Volume 48 • Issue 7

IMS Bulletin

October/November 2019

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Read it online: imstat.org/news

Bulletin news now on IMS site

Regular readers of the *IMS Bulletin* probably know that, as well as reading the news items and articles that we publish here in print, you can also access them online via the *Bulletin*'s website. Each issue is available as a PDF to download, and we also post news, columns and articles online. (Jobs and meetings are listed on the main IMS website). Since 2011, the Bulletin website has been located at http://bulletin.imstat.org.

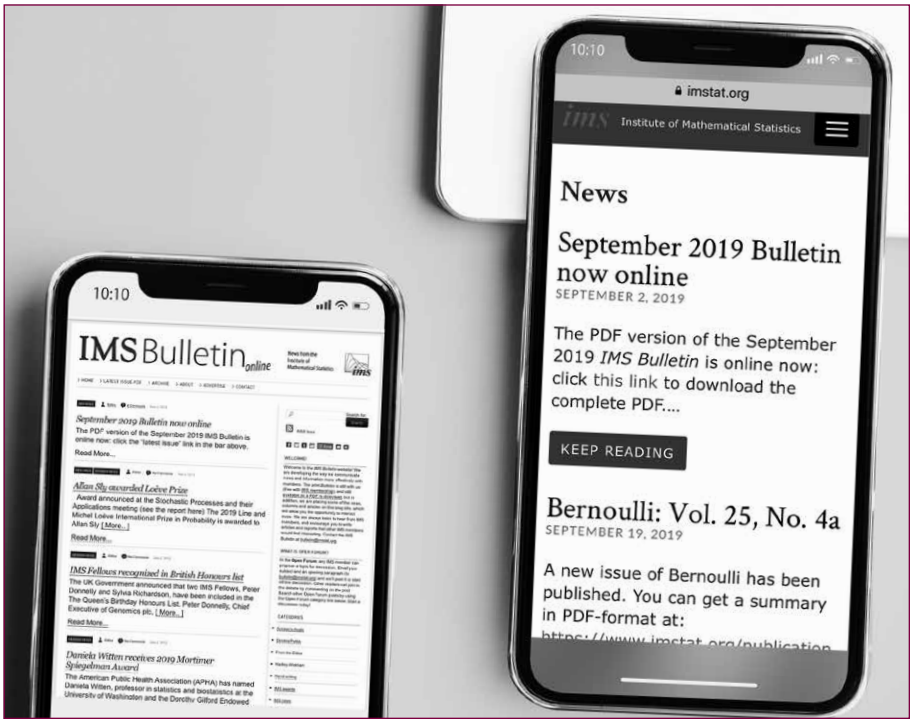
Given the fact that increasing numbers of people are browsing the internet on smartphones and tablets, and the old *Bulletin* website was best viewed on a desktop computer, we have now moved all the articles, as well as the *Bulletin* PDF archives, over to the main IMS site, where you can find them under the News tab at the top of each page: https://www.imstat.org/news/

If you're looking for an older story, search the archives at https://www.imstat.org/ims-bulletin-archive/

Of course, you can also find news on our social media channels: on Facebook (https://www.facebook.com/IMSTATI/) and Twitter (https://twitter.com/InstMathStat).

We love to hear from you, so if you have any news to share—your own or someone else's—or you have an idea for an article, please get in touch to discuss this. We also want to hear the sad news of the passing of members of our community, so again, please get in touch if you hear that a member or fellow has passed away. Email your news to Tati Howell: bulletin@imstat.org.

The new version (right) is easier to read on small screens than the old one (below left)



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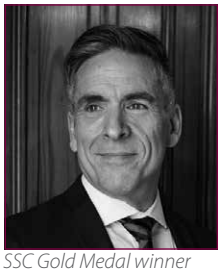
IMS Members' News

Statistical Society of Canada awards



SSC Gold Medal winner Bruno Rémillard

The Statistical Society of Canada (SSC) awarded several of its awards this year to IMS members.

The **SSC Gold Medalist 2019** is Bruno N. Rémillard, HEC Montreal. This prestigious award is bestowed upon a person who has made outstanding contributions to statistics, or to probability, either to mathematical developments or in applied work. It is intended to honour current leaders in their field. His award citation was "*for his broad and influential contributions to probability theory, statistics, and financial engineering, for his excellence in training and mentoring, for his academic leadership, and for his dedication to the profession.*"

The **CRM-SSC Prize in Statistics** is awarded annually by the Centre de recherches mathématiques (Montreal) and the SSC, to recognize a statistical scientist's professional accomplishments in research during the first fifteen years after earning a doctorate. This year's winner is Johanna Nešlehová, McGill University.

The **Pierre Robillard Award** is awarded annually by the SSC to recognize the best PhD thesis in probability or statistics defended at a Canadian university during the previous year. This year's winner is Peijun Sang, Simon Fraser University (advisor: Jiguo Cao) for his thesis, entitled "New Methods and Models in Functional Data Analysis".

The ***Canadian Journal of Statistics* Award** is awarded to the authors, in recognition of the outstanding quality of their paper's methodological innovation and presentation. This year's winners are Reihaneh Entezari (Bosch Center for Artificial Intelligence), Radu Craiu (University of Toronto) and Jeffrey Rosenthal (University of Toronto) for their paper "Likelihood inflating sampling algorithm", which appeared in volume 46, number 1, 2018.

Adam Kashlak, University of Alberta, received the SSC's **New Investigator Presentation Award** for his paper on "Symmetrization for exact nonparametric functional ANOVA."

A complete list of award winners is at https://ssc.ca/en/awards

Mathias Drton wins Ethel Newbold Prize

The 2019 Ethel Newbold Prize is awarded to Mathias Drton (U Washington, TU Munich). The prize is awarded every two years to an outstanding statistical scientist in early or mid-career for a body of work that represents excellence in research in mathematical statistics, and/or excellence in research that links developments in a substantive field to new advances in statistics.

Bernoulli Society New Researcher Awards

The Bernoulli Society's 2018–19 New Researcher Awards were awarded to Po-Ling Loh, University of Wisconsin–Madison; Gongjun Xu, University of Michigan; and Lingzhou Xue, Penn State University. Among the Honorable Mentions was Quentin Berthet, University of Cambridge, UK.

IMS signs multi-society letter on foreign influence

Sixty science, engineering and education organizations—including IMS, the ASA, SIAM, WNAR and the American Mathematical Society—which collectively represent hundreds of thousands of scientists, engineers and educators around the world, have co-signed a letter asking U.S. agencies to balance national security concerns with impacts on scientific enterprise: https://www.imstat.org/2019/09/04/multisociety-letter-on-foreign-influence/

Meeting News

ISI World Statistics Congress

New IMS President Susan Murphy was interviewed at the International Statistical Institute's 62nd World Statistics Congress, which was held in Kuala Lumpur in August. You can watch her talking with Anne Edwards in the WebTV section of the ISI2019 website, at https://www.isi2019.org/isi-wsc-2019-webtv/ Also interviewed were the Presidents—all women—of the other four international statistical societies that created the International Prize in Statistics: Karen Kafadar of the American Statistical Association (ASA), Louise Ryan of the International Biometric Society (IBS), Helen MacGillivray of the International Statistical Institute (ISI), and Deborah Ashby of the Royal Statistical Society (RSS). Several other leading statisticians were also interviewed; see the same webpage for the videos.

At the congress, the second **International Prize in Statistics** was presented to the winner, Bradley Efron, professor of statistics and biomedical data science at Stanford University. He received the prize in recognition of the "bootstrap," a method he developed in 1977 for assessing the uncertainty of scientific results that has had extraordinary impact across many scientific fields. Brad Efron participated in the award ceremony through a video message; ISI President Helen MacGillivray received the prize certificate on his behalf. Brad also gave his prize-winner's lecture via a video linkup. The lecture, "Prediction, estimation, and attribution," examined the changing scientific needs and computational limitations that have fashioned classical statistical methodology. According to his abstract: "Large-scale prediction algorithms—neural nets, deep learning, boosting, support vector machines, random forests—have achieved star status in the popular press. They are recognizable as heirs to the regression tradition, but ones carried out at enormous scale and on titanic data sets. How do these algorithms compare with standard regression techniques such as Ordinary Least Squares or logistic regression? Several key discrepancies will be examined, centering on the difference between prediction and estimation or attribution (significance testing)."

The other activities of the World Congress are detailed in the report by the organizers, at https://www.isi-web.org/images/WSC/2019/Report-62nd-ISI-WSC-2019.pdf

International Prize in Statistics winner Bradley Efron gave his lecture by live video link

= access published papers online

IMS Journals and Publications

Annals of Statistics: Ming Yuan, Richard Samworth
http://imstat.org/aos
http://projecteuclid.org/aos

Annals of Applied Statistics: Karen Kafadar
http://imstat.org/aoas
http://projecteuclid.org/aoas

Annals of Probability: Amir Dembo
http://imstat.org/aop
http://projecteuclid.org/aop

Annals of Applied Probability: Francois Delarue, Peter Friz
http://imstat.org/aap
http://projecteuclid.org/aoap

Statistical Science: Cun-Hui Zhang
http://imstat.org/sts
http://projecteuclid.org/ss

IMS Collections
http://projecteuclid.org/imsc

IMS Monographs and *IMS Textbooks:* Nancy Reid
https://www.imstat.org/journals-and-publications/ims-monographs/

IMS Co-sponsored Journals and Publications

Electronic Journal of Statistics: Domenico Marinucci
http://imstat.org/ejs
http://projecteuclid.org/ejs

Electronic Journal of Probability: Andreas Kyprianou
https://projecteuclid.org/euclid.ejp

Electronic Communications in Probability: Giambattista Giacomin
https://projecteuclid.org/euclid.ecp

Journal of Computational and Graphical Statistics: Tyler McCormick
http://www.amstat.org/publications/jcgs
log into members' area at imstat.org

Statistics Surveys: David Banks
http://imstat.org/ss
http://projecteuclid.org/ssu

Probability Surveys: Ben Hambly
http://imstat.org/ps
http://www.i-journals.org/ps/

IMS-Supported Journals

ALEA: Latin American Journal of Probability and Statistics: Roberto Imbuzeiro Oliveira
http://alea.impa.br/english

Annales de l'Institut Henri Poincaré (B): Gregory Miermont, Christophe Sabot
http://imstat.org/aihp
http://projecteuclid.org/aihp

Bayesian Analysis: Michele Guindani
https://projecteuclid.org/euclid.ba

Bernoulli: Mark Podolskij, Markus Reiß
http://www.bernoulli-society.org/
http://projecteuclid.org/bj

Brazilian Journal of Probability and Statistics: Enrico Colosimo
http://imstat.org/bjps
http://projecteuclid.org/bjps

IMS-Affiliated Journals

Observational Studies: Dylan Small
https://obsstudies.org/

Probability and Mathematical Statistics: K. Bogdan, M. Musiela, J. Rosiński, W. Szczotka, & W.A. Woyczyński
http://www.math.uni.wroc.pl/~pms

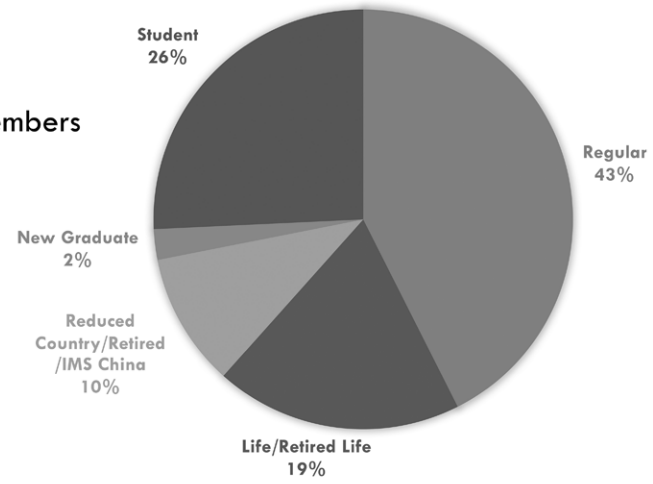
Stochastic Systems: Shane Henderson
https://pubsonline.informs.org/journal/stsy

IMS Members: Who are we?

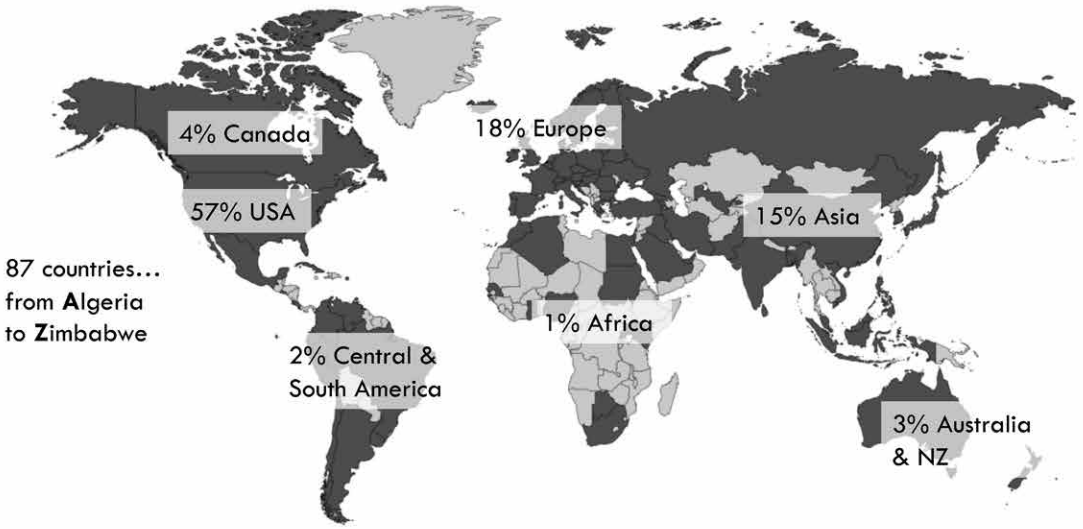
IMS: SNAPSHOT OF MEMBERSHIP

In 2018 we had:

1,369 **Regular** members, plus
613 **Life** members, including **Retired Life** members
331 **Reduced Country, Retired** and **IMS China** members
76 **New Graduates** (first and second year post-PhD)
828 **Student** members



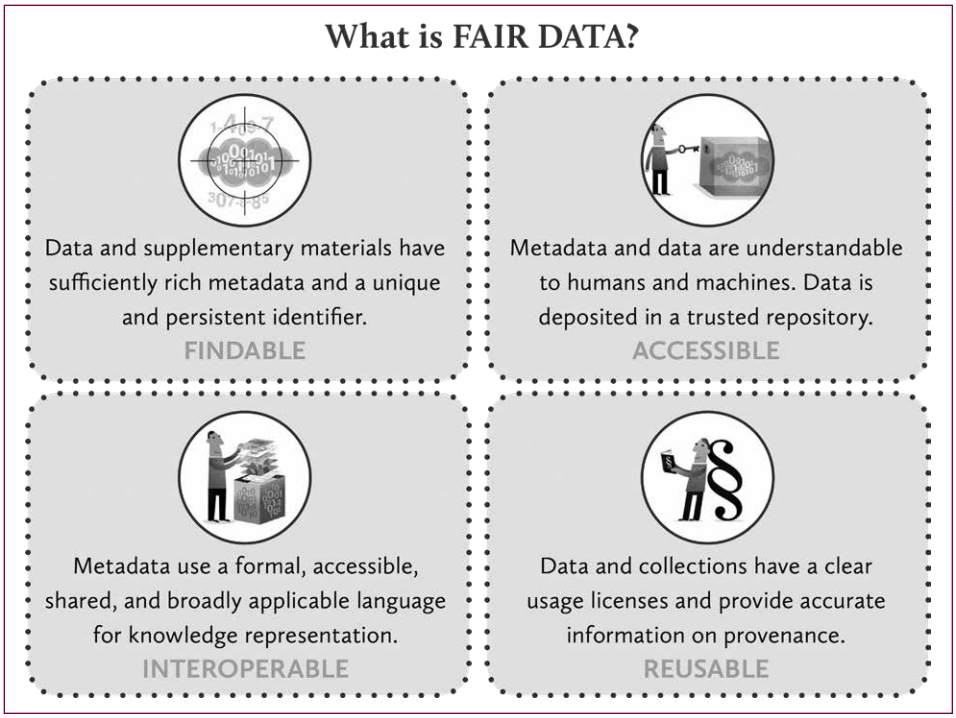
IMS: WHERE ARE WE FROM?



Keeping our research FAIR

The International Council for Industrial and Applied Mathematics (ICIAM) is a worldwide organisation for professional applied mathematics societies—including IMS—and for other societies with a significant interest in industrial or applied mathematics. At the ICIAM Congress in Valencia in July, discussions took place at the meeting of presidents and the ICIAM Board about the new FAIR (**findable, accessible, interoperable** and **reusable**) principles concerning research data that could affect the practices of our communities in a significant way in the near future. Volker Mehrmann, TU Berlin's Institut für Mathematik, who is president of the European Mathematical Society and an Officer of ICIAM, writes:

In many European countries, notably in Germany, there is a strong movement that all research data should be freely available according to the FAIR principles (**findable, accessible, interoperable** and **reusable**). See the LIBER (Association of European Research Libraries) document: https://libereurope.eu/wp-content/uploads/2017/12/LIBER-FAIR-Data.pdf



LIBER (Association of European Research Libraries)

In principle, FAIR is a laudable goal that will improve the openness of science. Of course, this is a major challenge for scientists who produce massive data, e.g. from numerical simulations, or physical experiments. In addition, the ways in which data and standards are defined also poses some serious challenges for mathematical research as a whole, by including non-traditional forms of "data", such as mathematical formulas and theorems.

How, and in which formats, can we standardize the way to find mathematical formulas or mathematical theorems, when different communities use different terminology for the same objects—and the same formulas for different objects?

The German Research Foundation, DFG, has recently issued a **large call for building research data infrastructure** to deal with this, see e.g. https://www.dfg.de/en/service/press/press_releases/2018/press_release_no_58/index.html

Most people in the mathematical community seem to ignore these developments, but this may lead to **real threats for the community if we do not join the movement right from the beginning**. Examples of such threats could be that standards will be fixed that are incompatible with our current way to produce mathematical articles (in LaTeX) and PDF, or that the way formulas are stored is just graphically. Another problem may be that standards are created for model generation, mathematical software, or simulation data that are cumbersome or impractical. It is clear that commercial code providers are heavily lobbying governments to make standards that are good for *them,* and that IT companies and data analytics people have their own views of how data should be addressed.

The mathematical community must unite in a common quest to be on board right away in the developments. (The German math community has already decided to do this.) We must make these principles realistic for mathematics and the neighbouring sciences, and preserve and improve established publishing standards so as to be able to deal with future developments. This may also require the construction of new and uniform concepts, such as semantic annotation of formulas or theorems.

Nominations open for these awards

Emanuel and Carol Parzen Prize for Statistical Innovation

In order to promote the dissemination of statistical innovation, the Emanuel and Carol Parzen Prize for Statistical Innovation is awarded in even-numbered years to a North American statistician whose outstanding research contributions include innovations that have had impact on practice, and whose PhD degree is at least 25 years old.

The Parzen Prize is awarded by the Department of Statistics at Texas A&M University and is selected by the members of the Parzen Prize Committee (consisting of four internal faculty members and one external member). The prize consists of an honorarium of $1000 and travel to College Station, TX, to present a lecture at the Prize Ceremony.

Nominations for the 2020 Parzen Prize should include a letter describing the nominee's outstanding contributions to high impact innovative research in statistics, a current curriculum vita, and two supporting letters. Nominations should be submitted by February 29, 2020 to Thomas Wehrly, the Chair of the 2020 Parzen Prize Committee, via e-mail to twehrly@stat.tamu.edu or to:

Professor Thomas Wehrly
Department of Statistics
Texas A&M University
TAMU 3143
College Station Texas 77843-3143.

Nominate for an IMU Award, Prize or Special Lecture at ICM2022

The International Mathematical Union grants prestigious prizes for mathematical achievement, which are awarded every four years at the Opening Ceremony of the International Congress of Mathematicians (ICM). The next ICM will be held in St Petersburg, Russia, July 6–14, 2022 (https://icm2022.org/). You can nominate an outstanding researcher for one of these prizes:

Fields Medal - recognizes outstanding mathematical achievement; it was first awarded in 1936.

Abacus Medal - honors distinguished achievements in mathematical aspects of information science, it will be awarded for the first time in 2022 (replacing the Rolf Nevanlinna Prize, which has been awarded since 1982).

Carl Friedrich Gauss Prize - awarded for outstanding mathematical contributions that have found significant applications outside of mathematics; it was first awarded in 2006.

Chern Medal Award - awarded to an individual whose accomplishments warrant the highest level of recognition for outstanding achievements in the field of mathematics; it was awarded for the first time in 2010.

Leelavati Prize - recognizes outstanding public outreach work for mathematics. The IMU has awarded this Prize since 2010, and since 2014 it has been sponsored by Infosys.

ICM Emmy Noether Lecture - honors women who have made fundamental and sustained contributions to the mathematical sciences; it was presented for the first time in 1994.

Nominations: To propose a person for one of the above IMU prizes, please send your nomination to the chair of the committee in charge of the selection of the winner(s). The Prize Committee Chairs 2022 are listed at https://www.mathunion.org/imu-awards/imu-awards-prizes-and-special-lecture. Electronic nominations are encouraged. Please observe the specific Statutes for each prize (see the prizes' webpages) before submitting a nomination and, in particular, explain the specific qualifications that make your nominee an excellent candidate for the prize you propose him/her for. Self-nominations are strongly discouraged.

CRM-Fields-PIMS Prize

The CRM-Fields-PIMS prize is the premier Canadian award for research achievements in the mathematical sciences. It is awarded jointly by the three Canadian mathematics institutes: Montreal's Centre de recherches mathématiques (CRM), Toronto's Fields Institute and Vancouver's Pacific Institute for the Mathematical Sciences (PIMS). The winner receives a monetary award and an invitation to present a lecture at each institute within one year after the award is announced. Nominations are invited for the CRM-Fields-PIMS prize, awarded in recognition of exceptional research achievement in the mathematical sciences. The candidate's research should have been conducted primarily in Canada or in affiliation with a Canadian university. As part of our commitment to equality, we particularly encourage nominations of women and of members of underrepresented groups.

Nomination instructions are at http://www.fields.utoronto.ca/honours-and-fellowships/crm-fields-pims-prize

Deadline: November 1, 2019.

Three COPSS awards, to be presented next year at JSM in Philadelphia

Please visit https://community.amstat.org/copss/home for details of eligibility and nomination requirements for all three of these awards. Please send nominations, preferably by email in PDF format, to the committee chairs. The deadline for nominations for all three awards is December 15, 2019.

The **Presidents' Award** is presented annually to a young member of one of the participating societies of COPSS in recognition of outstanding contributions to the statistics profession. It is typically granted to an individual who either (i) has not yet reached his or her 41st birthday during the calendar year of the award or (ii) will be under age 46 throughout the award calendar year and will have received a terminal statistically-related degree no more than 12 years prior to that year (see COPSS website for more details on eligibility criteria).

The **Fisher Award and Lectureship**, awarded annually, was established in 1963 by COPSS to honor the outstanding contributions of the late Sir Ronald Aylmer Fisher, and those of a current statistician, on aspects of statistics and probability that closely relate to the scientific collection and interpretation of data. The award exists to recognize the importance of statistical methods for scientific investigations.

The **Elizabeth L. Scott Award and Lectureship** is presented biennially (even-numbered years) to an individual, male or female, who has helped foster opportunities in statistics for women. The 2020 award winner will deliver the first E.L. Scott Lecture at the JSM in Philadelphia.

Breiman Senior Scholar and Junior Scholar Award Nominations

The Breiman Award Committee of the ASA Statistical Learning and Data Science (SLDS) Section, chaired by Professor David Madigan, invites nominations for the **senior and junior awards in honor of Professor Leo Breiman** (1928-2005). Breiman's work helped to bridge the gap between statistics and computer science, particularly in the field of machine learning. His most important contributions were his work on classification and regression trees, ensemble estimators, and random forests.

The Breiman Award Committee selects the Breiman senior scholar and junior scholar based on outstanding theoretical or methodological contributions to machine learning and/or computational statistics, contributions which have made a substantial, sustained impact on the subject and on practical applications. Nominations are accepted in odd-numbered years.

The award includes a monetary prize, a plaque, and an invited lecture at JSM two years later.

The Breiman junior scholar must have received a doctoral degree no earlier than 2007, and been a SLDS section member at least for two years, as of December 15, 2019.

Nominations are due by December 15, 2019. A nomination packet including a nominating letter, up to three supporting letters (the nominator may also write one of the supporting letters), and curriculum vitae of the nominee should be sent to:

Breiman Award Committee Chair
David Madigan, Professor of Statistics
Columbia University
david.madigan@columbia.edu

Nominations and applications for IMS Awards

If you're thinking of nominating your outstanding colleagues and collaborators for an IMS award, you'll find the call for the (new) **Peter Hall Early Career Prize** and the **Richard Tweedie New Researcher Award** on page 11, and the **Carver Medal** and **IMS Fellowship** calls are on page 9. Applications are also open for the **IMS Travel Awards** for Graduate Students and for New Researchers: see page 11.

Anirban's Angle: The "Missing Women" and Statistical Tests for Female Infanticide

Contributing Editor Anirban DasGupta examines the sometimes unpleasant reasons behind the widely varying ratios of male and female populations around the world, and considers the role of statistics in detecting patterns:

It was observed at least 300 years ago that, for reasons that are not fully understood, the biology of human reproduction leads to a slightly uneven sex ratio at birth. The term "sex ratio" is defined here as $\frac{p}{1-p}$, where p is the probability that a newborn child will be a boy. In most populations, p is about 21⁄41, which amounts to saying that 105 boys are born per 100 girls. This gives a sex ratio of 1.05. (We are looking here at male and female gender, but acknowledge that, depending upon which definition is used, between 0.1% and 1.7% of live births are intersex.)

Gender at conception is influenced by numerous factors, including but not limited to the preponderance of Y chromosomes over X among the fathers in a given population, the age of the father or mother, ethnicity, and order of birth of the child. Despite these and other scientific explanations for the natural imbalance in the sex ratio at birth, it is worth noting that in a significant number of countries of the world, the sex ratio far exceeds the 1.05 value. One would wonder, and should ask, *why?*

This is, in fact, a fairly old question. Nobel Laureate Amartya Sen wrote a famous article in the 1990 *New York Review of Books* in which he estimated that, in Asia alone, more than 100 million women are "missing." This means that the actual number of women in the population at large is 100 million short of the expected value.

A large amount of subsequent work, focusing on the sociological, economic and medical aspects of the "missing women" phenomenon now exists. We can look at the UN data on the sex ratio for the period 2010–15 for a sample of 36 countries of the world and perform, for each, the Wald test for the null hypothesis H_0: p = 21⁄41 against the one-sided alternative H_1 : p > 21⁄41. The z-values are astoundingly large for a number of countries.

We will briefly touch on possible explanations for these staggering significance levels. The countries and corresponding data are listed in the table. [The z-values are not reported when they are less than or equal to 0. The number of new births, n, is needed for each country in order to compute the z-value; n is obtained from the UN data on number of births by country for the year 2011 and by multiplying it by 5, because our sex ratios are for a five-year window combined.]

Country	Sex Ratio	n (×5000)	z-value
Australia	1.06	310	5.90
Afghanistan	1.06	1410	12.58
Bahrain	1.04	23	
Bangladesh	1.05	3015	
Bhutan	1.04	15	
Brazil	1.05	3000	
Canada	1.05	390	
China	1.15	16400	411.03
Costa Rica	1.05	75	
Cuba	1.06	110	3.51
Egypt	1.07	1885	28.95
France	1.05	790	
Greece	1.06	115	3.59
India	1.10	27100	270.47
Ireland	1.06	70	2.80
Italy	1.06	560	7.93
Japan	1.06	1075	10.98
Kuwait	1.05	50	
Mexico	1.05	2200	
Myanmar	1.03	825	
Nepal	1.05	720	
Norway	1.05	60	
Pakistan	1.09	4765	91.17
Qatar	1.05	20	
Republic of Korea	1.06	350	6.27
Russian Federation	1.06	1690	13.77
Saudi Arabia	1.03	605	
Singapore	1.07	45	4.47
Sri Lanka	1.04	375	
Sudan	1.04	1450	
Switzerland	1.05	75	
Thailand	1.06	825	9.62
UAE	1.05	95	
Uganda	1.03	1545	
UK	1.05	760	
USA	1.05	4320	

Continued from **page 8**

The five largest z-values are 411 (China), 270 (India), 91 (Pakistan), 29 (Egypt) and 14 (Russia); their p-values are immeasurably small. It is well known that sex ratio at puberty can be seriously imbalanced due to treatment of the girls as essentially second class citizens: in some populations, they are deliberately given lesser medical care, poor nutrition, responsibilities for hard physical work, and little or no access to education. But the sex ratios reported in this column are the ratios at birth. One must wonder why the z-values are so large for several countries. Some possible explanations are:

a) gender selective abortions following a cheaply available ultrasound;
b) for births at home, elimination of girls immediately after birth, known as witch killing;
c) incomplete or incorrect data given to the UN by some countries.
d) Some other genetic reason to make the value of $p > 21/41$ in these countries.

Female infanticide is a repugnant practice but sadly not a new one: Darwin elaborated on it in 1871.

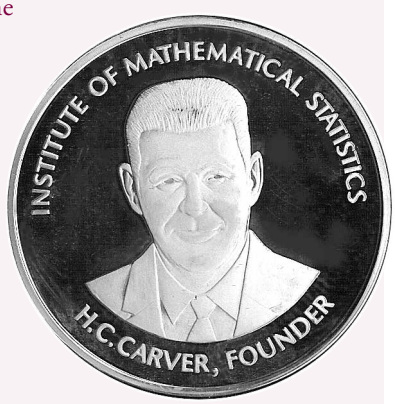
I close with a few comments on mathematical treatment of this problem. Can we diagnose female infanticide using rigorous statistical methods and suitable data? It turns out that we probably can. If p is the natural probability for a male child and ϑ the probability that a female child will be eliminated or aborted, then we have a three-cell multinomial, with the balls in one cell being unobservable. The model is identifiable if p is known, and unidentifiable otherwise. A rigorous likelihood theory is possible, and ϑ can be estimated as long as p is known; one has to solve a cubic. The Wald or the score interval is computable. If we have data on the full sequence of births, e.g., BGBG (i.e., boy–girl–boy–girl), we can also devise test statistics for whether certain important patterns occur more frequently than would be normal. As an example, female infanticide is more common among lower order births. Thus, if we see a pattern such as GBGBBB occur frequently in six-children families, we have a marker for female infanticide. Run statistics also give useful tests.

Of course, I do not offer social or political solutions to such a widespread and chronic problem. But if these apparently very large z-values do have something to do with female infanticide, I hope in a small way I have helped IMS members to be more aware of this abhorrent monstrosity.

Nominate for these IMS Awards

It's time to think about nominating your outstanding colleagues and collaborators for these IMS awards: **Hall and Tweedie awards** (see page 11), Carver Medal and IMS Fellowship. Applications are also open for the **IMS Travel Awards**: see page 11.

Nominations are invited for the **Carver Medal**, created by the IMS in honor of Harry C. Carver, for exceptional service specifically to the IMS. All nominations must be received by February 1, 2020. Please visit https://www.imstat.org/ims-awards/harry-c-carver-medal/.



A candidate for **IMS Fellowship** shall have demonstrated distinction in research in statistics or probability, by publication of independent work of merit. This qualification may be partly or wholly waived in the case of either a candidate of well-established leadership whose contributions to the field of statistics or probability other than original research shall be judged of equal value; or a candidate of well-established leadership in the application of statistics or probability, whose work has contributed greatly to the utility of and the appreciation of these areas. Candidates for fellowship should be members of IMS when nominated—you can email Elyse Gustafson erg@imstat.org to check this before you start.

Philip Protter, a past Chair of the Committee on Fellows, was invited by former President Alison Etheridge to write an article, providing some words of advice on how to choose and nominate a Fellow. It's in the October/November 2018 issue: https://www.imstat.org/2018/10/01/nominating-a-fellow-heres-how-to-choose/

The Fellowship nomination deadline is January 31, 2020. For nomination requirements, see https://www.imstat.org/honored-ims-fellows/nominations-for-ims-fellow/.

Hand Writing: Fraud Detection and Statistics

David J. Hand, Imperial College London, is one of our Contributing Editors. He writes about the role statistics can play in detecting and combating fraud:

I do not need to remind the readers of the *IMS Bulletin* that the discipline of statistics is ubiquitous, being applied in all walks of life and helping to improve understanding, decision-making, and the human condition just about everywhere. It is encouraging that non-statisticians are also beginning to recognise this, with the sudden awareness of the power of data science and the recognition that the core discipline at the centre of data science is statistics.

One of the drivers behind this sudden growth in awareness has been the increasing quantification of our lives: the fact that data describing what we do and how and why we do it is accumulated in large quantities and often automatically. That, coupled with the recognition that understanding (not to mention value, often monetary) can be squeezed from this data has attracted considerable interest. Numbers of applications to college and university to study statistics and data science have rocketed.

One area which demonstrates the power of using advanced statistical tools to analyze large data sets is fraud detection. While fraud will always be with us, increasingly sophisticated methods for detecting it can make life tougher for fraudsters. The scope for application of statistical methods to detect fraud is unlimited.

Fraud detection systems need to satisfy certain criteria. Obviously, they need to detect a reasonable proportion of fraud cases (though hoping to detect *all* of them is unrealistic) while not raising questions about too many legitimate cases. Also, in many situations, they need to be *fast*: there's little point in raising concerns about a credit card purchase long after it has been made and the fraudster has disappeared over the horizon. A credit card fraud detection system should, ideally, flag up a suspicious transaction while it is being made rather than three months later.

Image by Darwin Laganzon from pixabay.com

One criterion that many other statistical decision-making systems have to satisfy—often by law—is that an explanation for the decision must be available if requested. This can obviously be problematic for some advanced and complex tools, such as deep learning neural networks. But this is not really important in fraud detection: you don't have to justify your concern that a transaction might be suspicious.

In general, the entire breadth of statistical tools might be applied in fraud detection operations. Statistical summaries and profiles of behaviour, anomaly and outlier detection, graphical methods, methods based on how real data behave, such as the Benford distribution, and network analysis have all been extensively used. Both supervised and unsupervised classes of methods are applied, the first based on contrasting properties of fraudulent behaviour with legitimate behaviour, and the second simply summarising and describing legitimate behaviour.

But there are challenges. Many domains are fundamentally non-stationary. People's behaviour changes over the course of time, perhaps in response to changing life circumstances, changing economic conditions, or other reasons. More critically, the behaviour of fraudsters will change in response to the detection mechanisms put in place: the system is *reactive*. Using a signature and a print of an embossed credit card was replaced by magnetic stripes, which were replaced by chip-and-PINs, and in turn by contactless. But none of these entirely stopped fraud. As I sometimes put it, organised crime does not say, "Ah, you've got me. I'll stop and find something legitimate to do instead." What it does instead is try to find some other way around the system. The analogy of an arms race is sometimes made, and this is no exaggeration.

Another problem in many situations is that the classes are often dramatically

Continued from **page 10**

unbalanced. If one in a 1000 credit card transactions is fraudulent, a system which correctly identifies 99% of the fraudulent transactions and 99% of the legitimate transactions will mean that 91% of the transactions the system flags as possibly fraudulent will in fact be legitimate. Putting a block on all those cards might not go down too well with customers.

And that, of course, leads on to a general feature of fraud detection systems in many domains. The statistical tool is just a part of the overall system. The customer and their expectations are also key parts. The statistical modelling and analysis has to be carried out within the wider context.

In general, in fraud detection a Pareto principle applies. While, as I commented above, we will not be able to prevent all fraud, we can in many situations detect 80% of it with relatively simple methods (my proportions here are purely illustrative). But then the same amount of further effort will be required to detect 80% of the remaining fraud. And the same amount of effort will be required for the next 80%, and so on. And at bottom we must remember that it is counter-productive to spend $1 billion to detect and prevent $1 worth of fraud. One reason that fraud will always be with us is that the amount of effort required to stop it eventually becomes more expensive than the fraud itself.

A further complication in many fraud situations arises from the fact that the definitions of what is fraud are not determined by nature, but by social and legal considerations. This means that what is fraud today might not be fraud tomorrow, or the other way round. Or worse: consider someone who (legitimately) spends a large amount on their credit card, but then (in horror at their own extravagance) declares the card as having been stolen and the transactions as having been made by a thief. Their declaration switches the transactions from legitimate to fraudulent, though nothing about them has changed.

Fraud detection presents some interesting challenges—and opportunities—for statisticians.

IMS Awards for Early Career Researchers

Peter Hall Prize nominations

The **IMS Peter Gavin Hall Early-Career Prize** recognizes early-career research accomplishments and research promise in statistics, broadly construed. Nominees for the inaugural 2020 prize should have received their doctoral degrees in 2012–2019. The IMS gives the award committee latitude to consider nominees with extenuating circumstances that may have delayed professional achievements. Nominations may be made by any member of the IMS, and nominees do not need to be IMS members. The nomination deadline is December 1, 2019. The inaugural award will be presented at the IMS Presidential Awards ceremony held at the IMS annual meeting, part of the **10th World Congress in Probability and Statistics** (WC2020), jointly organized by the Bernoulli Society and IMS, hosted by Seoul National University from August 17–21, 2020.

Electronic submission is required. Instructions at https://www.imstat.org/ims-awards/peter-gavin-hall-ims-early-career-prize/

Tweedie Award nominations

Richard Tweedie (1947–2001) played a significant role throughout his career as a mentor. The **Tweedie New Researcher Award**, created in his memory, provides funds for travel to present the Tweedie New Researcher Invited Lecture at the IMS New Researchers Conference. Nominate by December 1, 2019. Instructions at https://www.imstat.org/ims-awards/

IMS Travel Awards: apply now for next year

Applications are open for two types of travel awards. The **IMS Hannan Graduate Student Travel Award** funds travel and registration to attend (and possibly present a paper/poster at) an IMS sponsored or co-sponsored meeting. This travel award is available to IMS members who are graduate students (seeking a Masters or PhD degree) studying some area of statistical science or probability. If you are a New Researcher (awarded your PhD in 2014–19) looking for travel funds, you should apply for the **IMS New Researcher Travel Award** to fund travel, and possibly other expenses, to present a paper or a poster at an IMS sponsored or co-sponsored meeting (not the IMS New Researcher's Conference, that's funded separately). Applicants for both these travel awards must be members of IMS, though joining at the time of application is allowed *(student membership is free, and new graduate membership discounted!)*. The application deadline for both is February 1, 2020. See https://www.imstat.org/ims-awards/ims-hannan-graduate-student-travel-award/ and https://www.imstat.org/ims-awards/ims-new-researcher-travel-award/.

Recent papers

Annals of Statistics: Volume 47, No. 5, October 2019

The *Annals of Statistics* aims to publish research papers of the highest quality reflecting the many facets of contemporary statistics. Primary emphasis is placed on importance and originality. The Co-Editors are Richard J. Samworth and Ming Yuan. Access papers at **https://projecteuclid.org/info/euclid.aos**

The two-to-infinity norm and singular subspace geometry with applications to high-dimensional statistics . . . . . JOSHUA CAPE, MINH TANG, AND CAREY E. PRIEBE; 2405 - 2439
Isotonic regression in general dimensions . . . . . QIYANG HAN, TENGYAO WANG, SABYASACHI CHATTERJEE, AND RICHARD J. SAMWORTH; 2440 - 2471
Property testing in high-dimensional Ising models . . . . . MATEY NEYKOV AND HAN LIU; 2472 - 2503
A knockoff filter for high-dimensional selective inference . . . . . RINA FOYGEL BARBER AND EMMANUEL J. CANDÈS; 2504 - 2537
Semi-supervised inference: General theory and estimation of means . . . . . ANRU ZHANG, LAWRENCE D. BROWN, AND T. TONY CAI; 2538 - 2566
Doubly penalized estimation in additive regression with high-dimensional data . . . . . ZHIQIANG TAN AND CUN-HUI ZHANG; 2567 - 2600
Semiparametrically point-optimal hybrid rank tests for unit roots . . . . . BO ZHOU, RAMON VAN DEN AKKER, AND BAS J. M. WERKER; 2601 - 2638
The middle-scale asymptotics of Wishart matrices . . . . . DIDIER CHÉTELAT AND MARTIN T. WELLS; 2639 - 2670
Linear hypothesis testing for high dimensional generalized linear models . . . . . CHENGCHUN SHI, RUI SONG, ZHAO CHEN, AND RUNZE LI; 2671 - 2703
An operator theoretic approach to nonparametric mixture models. . . . . ROBERT A. VANDERMEULEN AND CLAYTON D. SCOTT; 2704 - 2733
Phase transition in the spiked random tensor with Rademacher prior . . . . . WEI-KUO CHEN; 2734 - 2756
Distance multivariance: New dependence measures for random vectors . . . . . BJÖRN BÖTTCHER, MARTIN KELLER-RESSEL, AND RENÉ L. SCHILLING; 2757 - 2789
A unified treatment of multiple testing with prior knowledge using the p-filter . . . . . AADITYA K. RAMDAS, RINA F. BARBER, MARTIN J. WAINWRIGHT, AND MICHAEL I. JORDAN; 2790 - 2821
Exact lower bounds for the agnostic probably-approximately-correct (PAC) machine learning model . . . . . ARYEH KONTOROVICH AND IOSIF PINELIS; 2822 - 2854
Eigenvalue distributions of variance components estimators in high-dimensional random effects models. . . . . ZHOU FAN AND IAIN M. JOHNSTONE; 2855 - 2886
Test for high-dimensional correlation matrices . . . . . SHURONG ZHENG, GUANGHUI CHENG, JIANHUA GUO, AND HONGTU ZHU; 2887 - 2921
Projected spline estimation of the nonparametric function in high-dimensional partially linear models for massive data. . . . . HENG LIAN, KAIFENG ZHAO, AND SHAOGAO LV; 2922 - 2949
Inference for the mode of a log-concave density . . . . . CHARLES R. DOSS AND JON A. WELLNER; 2950 - 2976
Testing for independence of large dimensional vectors. . . . . TARAS BODNAR, HOLGER DETTE, AND NESTOR PAROLYA; 2977 - 3008

Email notifications: new journal issues

Would you like to receive a notification when a new IMS journal, or an IMS-supported journal, is released? You can! Sign up to receive emails that include a contents list, abstracts and references. These are available for the following IMS core and supported journals:

IMS journals:
Annals of Applied Probability
Annals of Applied Statistics
Annals of Probability
Annals of Statistics
Statistical Science

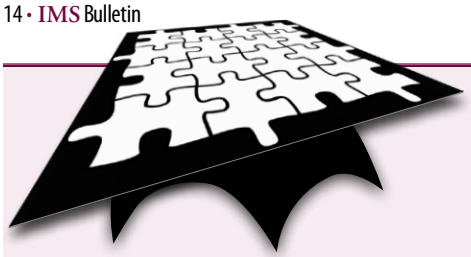
IMS-supported journals:
Annales de l'Institut Henri Poincaré (B)
Bernoulli
Brazilian Journal of Probability and Statistics

Log in and view or edit your journal alerts on the IMS portal, at https://imstat.org/portal/login

Annals of Applied Statistics: Volume 13, No. 2, June 2019

Statistical research spans an enormous range from direct subject-matter collaborations to pure mathematical theory. The *Annals of Applied Statistics* is aimed at papers in the applied half of this range. Our goal is to provide a timely and unified forum for all areas of applied statistics. The Editor in Chief is Tilmann Gneiting.
Access published papers at **http://projecteuclid.org/euclid.aoas**

Climate inference on daily rainfall across the Australian continent, 1876–2015. . . . . .MICHAEL BERTOLACCI, EDWARD CRIPPS, ORI ROSEN, JOHN W. LAU, AND SALLY CRIPPS; 683 - 712
Modelling ocean temperatures from bio-probes under preferential sampling . . . . . DANIEL DINSDALE AND MATIAS SALIBIAN-BARRERA; 713 - 745
Complete spatial model calibration . . . . . .YEN-NING HUANG, BRIAN J. REICH, MONTSERRAT FUENTES, AND A. SANKARASUBRAMANIAN; 746 - 766
Extended sensitivity analysis for heterogeneous unmeasured confounding with an application to sibling studies of returns to education . COLIN B. FOGARTY AND RAIDEN B. HASEGAWA; 767 - 796
A hierarchical multivariate spatio-temporal model for clustered climate data
with annual cycles . . . . . .GIANLUCA MASTRANTONIO, GIOVANNA JONA LASINIO, ALESSIO POLLICE, GIULIA CAPOTORTI, LORENZO TEODONIO, GIULIO GENOVA, AND CARLO BLASI; 797 - 823
Fused comparative intervention scoring for heterogeneity of longitudinal intervention effects . . . . . .JARED D. HULING, MENGGANG YU, AND MAUREEN SMITH; 824 - 847
Graphical models for zero-inflated single cell gene expression . . . . . .ANDREW MCDAVID, RAPHAEL GOTTARDO, NOAH SIMON, AND MATHIAS DRTON; 848 - 873
TreeClone: Reconstruction of tumor subclone phylogeny based on mutation pairs
using next generation sequencing data . . . . . TIANJIAN ZHOU, SUBHAJIT SENGUPTA, PETER MÜLLER, AND YUAN JI; 874 - 899
Latent space modelling of multidimensional networks
with application to the exchange of votes in the Eurovision song contest . . . . . SILVIA D'ANGELO, THOMAS BRENDAN MURPHY, AND MARCO ALFÒ; 900 - 930
Modeling association in microbial communities with clique loglinear models. . . . . .ADRIAN DOBRA, CAMILO VALDES, DRAGANA AJDIC, BERTRAND CLARKE, AND JENNIFER CLARKE; 931 - 957
Variable prioritization in nonlinear black box methods: A genetic association case study . . . . . .LORIN CRAWFORD, SETH R. FLAXMAN, DANIEL E. RUNCIE, AND MIKE WEST; 958 - 989
Coherence-based time series clustering for statistical inference and visualization of brain connectivity. . . . . CAROLINA EUÁN, YING SUN, AND HERNANDO OMBAO; 990 - 1015
Sparse principal component analysis with missing observations . . . . . .SEYOUNG PARK AND HONGYU ZHAO; 1016 - 1042
Adaptive gPCA: A method for structured dimensionality reduction with applications to microbiome data. . . . . .JULIA FUKUYAMA; 1043 - 1067
Learning algorithms to evaluate forensic glass evidence. . . . . SOYOUNG PARK AND ALICIA CARRIQUIRY; 1068 - 1102
Three-way clustering of multi-tissue multi-individual gene expression data using semi-nonnegative tensor decomposition MIAOYAN WANG, JONATHAN FISCHER, AND YUN S. SONG; 1103 - 1127
Nonparametric testing for differences in electricity prices: The case of the Fukushima nuclear accident. . . . . DOMINIK LIEBL; 1128 - 1146
Nonparametric inference for immune response thresholds of risk in vaccine studies . . . . . KEVIN M. DONOVAN, MICHAEL G. HUDGENS, AND PETER B. GILBERT; 1147 - 1165
Semiparametric empirical best prediction
for small area estimation of unemployment indicators. . . . . MARIA FRANCESCA MARINO, MARIA GIOVANNA RANALLI, NICOLA SALVATI, AND MARCO ALFÒ; 1166 - 1197
The identity of the zero-truncated, one-inflated likelihood and the zero-one-truncated likelihood for general count densities
with an application to drink-driving in Britain. . . . . .DANKMAR BÖHNING AND PETER G. M. VAN DER HEIJDEN; 1198 - 1211
Phylogeny-based tumor subclone identification using a Bayesian feature allocation model . . . . . LI ZENG, JOSHUA L. WARREN, AND HONGYU ZHAO; 1212 - 1241
Estimating population average causal effects in the presence of non-overlap:
The effect of natural gas compressor station exposure on cancer mortality. . . . . .RACHEL C. NETHERY, FABRIZIA MEALLI, AND FRANCESCA DOMINICI; 1242 - 1267
Survival analysis of DNA mutation motifs with penalized proportional hazards . . . . . JEAN FENG, DAVID A. SHAW, VLADIMIR N. MININ, NOAH SIMON, AND FREDERICK A. MATSEN IV; 1268 - 1294
Early diagnosis of neurological disease using peak degeneration ages of multiple biomarkers . . . . . .FEI GAO, YUANJIA WANG, AND DONGLIN ZENG; 1295 - 1318
Correction to: Statistical modeling and analysis of trace element concentrations in forensic glass evidence . . . . . .KAREN D. H. PAN AND KAREN KAFADAR; 1319 - 1328



Student Puzzle Corner 26

Here's Anirban DasGupta's latest puzzle. He says: *This time we're looking at a delicate and fascinating phenomenon pervasive in mathematics and probability:* ***phase transition****. A system's evolution is being driven or influenced by some underlying force or parameter, and when that parameter just crosses a suitable critical boundary or threshold, the system undergoes a rapid transition. We propose a problem that can be rhetorically framed as whether we should put any trust in a unanimous assertion made independently by a large number of pathological liars. On the one hand, you may argue that if just one of them is telling the truth, then the assertion must be true. But you may also argue that chronic liars should never be trusted. It will turn out that in an appropriate mathematical formulation, there is a phase transition in the problem, and we will ask you to discover that phase transition. Here is the exact statement of the problem.*

A club consists of m members, and on any given instance, each member tells the truth with probability p and lies with probability $1-p$; we will take p to be very small, but not zero. The club members are assumed to act independently. Suppose that these m members are taken to planet X, and on arrival, each member is given a choice of n distinct color names, such as red, blue, green, etc. Each member looks at Earth from planet X, and one by one each of them announces that Earth looks purple, one of the colors on their color list.

a) Suppose $m = n = 20$. Calculate the probability that indeed Earth looks purple from planet X if each club member said so, for $p = .05$ and for $p = .04$; assume that the true color is one of the n on the list with equal probability.

b) Suppose $\frac{1}{p} = n - \alpha \log n, m = \gamma n$, where $\alpha \geq 0, \gamma > 0$. Denote the probability that from planet X, Earth really does look purple if each of the m members says so by $u(\alpha, \gamma, n)$. Find the limit of $u(\alpha, \gamma, n)$ as $n \to \infty$ for given α and given γ.

Remember to look for a phase transition.

Deadline: November 1, 2019

Student members of IMS are invited to submit solutions (to bulletin@imstat.org with subject "Student Puzzle Corner").

The names of student members who submit correct solutions, and the answer, will be published in the issue following the deadline.

The Puzzle Editor's decision is final.

Solution to puzzle 25

Congratulations to the two student members who sent correct answers: Yudong Chen (University of Cambridge, UK) and Zhen Huang (Columbia University, USA).


Yudong Chen


Zhan Huang

Contributing Editor Anirban DasGupta writes on the previous puzzle:

In the notation of the problem, the recorded values $Y_1, Y_2, \cdots$ are iid with

$$E(Y_i) = \sum_{i=1}^{\infty} \left(i\, c\, [F((i + \tfrac{1}{2})\, c) - F((i - \tfrac{1}{2})\, c)] \right),$$

where $c = \frac{1}{100}$, and $F(x) = 1 - e^{-x/\lambda}$ is the CDF of the exponential distribution with mean λ. On using the formula $\sum_{i=1}^{\infty} i\, a^i = \frac{a}{(1-a)^2}$ for $|a| < 1$, we get

$$\frac{e^{-1/200\lambda}}{100(1-e^{-1/100\lambda})} = \lambda - \frac{1}{24 \times 10^4 \lambda} + \frac{7}{576 \times 10^9 \lambda^3} + O(\lambda^{-5}) \text{ as } \lambda \to \infty.$$

Thus, even for large λ, there is a small persistent bias in the estimator that we actually use in real life, and the real life estimator is inconsistent.

IMS meetings around the world

Joint Statistical Meetings: 2019–2023

IMS sponsored meeting

JSM 2020

August 1–6, 2020. Philadelphia, PA, USA.

w http://ww2.amstat.org/meetings/jsm/2020/

JSM (the Joint Statistical Meetings) is the largest gathering of statisticians and data scientists held in North America. It is also one of the broadest, with topics ranging from statistical applications to methodology and theory to the expanding boundaries of statistics, such as analytics and data science. JSM also offers a unique opportunity for statisticians in academia, industry, and government to exchange ideas and explore opportunities for collaboration.

IMS sponsored meetings: JSM dates for 2020–2024

IMS Annual Meeting @ JSM 2021	**2022 Joint Statistical Meetings**	**IMS Annual Meeting @ JSM 2023**	**JSM 2024**	**IMS Annual Meeting @ JSM 2025** NEW
August 7–12, 2021, Seattle, WA	**August 6–11, 2022 Washington DC**	**August 5–10, 2023 Toronto, ON, Canada**	**August 3–8, 2024 Portland, Oregon**	**August 2–7, 2025 Nashville, TN, USA**

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*

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: London, UK, NEW dates TBC

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

2023

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

2024

IMS Annual Meeting: TBC

JSM: Portland, OR, **August 3–8, 2022**

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

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 academia, government and industry.

IMS sponsored meetings

ENAR/IMS 2021
March 14–17, 2021
Baltimore, MD

ENAR/IMS 2022
March 27–30, 2022
Houston, TX

IMS co-sponsored meeting

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

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 conference offers a forum for researchers and scientists working in pure mathematics, applied mathematics, mathematical 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), a high caliber young university 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.

IMS co-sponsored meeting

Bayes Comp 2020
January 7–11, 2020
University of Florida, Gainesville, FL
w http://users.stat.ufl.edu/~jhobert/BayesComp2020/Conf_Website/

Bayes Comp is a biennial conference sponsored by the ISBA section of the same name. The conference and the section both aim to promote original research into computational methods for inference and decision making and to encourage the use of frontier computational tools among practitioners, the development of adapted software, languages, platforms, and dedicated machines, and to translate and disseminate methods developed in other disciplines among statisticians.

Bayes Comp is the current incarnation of the popular MCMSki series of conferences, and Bayes Comp 2020 is the second edition of this new conference series. The first edition was Bayes Comp 2018, which was held in Barcelona in March of 2018.

IMS sponsored meeting NEW

IMS Asia Pacific Rim Meeting (IMS-APRM2021)
January 5–8, 2021
University of Melbourne, Australia
w http://ims-aprm2021.com/

The sixth meeting of the Institute of Mathematical Statistics Asia Pacific Rim Meeting (IMS-APRM) will take place in Melbourne, Australia. It will provide an excellent worldwide forum for scientific communications and collaborations for researchers in Asia and the Pacific Rim, and promote communications and collaborations between the researchers in this area and those from other parts of the world. The sixth meeting will continue and extend the accomplishments of the previous meetings, and will add a significant value to our continuous efforts to carry out our common mission in the statistical profession.

Other meetings and events around the world

Statistical Methods in Finance NEW
December 16–21, 2019
Chennai, India
w http://statfin.cmi.ac.in/2019/

The fifth conference and workshop on Statistical Methods in Finance will be held at the Chennai Mathematical Institute (CMI). The conference is jointly organized by the Indian Statistical Institute and CMI with support from ISBIS. Confirmed plenary speakers are Kose John, NYU and Richard Davis, Columbia. There will be a panel discussion on **Financial Analytics in the Blockchain Era,** focusing on the impact of Block-chain technology on the financial market, in terms of investment strategy, arbitrage opportunities and risk—both transaction and credit risk. There will also be a three-day workshop on **Data Science in Finance**.

If you are a student and want your paper to be considered for the **student paper competition**, ask your supervisor to send an email to statfin@cmi.ac.in, confirming that you were the primary contributor and author of the paper, by October 15, 2019. You must submit your paper by October 15, 2019, to be considered for the competition. Mail your paper to the same address.

Institute for Data Science and Big Data NEW
January 2–11, 2020
Washington DC, USA
w https://www.american.edu/spa/data-science/data-science-institute.cfm

The American University Center for Data Science will run the Institute for Data Science and Big Data on campus, which is open to all under a university course credit or certificate option, both geared to working professionals. The institute will cover the basics of data science, including obtaining relevant data, cleaning and exploring data, creating models, stating inferences, making reliable predictions, and communicating findings. The course consists of a mixture of lectures, guest speakers, and group assignments. It will take place over 10 working days, Monday through Saturday, 9 AM to 5 PM. To apply, interested parties can submit a resume and letter of interest to dsi@american.edu.

Mixtures, Hidden Markov Models and Clustering NEW
June 17–19, 2020
Paris Orsay, France
w https://www.math.u-psud.fr/~mhc2020/

The aim of the MHC2020 international conference is to bring together for three days some particularly renowned and active researchers in the latent variable models community in order to share their most recent contributions, introduce a community of young researchers (Ph.D. or postdocs students) to this topic in constant change, but also and principally create a momentum in which interesting further perspectives will be discussed such as theoretical open problems, new modeling requirements driven by applications, and in particular today's role of latent variable models in understanding massive and high dimensional data structures.

Confirmed speakers: Christophe Biernacki, Alexandra Carpentier, Ismael Castillo, Jiahua Chen, Mathias Drton, Christian Hennig, Daniel Hsu, Christine Kéribin, Yuichi Kitamura, Claire Lacour, Sylvain Le Corff, Michael Levine, Catherine Matias, Axel Munk, Stéphane Robin, Judith Rousseau, Gregory Valiant, Nicolas Verzelen, Nick Whiteley, Yihong Wu, Weixin Yao.

Registration is free but mandatory. The number of participants will be limited to 100. Register at https://www.math.u-psud.fr/~mhc2020/spip.php?rubrique4.

63rd ISI World Statistics Congress 2021 NEW
July 11–15, 2021
The Hague, The Netherlands
w http://www.isi2021.org/

The 63rd International Statistical Institute's World Statistics Congress will bring together statisticians and data scientists from academia, official statistics, health sector and business, junior and senior professionals, in an inviting environment.

The inspiring and interactive programme will provide the platform to learn about the latest developments in statistical research and practice in an informal ambiance. A series of short courses, satellites and other events completes the WSC programme.

Employment Opportunities around the world

Australia: Sydney, NSW

The University of Sydney
Head of School
School of Mathematics and Statistics
https://jobs.imstat.org/job//50502264

Australia: Melbourne, Vic

University of Melbourne
Lecturer/Senior Lecturer Statistics (Data Science)
https://jobs.imstat.org/job//49886904

Australia: Melbourne, Vic

University of Melbourne
Lecturer/Senior Lecturer Mathematical Statistics
https://jobs.imstat.org/job//49886748

Austria: Klosterneuburg

Institute of Science and Technology Austria
Faculty
https://jobs.imstat.org/job//50470554

Austria: Vienna

University of Vienna, Department of Statistics and Operations Research
Post-Doctoral Fellowship
https://jobs.imstat.org/job//50839623

Canada: Edmonton, AB

University of Alberta
Assistant Professor - Statistics
https://jobs.imstat.org/job//50517302

Canada: Vancouver, BC

University of British Columbia
Assistant Professor (Tenure Track)
https://jobs.imstat.org/job//50139802

Canada: Waterloo, ON

University of Waterloo, Department of Statistics & Actuarial Science
Tenure-track or tenured faculty positions in Statistics, Biostatistics or Data Science
https://jobs.imstat.org/job//50764258

Singapore

Faculty Positions at the Department of Statistics & Applied Probability, National University of Singapore

The National University of Singapore intends to hire faculty members whose research focus is in statistics. The positions can be at any level.

A PhD in statistics or a related field is required. The applicants should have demonstrated potential for excellence in research, teaching and service. The shortlisting of candidates will begin in December 2019.

Applicants should send an application letter, a CV, a research statement and a teaching statement and arrange for at least THREE reference letters to be sent directly to the Department of Statistics & Applied Probability.

Applications should be mailed by post or via e-mail to:

Search Committee
Department of Statistics & Applied Probability
National University of Singapore
6 Science Drive 2
Singapore 117546
E-mail: stasec@nus.edu.sg

NUS offers internationally competitive remuneration, generous research support and funding, relocation assistance and other benefits. The Department of Statistics & Applied Probability has close to 30 faculty. We provide a stimulating environment for our faculty to develop professionally. For more information about the University, Department and Terms of Service, please visit our websites:

University: http://www.nus.edu.sg/

Department of Statistics & Applied Probability: http://www.stat.nus.edu.sg/

Singapore

Faculty Positions at the Department of Statistics & Applied Probability, National University of Singapore

The National University of Singapore intends to hire faculty members whose research focus is in data science, broadly defined, and with interest or experience in big data analysis. The positions can be at any level.

A PhD in statistics or a related field is required. The applicants should have demonstrated potential for excellence in research in data science, teaching and service. The shortlisting of candidates will begin in December 2019.

Applicants should send an application letter, a CV, a research statement and a teaching statement and arrange for at least THREE reference letters to be sent directly to the Department of Statistics & Applied Probability.

Applications should be mailed by post or via e-mail to:

Search Committee
Department of Statistics & Applied Probability
National University of Singapore
6 Science Drive 2
Singapore 117546
E-mail: stasec@nus.edu.sg

NUS offers internationally competitive remuneration, generous research support and funding, relocation assistance and other benefits. The Department of Statistics & Applied Probability has close to 30 faculty. We provide a stimulating environment for our faculty to develop professionally. For more information about the University, Department and Terms of Service, please visit our websites:

University: http://www.nus.edu.sg/

Department of Statistics & Applied Probability: http://www.stat.nus.edu.sg/

Employment Opportunities around the world

China: Shanghai

NYU Shanghai

Business Statistics and Operations Management, Tenured/Tenure-track

https://jobs.imstat.org/job//50613978

China: Shenzhen

The Chinese University of Hong Kong, Shenzhen

Tenured/Tenure-track/Teaching-track Faculty Positions

https://jobs.imstat.org/job//50389835

New Zealand: Wellington

Victoria University of Wellington

Professor in Statistics and Data Science

https://jobs.imstat.org/job//50722672

New Zealand: Wellington

Victoria University of Wellington

Lecturer in Computational Mathematics and Statistics

https://jobs.imstat.org/job//50901629

Switzerland: Fribourg

University of Fribourg, Fac SciMed, Dep Mathematics

Professor of Mathematics

https://jobs.imstat.org/job//50151017

Switzerland: Lausanne

EPFL

Assistant Professor of Applied Mathematics

https://jobs.imstat.org/job//49973294

Switzerland: Lausanne

EPFL

Assistant Professor of Mathematics

https://jobs.imstat.org/job//49973286

Taiwan: Taipei City

Institute of Statistical Science, Academia Sinica

Tenure-Track Faculty Positions

https://jobs.imstat.org/job//49747539

United Kingdom: London

London School of Economics and Political Science (LSE)

Assistant Professor in Data Science

https://jobs.imstat.org/job//50877946

Taiwan: Taipei

中央研究院 統計科學研究所
Institute of Statistical Science, Academia Sinica

Institute of Statistical Science, Academia Sinica

Tenure-Track Faculty Positions

The Institute of Statistical Science, Academia Sinica, is pleased to invite applications for our tenure-track faculty positions. Academia Sinica, the most preeminent academic research institution in Taiwan, offers a secured research environment facilitated with rich collaboration opportunities as well as the freedom of conducting independent research. With a strong tradition of theoretical and interdisciplinary research, the Institute of Statistical Science is aiming for global excellence in mathematical statistics and various statistical applications.

Applications are invited for tenure-track appointments as Full/Associate/Assistant Research Fellows (equivalent to Full/Associate/Assistant Professors in Universities) in the Institute of Statistical Science, Academia Sinica, to commence on August 1, 2020 or as soon as possible thereafter. Applicants should possess a PhD degree in Statistics, Biostatistics, Computer Science, Data Science or related areas, and should submit: (1) a cover letter, (2) an up-to-date curriculum vita, (3) a detailed publication list, (4) a research proposal, (5) three letters of recommendation, (6) representative publications and/or technical reports and (7) advisers' names of master and PhD degrees. Additional supporting materials such as transcripts for new PhD degree recipients may also be included. Electronic submissions are encouraged. Applications should be submitted to

Dr. Yen-Tsung Huang, Chair of the Search Committee
Institute of Statistical Science, Academia Sinica
128 Sec. 2 Academia Road, Taipei 11529,
Taiwan, R.O.C.
Fax: +886-2-27886833
Email: recruit@stat.sinica.edu.tw

Application materials should be received by **December 27, 2019** for consideration, but early submissions are encouraged.

United States: Auburn, AL
Auburn University
Assistant Professor - Statistics
https://jobs.imstat.org/job//50788109

United States: Berkeley, CA
University of California, Berkeley, Department of Statistics
Associate/Full Professor- Statistics
https://jobs.imstat.org/job//50576295

United States: Berkeley, CA
University of California, Berkeley, Department of Statistics
Assistant Professor
https://jobs.imstat.org/job//50575221

United States: Davis, CA
University of California, Davis, department of Statistics
Assistant Professor, Tenure Track
https://jobs.imstat.org/job//50643084

United States: La Jolla, CA
IDA Center for Communications Research
Research Staff Member
https://jobs.imstat.org/job//50332370

United States: Los Angeles, CA
UCLA Department of Statistics
UCLA Data Theory Faculty Search
https://jobs.imstat.org/job//50665636

United States: San Diego, CA
University of California, San Diego
UCSD Department of Mathematics
https://jobs.imstat.org/job//50471168

United States: San Francisco, CA
San Francisco State University
Assistant Professor - Statistics
https://jobs.imstat.org/job//50722601

United States: Fort Collins, CO
Colorado State University, Department of Statistics
Assistant Professor
https://jobs.imstat.org/job//50722469

United States: Ames, IA
Iowa State University, Department of Statistics
Assistant Professor
https://jobs.imstat.org/job//50898039

United States: Iowa City, IA
University of Iowa
Assistant Professor of Data Science
https://jobs.imstat.org/job//50612781

United States: Champaign, IL
University of Illinois at Urbana-Champaign, Department of Statistics
Assistant Professor Positions in Statistics and Data Science
https://jobs.imstat.org/job//50665401

United States: Chicago, IL
The University of Chicago Booth School of Business
Assistant/Associate Professor of Econometrics and Statistics
https://jobs.imstat.org/job//50518738

United States: Bloomington, IN
Indiana University, Department of Statistics
Assistant/Associate/Full Professor
https://jobs.imstat.org/job//50722262

United States: Bloomington, IN
IUB School of Public Health
Chair & Full Professor Department of Epidemiology/Biostatistics
https://jobs.imstat.org/job//50745727

United States: Bloomington, IN
IUB School of Public Health
Multiple Tenure/Tenure-Track Positions Fall 2020
https://jobs.imstat.org/job//50839788

United States: West Lafayette, IN
Department of Statistics, Purdue University
Department Head/Professor
https://jobs.imstat.org/job//50389502

United States: Boston, MA
Boston University
Tenure-track Assistant Professor in Statistical Neuroscience
https://jobs.imstat.org/job//50722777

United States: Cambridge, MA
Harvard Graduate School Of Education
Bluhm Family Assistant/Associate Professor of Data Science and Education
https://jobs.imstat.org/job//50643361

United States: Ann Arbor, MI
University of Michigan Statistics
RTG Postdoctoral associate
https://jobs.imstat.org/job//37685748

United States: Minneapolis, MN
University of Minnesota, School of Statistics and Department of Psychology
Tenure Track Assistant Professor
https://jobs.imstat.org/job//50075025

United States: Minneapolis, MN
University of Minnesota, School of Statistics
Tenure Track Assistant Professor
https://jobs.imstat.org/job//50499570

United States: Springfield, MO
Missouri State University, Department of Mathematics
Tenure Track Assistant Professor of Statistics
https://jobs.imstat.org/job//50239456

Employment Opportunities around the world

USA: New York, NY

Eleanor and Howard Morgan Professorship
School of Operations and Information Engineering

The School of Operations Research and Information Engineering at Cornell University invites exceptional applicants for the Eleanor and Howard Morgan Professorship. The School of ORIE seeks visionary candidates who will drive new research thrusts, catalyze growth in existing areas, and help lead efforts to realize the School's vision of a world in which operation research and analytics are fundamental to improved decision-making that helps address some of society's most pressing problems.

Cornell ORIE is a diverse group of high-quality researchers and educators interested in probability, optimization, statistics, machine learning, simulation, and a wide array of applications including, but not limited to, e-commerce, supply chains, scheduling, manufacturing, transportation and mobility, health care, financial engineering, service systems and network science. We value mathematical and technical depth and innovation, and experience with applications and practice. Ideal candidates will have correspondingly broad training and interests. The School of Operations Research and Information Engineering spans both the traditional Cornell campus in Ithaca and the new presence at Cornell Tech on Roosevelt Island in New York City. This position is for the Cornell Ithaca campus, but the potential for connection with the Cornell Tech campus and its associated mission of external engagement is desirable.

Applicants should submit a curriculum vitae, statement of research and leadership vision, and complete contact information for at least three references. Applications will be accepted until the position is filled. Submit applications online at **https://academicjobsonline.org/ajo/jobs/14253**. Questions may be addressed by email to David Shmoys, Chair, Eleanor and Howard Morgan Chair Search Committee at **morganchairsearch@cornell.edu**.

ORIE and the College of Engineering at Cornell embrace diversity and seek candidates who can contribute to a welcoming climate for students, staff and faculty of all races and genders. Cornell University seeks to meet the needs of dual career couples, has a Dual Career program, and is a member of the Upstate New York Higher Education Recruitment Consortium to assist with dual career searches. Visit **www.unyherc.org/home** to see positions available in higher education in the upstate New York area.

Cornell University is an innovative Ivy League university and a great place to work. Our inclusive community of scholars, students and staff impart an uncommon sense of larger purpose and contribute creative ideas to further the university's mission of teaching, discovery and engagement. With our main campus located in Ithaca, NY Cornell's far-flung global presence includes the medical college's campuses in Manhattan and Doha, Qatar, as well as the new Cornell Tech campus located on Roosevelt Island in the heart of New York City.

Diversity and Inclusion are a part of Cornell University's heritage. We are a recognized employer and educator valuing AA/EEO, Protected Veterans, and Individuals with Disabilities. We strongly encourage women and underrepresented minorities to apply.

United States: Charlotte, NC

University of North Carolina at Charlotte
Chair, Department of Mathematics and Statistics
https://jobs.imstat.org/job//50616194

United States: Durham, NC

The Fuqua School of Business, Duke University
Decision Sciences Tenure Track Faculty
https://jobs.imstat.org/job//50588894

United States: Princeton, NJ

Princeton University
Assistant Professor - Operations Research & Financial Engineering Department
https://jobs.imstat.org/job//50518903

United States: Las Cruces, NM

New Mexico State University
Assistant Professor in Applied Statistics
https://jobs.imstat.org/job//46388339

United States: Ithaca, NY

Cornell University
Eleanor and Howard Morgan Professorship
https://jobs.imstat.org/job//50575012

United States: New York, NY

Columbia University, Department of Statistics
Lecturer in Discipline
https://jobs.imstat.org/job//50854943

United States: New York, NY

Columbia University, Department of Statistics
Assistant Professor (Limited-term)
https://jobs.imstat.org/job//50841528

United States: New York, NY

Columbia University, Department of Statistics
Assistant Professor (Tenure-Track)
https://jobs.imstat.org/job//50841506

United States: New York, NY

Columbia University, Department of Statistics
Distinguished Postdoctoral Fellow in Statistics
https://jobs.imstat.org/job//50854953

United States: Corvallis, OR

Oregon State University College of Business
Assistant/Associate/Full Professor - Business Analytics
https://jobs.imstat.org/job//50621069

United States: Easton, PA

Lafayette College
Assistant Professor of Mathematics
https://jobs.imstat.org/job//50732478

United States: Pittsburgh, PA

Carnegie Mellon University
Teaching Track Faculty Position, Heinz College
https://jobs.imstat.org/job//50919613

United States: University Park, PA

Penn State University
Tenure Track Faculty Positions
https://jobs.imstat.org/job//49212272

USA: Philadelphia, PA

Wharton Department of Statistics, University of Pennsylvania
Tenure-track Assistant Professor

The Department of Statistics of the Wharton School, University of Pennsylvania, is seeking applicants for a full-time, tenure-track Assistant Professor position. Applicants must show outstanding capacity and achievement in research, as well as excellent teaching and communication skills. Applicants must have a PhD or equivalent (expected completion by June 30, 2021 is acceptable) from an accredited institution. The appointment is expected to begin July 1, 2020.

Please visit our website, https://statistics.wharton.upenn.edu/recruiting/facultypositions, for a description of the department and a link to submit a CV and other relevant materials. For full consideration, candidates are encouraged to have all required application documents submitted by **December 1**. Any questions can be sent to statistics.recruit@wharton.upenn.edu.

The University of Pennsylvania is an EOE. Minorities / Women / Individuals with disabilities / Protected Veterans are encouraged to apply.

United States: Columbia, SC

University of South Carolina, Department of Statistics
Assistant Professor
https://jobs.imstat.org/job//50840923

United States: Seattle, WA

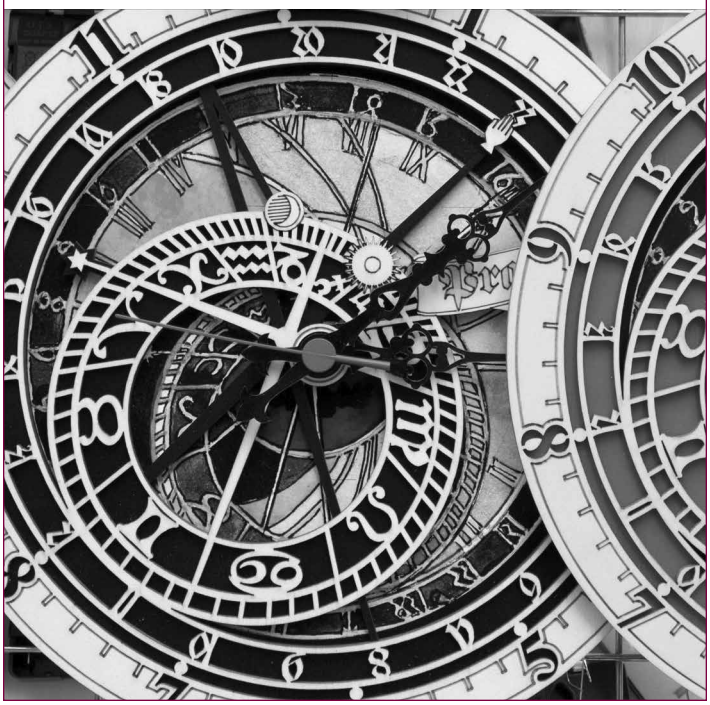
University of Washington
Chair, Department of Statistics
https://jobs.imstat.org/job//50331839

United States: Seattle, WA

University of Washington, Department of Statistics
Assistant Professor
https://jobs.imstat.org/job//50483392

United States: Madison, WI

University of Wisconsin, Madison, Department of Statistics
Assistant Professor of Statistics
https://jobs.imstat.org/job//50901640



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

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

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

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

Meeting organizers: to get a FREE LISTING in this calendar, please submit the details (as early as possible) at https://www.imstat.org/ims-meeting-form/ Or you can email the details to Elyse Gustafson at erg@imstat.org We'll list them here in the Bulletin, and on the IMS website too, at imstat.org/meetings-calendar/

November 2019

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/

NEW December 12–15, 2019: Taipei, Taiwan. **11th International Conference on Multiple Comparison Procedures (MCP)** w https://2019mcp.smartevent.com.tw/

NEW December 16–21: Chennai, India. **Statistical Methods in Finance** w http://statfin.cmi.ac.in/2019/

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

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

January 2020

NEW January 2–11: Washington DC, USA. **Institute for Data Science and Big Data** w https://www.american.edu/spa/data-science/data-science-institute.cfm

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

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

 January 7–11: University of Florida, Gainesville, USA. **Bayes Comp 2020 w** http://users.stat.ufl.edu/~jhobert/BayesComp2020/Conf_Website/

February 2020

 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

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

May 2020

NEW May 31–June 3: Carleton University, Ottawa, ON, Canada. **2020 SSC Annual Meeting w** https://ssc.ca/en/meetings/2020-annual-meeting-ottawa

June 2020

June 1–26: Vancouver, BC, Canada. **2020 PIMS-CRM Probability Summer School w** http://www.math.ubc.ca/Links/ssprob20/

June 2–5: Barcelona, Spain. **6th Stochastic Modeling Techniques and Data Analysis International Conference (SMTDA2020). Also featuring Demographics 2020 Workshop**
w www.smtda.net

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

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

NEW June 17–19: Paris Orsay, France. **Mixtures, Hidden Markov Models and Clustering w** https://www.math.u-psud.fr/~mhc2020/

 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/

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

Continues on **page 26**

International Calendar *continued*

January 2021

NEW ims January 5–8: Melbourne, Australia. **IMS Asia Pacific Rim Meeting (IMS-APRM2021)** w http://ims-aprm2021.com/

March 2021

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

July 2021

NEW July 11–15: The Hague, The Netherlands. **63rd ISI World Statistics Congress 2021** w http://www.isi2021.org/

NEW July 15–18: Montreal, Canada. **Statistics 2021 Canada** w https://www.concordia.ca/artsci/events/statistics-2021.html

August 2021

ims 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

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

July 2022

ims July/August [exact dates TBC]: London, UK. **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

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

August 2023

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

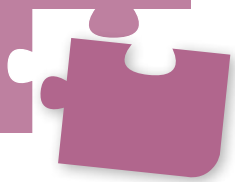
August 2024

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

August 2025

ims 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/



Membership and Subscription Information

Journals

The scientific journals of the Institute of Mathematical Statistics are *The Annals of Statistics*, *The Annals of Probability*, *The Annals of Applied Statistics*, *The Annals of Applied Probability*, and *Statistical Science*. The *IMS Bulletin* is the news organ of the Institute.

Individual Memberships

Each individual member receives the *IMS Bulletin* (print and/or electronic) and may elect to receive one or more of the five scientific journals. Members pay annual dues of $105. An additional $101 is added to the dues of members for each scientific journal selected ($63 for *Stat Sci*). **Reduced membership dues** are available to full-time students, new graduates, permanent residents of countries designated by the IMS Council, and retired members.

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