistical Ecology Conference (ISEC2020) w** http://www.isec2020.org/

June 24–27: Brno, Czech Republic. **Fifth International Workshop on Functional and Operatorial Statistics (IWFOS 2020)** **w** https://iwfos2020.sci.muni.cz/

June 29–July 3: Nový Smokovec, Slovakia. **LinStat 2020** **w** https://linstat2020.science.upjs.sk/

July 2020

July 5–11: Portoroz, Slovenia. **8th European Congress of Mathematics. w** http://www.8ecm.si/

July 6–10: Gold Coast, QLD, Australia. **2020 Australian and New Zealand Statistical Conference (ANZSC 2020) w** https://anzsc2020.com.au

July 6–10: Seoul, South Korea. **30th International Biometric Conference (IBC2020) w** https://www.biometricsociety.org/2018/07/ibc-2020-seoul-preview/

International Calendar *continued*

August 2020

August 1–6: Philadelphia, PA, USA. **JSM 2020 w** http://www.amstat.org/ASA/Meetings/Joint-Statistical-Meetings.aspx

August 17–21: Seoul, Korea. **Bernoulli/IMS World Congress in Probability and Statistics w [NEW]** http://www.wc2020.org

March 2021

March 14–17: Baltimore, MD, USA. **ENAR Spring Meeting w** http://www.enar.org/meetings/future.cfm

August 2021

August 7–12: Seattle, WA, USA. **IMS Annual Meeting at JSM 2021 w** http://www.amstat.org/ASA/Meetings/Joint-Statistical-Meetings.aspx

March 2022

March 27–30: Houston, TX, USA. **ENAR Spring Meeting w** http://www.enar.org/meetings/future.cfm

July 2022

July/August: Location TBC. **IMS Annual Meeting w** TBC

July 10–15: Riga, Latvia. **XXXI International Biometric Conference (IBC 2022) w** https://www.biometricsociety.org/meetings-events/ibcs/

August 2022

August 6–11: Washington DC, USA. **JSM 2022 w** http://www.amstat.org/ASA/Meetings/Joint-Statistical-Meetings.aspx

August 2023

August 5–10: Toronto, ON, Canada. **IMS Annual Meeting at JSM 2023 w** http://www.amstat.org/ASA/Meetings/Joint-Statistical-Meetings.aspx

August 2024

August 3–8: Portland, OR, USA. **JSM 2024 w** http://www.amstat.org/ASA/Meetings/Joint-Statistical-Meetings.aspx

August 2025

August 2–7: Nashville, TN, USA. **IMS Annual Meeting at JSM 2025 w** http://www.amstat.org/ASA/Meetings/Joint-Statistical-Meetings.aspx

Are we missing something? If you know of any statistics or probability meetings which aren't listed here, please let us know.
You can email the details to Elyse Gustafson at erg@imstat.org, or you can submit the details yourself at https://www.imstat.org/ims-meeting-form/
We'll list them here in the Bulletin, and on the IMS website too, at imstat.org/meetings-calendar/

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3:	April/May	**March 15**	April 1	April 15
4:	June/July	**May 1**	May 15	June 1
5:	August	**July 1**	July 15	August 1
6:	September	**August 15**	September 1	September 15
7:	Oct/Nov	**September 15**	October 1	October 15
8:	December	**November 1**	November 15	December 1

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Articles

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