Bernoulli News

Newsletter of the Bernoulli Society for Mathematical Statistics and Probability

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A VIEW FROM THE PRESIDENT

Dear Members of the Bernoulli Society,

This year's General Assembly of our society was held *online* on July 8th, due to the COVID-19 pandemic. It was a symbolic closure of the presidential term 2019 – 2021 of Claudia Klüppelberg. During her presidency all major events had been either postponed or organized in a virtual form. Moreover, the impact of the pandemic was present at practically all activities performed in this difficult and depressing time. It is therefore really surprising to realize that in many aspects the Bernoulli Society seems to be stronger now than it was two years ago!

First, the congresses were successful, taking into account the number of participants and the broad spectrum of presented topics (see the report section in this issue, in particular the report on 10th Bernoulli – IMS World Congress, written by Siva Athreya and Hee-Seok Oh). And the virtual form of these conferences is a source of solid experience that will be used in the future, especially in the organization of hybrid meetings and interactive sessions during standard conferences. Bernoulli Society and IMS will work together on these key developments.

Second, in 2020 the finances of the Bernoulli Society showed a moderate income, after three consecutive years of loss. It was the result of reducing backlog of our flagship journal *Bernoulli* and of executing some overdue royalties. This seems to be an instant balance, but there is a hope for stabilization. Successful negotiations led by the Treasurer, Geoffrey Grimmett, have brought essential reduction of our financial obligations in financing several open access (true OA!) journals, sponsored by the Bernoulli Society. And the collaboration of Geoffrey and Herold Dehling, the Publication Secretary, resulted in substantial reduction of publication costs of *Bernoulli*.

Finally, an essential simplification of the membership structure of the Bernoulli Society has been achieved. This was done by a personal involvement of Claudia in tight collaboration with the responsible officers of ISI. The procedure required tact and patience and brought a decay in the official number of memberships, but now we have a real picture. [. . .]

... Continued on p. 1

Deadline for the next issue: **31 March, 2022**
Send contributions to: *manuele.leonelli@ie.edu*

A View from the President (continued from front cover)

We should thank at this place Claudia and her whole Team. It is my strong feeling that the Bernoulli Society will benefit from their devoted work over many years!

We enter the new presidential term with a hope that the pandemic will remain under control and all standard activities will return. We expect that the energy and the experience represented by our new officers will contribute to the success of our society. I am pleased to welcome the President-Elect Victor Panaretos and new Councillors: David Aldous, Susanne Ditlevsen, Jean-Marie Dufour, Marie-Colette van Lieshout, Rolando Rebolledo Berroeta and Aad van der Vaart. I wish a good luck to Juan Carlos Pardo Millán in chairing the Latin American Regional Committee, to Matthias Löwe in editorship of Stochastic Processes and their Applications and to Bojana Milošević in editorship of e-Briefs. I would also like to congratulate Maria Eulália Vares – the first ever winner of the Willem van Zwet Medal.

Given a bit safer financial situation of the Bernoulli Society we can think on modernization and strengthening the technical and administrative support of the society. This is really important, as our Society is involved in many initiatives. The Society's Handbook, initiated by Wilfried Kendall 8 years ago, counts now almost 40 pages of things "to do". We plan to start the modernization in the nearest future.

Another rather urgent task consists in the digitalization of the Society's archives. As all our activities are based on volunteers efforts, we should carefully acknowledge it, wherever it is still possible. Gathering all accessible knowledge related to the Bernoulli Society would also be a preparatory step towards the Society's 50th anniversary. We point out that the dates here are not completely clear. The Bernoulli Book, the symbol of presidency, declares David G. Kendall to be the first President of the Bernoulli Society (1973-1975). On the other hand, Jef Teugels in his article, available at `http://www.bernoulli-society.org/history`, states that

"The Bernoulli Society has been officially created on 10 June 1975 at Voorburg in the Netherlands"

and that the first formally appointed president for the term 1975-1977 was David Blackwell. In this context, a reasonable choice seems to be celebrating the semicentennial of the Bernoulli Society during the whole term 2023-2025, with top events organized during the next, 11th Bernoulli – IMS World Congress in Bochum in 2024.

I would like to conclude my first presidential view by an excerpt from the article "A Conversation in the Polish Space" by Krzysztof Burdzy and myself, published in this issue of *Bernoulli News*.

"Our random walk in the space of historical events has brought us to the early 1920s. That was an exciting period for probability theory. In 1922 the direct part of what is nowadays called the Lindeberg–Feller Central Limit Theorem was published. Lindeberg's result was obtained by a new method that is still of interest. In 1924 Khintchine's Law of the Iterated Logarithm appeared in (once again) *Fundamenta Mathematicae*. These are just two of many examples of fundamental developments in that golden age of probability theory. I plan to make the preparation for the celebrations of centennials of the above milestones in probability theory one of the main undertakings of my presidency. In particular, I am going to encourage organizing conference sessions placing the above cornerstone results in a historical context."

Adam Jakubowski
President of the Bernoulli Society
Toruń

News from the Bernoulli Society

Meeting of the Presidents

"*A Meeting of Presidents*" took place in EPF Lausanne on September 9th, 2021. As the name suggests, the participants were Claudia Klueppelberg (Past President), Adam Jakubowski (President) and Victor Panaretos (President-Elect). The meeting completed the process of transition of presidency, initiated during the General Assembly that was held virtually on July 8th, 2021. As all the participants were present in person, a handing on "*The Bernoulli Book*" (the symbol of presidency) was possible (see the picture in the cover of this issue).

This formal event was, of course, only a part of the meeting. Most of the time was devoted to discussion of the present state of the Bernoulli Society, forthcoming challenges and necessary steps to be done in the nearest future.

Adam Jakubowski
The President
Toruń

Victor Panaretos is Nominated President Elect

The Nominating Committee of the Bernoulli Society has selected Victor Panaretos as the next President- Elect of the society.

Victor Michael Panaretos (born 1982) is a Greek mathematical statistician. He is currently Professor and Director at the Institute of Mathematics of the EPFL, where he holds the Chair of Mathematical Statistics.

He works at the interface of nonparametric statistics, random processes, and stochastic geometry. He is known for contributions to the functional data analysis of random functions, operators, and measures. He has published widely in statistical theory and methods as well as in applied probability, and is the author of two books.

Panaretos received his PhD from the University of California, Berkeley in 2007, advised by David R. Brillinger. His doctoral thesis was awarded the Erich Lehmann Award. Upon graduation he took up a faculty position at EPFL, becoming the youngest person ever to be appointed to a Chair at the institution. He is an Elected Member of the International Statistical Institute and a Fellow of the Institute of Mathematical Statistics. He was a recipient of an ERC Starting Grant Award in 2010, and the 2019 Bernoulli Society Forum Lecturer.

An active member of the Bernoulli Society and its parent organization, the International Statistical Institute, Panaretos has served the probability and statistics community from several posts, notably as the Editor of Bernoulli News, and a member of the ISI Council.

He has served on the editorial boards of the Annals of Statistics, the Annals of Applied Statistics, Biometrika, the Electronic Journal of Statistics, and the Journal of the American Statistical Association.

The Editor
Madrid

New Ordinary Council Members of the Bernoulli Society

The Nominating Committee of the Bernoulli Society has nominated the following six outstanding researchers as Ordinary Council Members of the Society for the period 2021-2025: David Aldous (UC Berkley, USA); Susanne Ditlevsen (University of Copenhagen, Denmark); Jean-Marie Dufour (McGill University, Canada); Marie-Colette van Lieshout (University of Twente, The Netherlands); Rolando Rebolledo (University of Valparaiso, Chile) and Aad van der Vaart (TU Delft, The Netherlands). A short Bio of each council member is reported below.

David Aldous is Professor Emeritus at University of California, Berkeley. He received his Ph.D. from Cambridge University in 1977 and joined Berkeley in 1979. He has served as a Founding Editor of Probability Surveys and as Associate Editor for journals including Annals of Probability, Annals of Applied Probability, Electronic J. Probability, Random Structures and Algorithms, and currently for American Math Monthly. He has served on the Institute of Mathematical Statistics Council (1987-1989) and on the Scientific Advisory Boards of two research institutes (MSRI and PIMS). He is a Fellow of the Royal Society and a Foreign Associate of the U.S. National Academy of Sciences. His research in mathematical probability has covered weak convergence, exchangeability, Markov chain mixing times, continuum random trees, stochastic coalescence and spatial random networks. Currently he is involved in articulating critically what mathematical probability says about the real world.

Susanne Ditlevsen is professor of Statistics and Stochastic Models in Biology at the Department of Mathematical Sciences, University of Copenhagen. She studied in Spain, and did her PhD in Biostatistics (2005). She has served or is serving as associate editor of Scandinavian Journal of Statistics, Biometrika, Mathematical Biosciences and Engineering, and Journal of Mathematical Psychology. Ditlevsen was the scientific coordinator of the Excellence Programme Dynamical Systems Interdisciplinary Network (2013-2017), and has been granted the Data Science Distinguished Investigator by Novo Nordisk Foundation (2020-2024). She has co-organized and chaired many international meetings, conferences, summer schools and scientific committees. Ditlevsen is elected member of the ISI, elected board member of the European Society for Mathematical and Theoretical Biology, elected member of the European Mathematical Society, Applied Mathematics Committee, and an elected member of the Royal Danish Academy of Sciences and Letters. She won the Teacher

of the Year 2017 at the faculty of Science, University of Copenhagen. She has published more than 70 scientific papers. Her main research interests are statistical inference for stochastic processes, mathematical neuroscience, statistical inference in complex and high-dimensional datasets from ecological applications, and biostatistics. She has close collaborations with biologists, physiologists and psychologists.

Jean-Marie Dufour is the William Dow Professor of Political Economy at McGill University. From 2007 to 2016, he also was Bank of Canada Research Fellow and before 2007, he held the Canada research Chair in econometrics at the Université de Montréal. Through his expertise in applying statistical and mathematical techniques to economic issues, Professor Dufour has made important contributions to the fields of dynamic macroeconomic modelling, structural macroeconomics and finance, inflation, the pricing of financial assets, taxation and investment, and export financing. The quality of his research has been recognized by several prizes. Jean-Marie Dufour has been very active in scientific organizations and conference organizations, including: President of the Canadian Economics Association (2002-2003), President of the Société Canadienne de Science Économique (1999-2000), Director of the Canadian Econometric Study Group (since 2002), and Director of the Centre de recherche et développement en économique. He recently organized in Montréal the 2015 World Congress of the Econometric Society.

Marie-Colette van Lieshout was educated at Free University and CWI Amsterdam. She started her career as lecturer at the University of Warwick before moving back to CWI as senior researcher. She also holds a chair in spatial stochastics at the University of Twente. She has published around 60 scientific papers and 5 books in stochastic geometry, spatial statistics and image analysis. Her research concerns the modelling and analysis of complicated geometrical structures such as point and object processes, random fields and tessellation models. Van Lieshout is an elected member of the ISI. She is a board member of the Dutch Royal Mathematics Society, currently serving as its secretary and was a member of the editorial boards of several journals, including Bernoulli and Methodology and Computing in Applied Probability.

Rolando Rebolledo Berroeta is Full Professor at the University of Valparaíso, Chile. He got his "Docteur d'État ès-Sciences" grade in Mathematics at the Université Pierre et Marie Curie, France. He has been a Professor at the University of Chile, at the Université Paris-Sud (Orsay) and a Full Professor at the Pontificia Universidad Católica de Chile from 1981 to 2016. During his career, he has been a visiting professor at many universities in Europe, Latin America, Australia and the United States. His prior research focused on Limit Theorems for Stochastic Processes, in particular, the Central Limit Theorem for Local Martingales and Semi-martingales. Later, inspired by the interrelation of Probability Theory with other disciplines (Dynamical Systems, Analysis, Operator Algebras), he started investigations in Open Quantum Systems, more precisely, in the raising Theory of Quantum Markov Semigroups. He served or serves as associate editor of: Stochastic Processes and Applications, Infinite Dimensional Analysis and Quantum Probability, Communications on Stochastic Analysis. Fellow of the ISI, and one of founders of the Latin America Committee of the Bernoulli Society, as well as the Latin America and Caribbean Mathematical Union (UMALCA), Rebolledo has chaired the IMU-Commission for Development and Exchange.

Aad van der Vaart is a professor of statistics at Delft University of Technology. He earlier held a 25 year position at VU University Amsterdam next to shorter commitments in the USA and France. He served as the scientific director of mathematical institutes in Leiden and Amsterdam. His main research is in mathematical statistics, with an emphasis on semiparametric models, high- and infinite dimensional Bayesian methods, empirical processes, and uncertainty quantification and causality. He has also been involved in applied statistical projects including projects in demography, genetics, genomics, finance, and PET and MEG imaging. He served as associate editor of nine journals and fulfilled a number of other administrative functions. The latter includes serving as the local organising chair of the European Meeting of Statisticians 2015, as the program chair of this meeting in 2005, and as the chair of the European Regional Committee of the Bernoulli Society from 2008-2010. Aad van der Vaart was supervisor to more than 20 PhD students and an about equal number of postdocs, helped by funding of the Netherlands Science foundation and the European Research Council.

The Editor
Madrid

Call for nominations of President-Elect and Council Members

At the General Assembly of the Bernoulli Society, held online on July 8th, 2021, a Nominating Committee was established. It consists of Adam Jakubowski (President of the BS), Victor Panaretos (President-Elect, Chair), Herold Dehling, Leonardo Rolla, Christina Goldschmidt, Marcos Valdebenito, Gesine Reinert, Gerda Claeskens, Zengjing Chen, Juan Carlos Pardo Millán and Song Xi Chen (Scientific Secretary). The task of the committee is to make nominations for the office of President-Elect (2023-2025) and for ordinary Council members for the term 2023-2027. All members of the Bernoulli Society are invited to submit names of possible candidates (with basic information and the web address) to Victor Panaretos (victor.panaretos@epfl.ch) by December 31st, 2021.

Adam Jakubowski
The President
Toruń

Awards and Prizes

Maria Eulália Vares wins the Willem van Zwet Medal

Maria Eulália Vares from Universidade Federal do Rio de Janeiro won the first *Willem van Zwet Medal* for special service to the Bernoulli Society. The award is a recognition for her outstanding service to the Bernoulli Society as Publications Committee member and chair, and as Editor of Stochastic Processes and their Applications (SPA). She played a key part in negotiations with Elsevier concerning Stochastic Processes and their Applications, showing great leadership in helping to obtain better prices and open access conditions for SPA and initiation of Elsevier's support for young researchers and students to participate in Bernoulli Society sponsored meetings, among other benefits. She has also served the Latin American Regional Committee and joined in organization of Bernoulli-sponsored events such as the Brazilian School of Probability, thus promoting the development of Probability and Mathematical Statistics in Latin America.

Congratulations Maria Eulália!

Florencia Leonardi
Member of the Award Committee
São Paulo

Call for 2022 COPSS Awards Nominations

Each year, the statistical profession recognizes outstanding members at the Joint Statistical Meetings in an awards ceremony organized by the Committee of Presidents of Statistical Societies (COPSS). The nominations are being sought for The Presidents' Award, The Distinguished Achievement Award and Lectureship, The Elizabeth L. Scott Award and Lectureship, The COPSS Leadership Academy Award. The deadline for nominations is December 15, 2021. More information about these awards can be found at`https://community.amstat.org/copss/awards/nominations`.

Bojana Milošević
Editor of E-Briefs
Belgrade

Bernoulli Society New Researcher Award 2022

The New Researcher Award recognizes the work of outstanding young researchers who are members of the Bernoulli Society. This year the award was for innovative contributions in the field of Probability Theory. The award committee chose the following new researchers for the award: Jacopo Borga (Stanford University); Jere Koskela (University of Warwick); Konstantin Matetski (Columbia University). Each of the above awardees is invited to deliver an invited talk during the 42nd Conference on Stochastic Processes and their Applications to be held in Wuhan, China, June 27 - July 1, 2022, and will receive a funding up to 1000 Euro to offset travel and other expenses.

Jacopo Borga is a Szegő Assistant Professor in the Mathematics Department of Stanford University. He holds a Master degree in Mathematics from Padua University and Sorbonne University. Jacopo obtained his Ph.D. from University of Zürich in 2021, supervised by Valentin Féray and Mathilde Bouvel. He is mainly interested in probability theory with connections to combinatorics. His work focuses on various random discrete structures such as random permutations, random walks, random trees and random planar maps. In particular, he studies their continuous and discrete limits and looks at universality phenomena.

Jere Koskela is an associate professor at the statistics department at Warwick. He obtained his Ph.D. in Mathematics and Statistics from the University of Warwick and then was a postdoctoral researcher at Technical University of Berlin. His research interests include Monte Carlo methods, statistical inference from stochastic processes and in settings with intractable likelihood, Bayesian nonparametric statistics, coalescent processes, and mathematical population genetics.

Konstantin Matetski is a Joseph F. Ritt Assistant Professor at Columbia University. He holds a Master degree in Mathematics from University of Bonn and obtained his Ph.D. in Mathematics in 2016 from Warwick under the supervision of Martin Hairer. He was then a postdoctoral researcher at the University of Toronto. Konstantin works on stochastic PDEs, including regularity structures and rough paths, and he is interested in integrable probability and the KPZ universality, as well as in limiting behavior of interacting particle systems.

Sebastian Engelke
Membership Secretary
Geneva

Call for Nominations for the 2022 Wolfgang Doblin Prize

The Bernoulli Society for Mathematical Statistics and Probability welcomes nominations for the 2022 Wolfgang Doeblin Prize.

The Wolfgang Doeblin Prize, which was founded in 2011 and is generously sponsored by Springer, is awarded biannually to a single individual who is in the beginning of his or her mathematical career, for outstanding research in the field of probability theory. The awardee will be invited to submit to the journal Probability Theory and Related Fields a paper for publication as the Wolfgang Doeblin Prize Article, and will also be invited to present the Doeblin Prize Lecture at a Conference on Stochastic Processes and their Applications.

More information about the Wolfgang Doeblin prize and past awardees can be found at `http://www.bernoulli-society.org/index.php/prizes/`.

Each nomination should offer a brief but adequate case of support and should be sent by December 30, 2021, to the chair of the prize committee, Christina Goldschmidt, at the following e-mail address: :goldschm@stats.ox.ac.uk with subject heading: Doeblin Prize 2022.

Bojana Milošević
Editor of E-Briefs
Belgrade

New Executive Members in the Bernoulli Society

Chair of the Latin American Regional Committee: Juan Carlos Pardo Millán

Short Bio: Juan Carlos Pardo is a full professor and currently the head of the department of Probability and Statistics at Centro de Investigación en Matemáticas (CIMAT) in Guanajuato, Mexico. He was educated at the Universidad Nacional Autónoma de México (UNAM) and Université de Paris VI (nowadays Sorbonne Université). He has spent over 13 years working on the theory and application of path-discontinuous stochastic processes and has more than 50 publications in these areas. He serves on the editorial boards of the journals Bernoulli, Stochastics and Stochastic Processes and their Applications. During the academic year 2018-2019, he held the David Parkin visiting professorship at the University of Bath.

Editor in Chief of Stochastic Processes and Their Applications: Matthias Löwe

Short Bio: Matthias Löwe is a Full Professor of Applied Mathematics at the Institute of Mathematical Stochastics, University of Münster. Matthias received a PhD at the University of Bielefeld, Germany, under the supervision of Friedrich Götze. After holding various positions both in Germany and in the Netherlands, he joined the University of Münster in 2003. He has published more than 50 research articles in the fields of applied probability and stochastic processes. Currently, he is also an Associate Editor for the Münster Journal of Mathematics.

Vision of the Job: I consider it a challenge, an honor, and a responsibility to be Editor in Chief of Stochastic Processes and Their Applications. We (as the Editorial Board) want to keep in on the high level it has been broad to by previous Editors in Chief, we want to maintain its position as one of the top journals in probability and statistics. To this end we need first class authors, first class referees, and first class editors. We need to be open to new and interesting directions and all areas of probability and statistics and, of course, also to new and interesting researchers.

e-Briefs Editor: Bojana Milošević

Short Bio: Bojana Milošević (born in 1989) is an Assistant Professor at the Faculty of Mathematics, University of Belgrade. She obtained PhD in 2016 at the same University. Bojana's main research field is in the domain of nonparametric statistics, however, with great enthusiasm, she is exploring other fields with a focus on statistical learning. She represented Serbia at the 20th EYSM and was the chair of the organizing committee of the 21st EYSM. Those two events and an extensive bibliography of scientific contributions for her young age has gained her recognition within both the Serbian and international scientific communities.

Vision of the Job: It is a great pleasure to take over the role of the editor of The Bernoulli Society Bulletin e-Briefs from Carlos Améndola and I would like to take this opportunity to thank Carlos for the great job done so far. Nowadays, I found it very important and challenging to create bridges between theory and applications and establishing positive feedback loops among them. Being well informed about forthcoming scientific events - where such connections might be established, and about prizes, job offers, etc. might be helpful toward this aim. One of the main goals of this bulletin is to communicate all relevant information related to the Bernoulli Society in an effective manner.

On extensions of rank correlation coefficients to multivariate spaces

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Communicated by the Editor

This note summarizes ideas presented in a lecture for the *Bernoulli New Researcher Award 2021*. Rank correlations for measuring and testing against dependence of two random scalars are among the oldest and best-known topics in nonparametric statistics. This note reviews recent progress towards understanding and extending rank correlations to multivariate spaces through building connections to optimal transport and graph-based statistics.

Measuring the strength of dependence and testing independence for a pair of random scalars/vectors (X, Y) based on n independent realizations $\{(X_i, Y_i)\}_{i=1}^n$ is a century-old problem. In the univariate case, many correlation coefficients have been proposed and our interest is in those that meet (most of) the following four criteria.

(a) **Distribution-freeness**: the (limiting) distribution of the correlation coefficient under the hypothesis of independence should not depend on the marginal distributions of X and Y;

(b) **Consistency**: the correlation coefficient should consistently estimate a measure of dependence that is 0 if and only if X is independent of Y within a fairly large distribution family of (X, Y);

(c) **Statistical efficiency**: the test of independence based on the correlation coefficient should have nontrivial power over root-n neighborhoods of "smooth" parametric models;

(d) **Computational efficiency**: there should exist a nearly linear-time algorithm to compute the correlation coefficient.

In the above four criteria, we are particularly insistent on the first that was prescribed as the *genesis* of all rank tests [16, Page 1]. Our attention is thus restricted to rank correlation coefficients. A rank correlation coefficient estimates a certain measure of dependence only using the ranks of univariate margins. Distribution-freeness is then immediate given that the probability measure is continuous. [20] introduced the first rank correlation coefficient that, in contrast to other popular ones, satisfies the consistency criterion. In addition, this rank correlation coefficient, ofter referred to as Hoeffding's D, can be computed in $O(n \log n)$ time. In this note we first present some recent results on Hoeffding's D and its variants and in particular, an identity between Hoeffding's D, Blum-Kiefer-Rosenblatt's R [4], and Bergsma-Dassios-Yanagimoto's τ^* [3, 29] that raises interesting connections to local structures in combinatorics [13].

Extending the aforementioned rank correlation coefficients to a multivariate setting when X and Y are multidimensional is a long-studied problem. Componentwise rank-based methods that simply rank univariate margins cannot eliminate within-group dependence and thus fail to be distribution-free in multivariate spaces, neither could other alternatives such as spatial, Mahalanobis, and cone ordering-based ranks [17, Section 3.2]. A recent breakthrough due to [7] and [18] paved an ingenious path towards a solution. It relates multivariate ranks to an optimal transport (OT) problem that studies mappings between the data generating probability to a preset reference measure that is known to the user – noticing that the cumulative distribution function (CDF) is a univariate transport function to the Lebesgue measure over $[0, 1]$. In the second part of this note we will reveal that the corresponding notion of multivariate rank can lead to correlation coefficients that achieve the first three goals, yet are not computationally efficient.

In addition to the OT-based extension of rank correlations to higher dimensions, in recent years there has been a growing interest in connecting rank correlations to graph-based statistics. Some rather remarkable results are due to Mona Azadkia and Sourav Chatterjee in their two recent papers [6, 2]. Noticing that the univariate ranks could also be understood as a correspondence to a 1-nearest neighbor (1-NN) graph — although NN graphs are metric-based but not the univariate ranks — they built a measure of dependence and its estimates over 1-NN graphs. In the third part of this note we will show their proposal leads to multivariate rank correlation coefficients that successfully achieve the goals of (a), (b), (d), but are not statistically efficient, though ways to boost efficiency were recently proposed.

§1. *Univariate rank correlation coefficients*

Spearman's ρ and Kendall's τ, like Pearson's correlation coefficient, do not satisfy the consistency property; a canonical example is the bivariate-t distribution which cannot admit independent components. Letting $F(\cdot, \cdot), F_X(\cdot), F_Y(\cdot)$ be the bivariate and marginal CDFs of (X, Y), X, and Y, respectively, Hoeffding [20] intro-

duced the following correlation measure,

$$D = \int \Big\{F(x,y) - F_X(x)F_Y(y)\Big\}^2 \mathrm{d}F(x,y);$$

assuming F is absolutely continuous, D is zero if and only F corresponds to a product measure. Furthermore, noticing that D is equal to $\mathrm{E}\mathbf{1}(X_1 \le X_3, Y_1 \le Y_3)\mathbf{1}(X_2 \le X_3, Y_2 \le Y_3) - 2\mathrm{E}\mathbf{1}(X_1 \le X_4, Y_1 \le Y_4)\mathbf{1}(X_2 \le X_4)\mathbf{1}(Y_3 \le Y_4) + \mathrm{E}\prod_{j=1}^{2}\mathbf{1}(X_j \le X_5)\prod_{k=3}^{4}\mathbf{1}(Y_k \le Y_5)$, an unbiased estimator of D could then be constructed as

$$\widehat{D}_n = \binom{n}{5}^{-1} \sum_{i_1<\ldots<i_5} h_D\{(X_{i_1}, Y_{i_1}), \ldots, (X_{i_5}, Y_{i_5})\},$$

which constitutes a U-statistic of order 5. Since the kernel function $h_D(\cdot)$ only involves ordinal comparisons of the inputs, $\widehat{D}_n$ is a rank correlation coefficient. Two more such rank correlation coefficients were later proposed by [4] (denoted as $\widehat{R}_n$) and [3] (denoted as $\widehat{\tau}_n^*$); they are U-statistics of orders 6 and 4 separately, and are both rank-based. The following items document their advantages.

(1) All three rank correlation coefficients are rank-based and hence satisfy the criterion (a). As a matter of fact, under independence they all weakly converge to a convolution of weighted chi-square distributions of distribution-free weights; cf. Shi et al. [27, Proposition 4].

(2) All three satisfy the criterion (b) for absolutely continuous measures; cf. Shi et al. [27, Propositions 2 and 3].

(3) All three lead to tests of independence admiting nontrivial power over root-n neighborhoods within the class of quadratic mean differentiable alternatives and thus satisfy the criterion (c); cf. Shi et al. [27, Theorem 1].

(4) All three can be computed in $O(n \log n)$ time, which is via Hoeffding [20, Section 5], Even-Zohar and Leng [13, Corollary 4], and the following identity

$$3\widehat{D}_n + 2\widehat{R}_n = 5\widehat{\tau}_n^*$$

that is due to Drton et al. [12, Equ. (6.1)], who traced it back to Yanagimoto [29, Proposition 9]

(5) Technically speaking, under independence all three rank correlations are degenerate U-statistics. Our recent works have established Cramér-type moderate deviation theorems and Bernstein-type tail bounds in complex stochastic systems for such statistics; cf. Drton et al. [12, Theorem 4.1] and Shen et al. [24, Theorem 2.1].

§2. OT-based correlation coefficients

Starting from this section, let's consider either X or Y or both of them are multivariate. Since a canonical ordering in general does not exist in a multidimensional space, extending rank correlation coefficients to higher dimensions is non-trivial and all existing extensions available into the 2000s are either lacking distribution-freeness in general or hard to compute [17, Section 3.2]. A major breakthrough was made in 2017, when Chernozhukov, Galichon, Hallin, and Henry [7] successfully connected the notion of multivariate CDF, and accordingly the notion of multivariate rank, to optimal transport.

Thinking about the univariate CDF as a mapping or *transport* from the data generating probability to the Lebesgue measure over $[0,1]$, their idea can be briefly described as follows. For any probability measure P in $\mathbb{R}^d$, set up a reference probability measure ν in $\mathbb{R}^d$ and then define the "multivariate CDF" $F^{\mathrm{P},\nu}$ as a transport from P to ν. As when $d \ge 2$ there generally exist multiple such mappings, define $F^{\mathrm{P},\nu}$ to be the *optimal transport* that minimizes the transportation cost under the squared Euclidean loss (analytically) or, more generally, is the gradient of a convex function $\psi : \mathbb{R}^d \to \mathbb{R}$ (geometrically). The celebrated McCann's theorem [23] guarantees the existence and uniqueness of such an $F^{\mathrm{P},\nu}$ as long as both P and ν are absolutely continuous (w.r.t the Lebesgue measure). Cafarelli-type regularity properties of $F^{\mathrm{P},\nu}$ (e.g., Lipschitz-ness and higher-order smoothness) further exist and were developed in, e.g., Figalli [14, Theorem 1.1] and Hallin et al. [18, Proposition 2.3], among many others.

Turning to statistical estimation of $F^{\mathrm{P},\nu}$, given that an empirical measure P_n of P has been observed, a natural idea is to "discretize" the reference distribution to some ν_n that will weakly converge to ν, and then define $\widehat{F}_n^{\mathrm{P},\nu}$ to be the corresponding optimal transport pushing P_n to ν_n. This is called *plug-in estimation* in optimal transport literature; the estimators' stochastic behavior (e.g., distribution-freeness and maximal ancillarity), uniform consistency as well as the rate of convergence for $\widehat{F}_n^{\mathrm{P},\nu}$ to estimate $F^{\mathrm{P},\nu}$ have already been established [7, 15, 18, 9, 22].

Now let's set up two regular reference distributions ν_X and ν_Y as "couples" of P_X and P_Y (the marginal probability measures of X and Y), respectively. We are then ready to define OT-based correlation coefficients as extensions to rank-based ones. Think about a generic multivariate correlation coefficient such as a U-statistic of order m and kernel $H(\cdot)$; one canonical example is the distance covariance with more to be found in Shi et al. [28, Section 2]. We then in-

troduce OT-based correlation coefficients as those that admit the same U-statistic form but with the input changed from the original data to its multivariate ranks, $\{(\widehat{F}_n^{\mathrm{P}_X,\nu_X}(X_i), \widehat{F}_n^{\mathrm{P}_Y,\nu_Y}(Y_i))\}_{i=1}^n$. The following items summarize the proposal's properties.

(1) OT-based correlation coefficients satisfies the distribution-freeness criterion, and their limiting null distributions are only dependent on ν_X, ν_Y that are known to the user; cf. Shi et al. [25, Theorem 3.1] and Deb and Sen [10, Theorem 4.1] for a special example of distance covariance, and Shi et al. [28, Corollary 5.1] for a general one.

(2) As long as the original multivariate correlation coefficient is consistent, the corresponding OT-based extension is consistent. This is due to the measure-preserving nature of the optimal transport; cf. Shi et al. [28, Proposition 5.3].

(3) Tests of independence built on OT-based correlation coefficients are statistically efficient, namely, they have nontrivial power over root-n neighborhoods within the class of quadratic mean differentiable alternatives; cf. Shi et al. [28, Theorem 5.3].

(4) As long as one of X and Y is multidimensional, there does not exist an algorithm to compute any considered OT-based correlation coefficient in nearly linear time; the time complexity is normally between $O(n^2)$ and $O(n^4)$; cf. Shi et al. [28, Section B.3].

(5) Technically speaking, the weak convergence results could be established using the permutation uniformity nature of OT-induced ranks and thus combinatorial inference tools; this route was explored in Shi et al. [25, Theorems 4.1 and 4.2]. Different from that, we employed Hájek representation theorems, which facilitate local power analyses via invoking Le Cam's third lemma [28]. Using either way, the limiting null distribution can be established without resorting to any sort of rate of convergence for $\widehat{F}_n^{\mathrm{P},\nu}$ but only consistency.

§3. Graph-based correlation coefficients

Graph-based inference encompasses a long and rich literature in nonparametric statistics and has been applied to test independence by, for example, drawing a data-driven (e.g., tree-structured) partition and then summarizing information across bins; cf. [19]. [6] and later [2] recently introduced an ingenious way to estimate the following measure of dependence between a random scalar Y and a random vector X whose format was first proposed in [11]:

$$\xi = \frac{\int \mathrm{Var}\big\{\mathrm{E}\big[\mathbf{1}\big(Y \geq y\big) \mid X\big]\big\}\mathrm{d}F_Y(y)}{\int \mathrm{Var}\big\{\mathbf{1}\big(Y \geq y\big)\big\}\mathrm{d}F_Y(y)}.$$

This dependence measure has some rather appealing properties including, in particular, the capability of being both consistent (i.e. $\xi = 0$ if and only if Y is independent of X) and able to detect **perfect dependence** (i.e., $\xi = 1$ if and only if Y is a measurable function of X).

To estimate ξ, let R_i represent the rank of Y_i among $Y_1, \ldots, Y_n$ and $N(i)$ index the nearest neighbor of X_i; the following graph-based correlation coefficient can be shown to be a strongly consistent estimator of ξ:

$$\xi_n = \frac{\sum_{i=1}^n \min(R_i, R_{N(i)}) - (n+1)(2n+1)/6}{(n^2-1)/6}.$$

To understand it, let's recall the law of total variance for ξ and that

$$\mathrm{E}[\mathrm{Var}\{\mathbf{1}(Y \geq t) \,|\, \boldsymbol{X}\}] \approx \frac{\mathrm{E}\big\{\mathbf{1}(Y_1 \geq t) - \mathbf{1}(Y_{N(1)} \geq t)\big\}^2}{2}$$

with

$$\begin{aligned}
&\frac{1}{2}\int \mathrm{E}\big\{\mathbf{1}(Y_1 \geq t) - \mathbf{1}(Y_{N(1)} \geq t)\big\}^2 \mathrm{d}\mathrm{P}_Y(t) \\
&\approx \int \mathrm{E}\big\{1(Y_1 \geq t) - 1(Y_1 \geq t)1(Y_{N(1)} \geq t)\big\}\mathrm{d}\mathrm{P}_Y(t) \\
&= \mathrm{E}\big[F_Y(Y_1) - \min\{F_Y(Y_1), F_Y(Y_{N(1)})\}\big] \\
&\approx \mathrm{E}[R_1/n - \min(R_1, R_{N(1)})/n],
\end{aligned}$$

so that $\mathrm{E}\xi_n$ is approximately ξ.

Azadkia and Chatterjee conjectured that under independence $\sqrt{n}\xi_n$ is asymptotically normal. In [26] we resolved this conjecture based on an elegant prior work of [8].

Theorem [*Distribution-freeness of* ξ_n]. Assume Y in $\mathbb{R}$ is continuous and independent of X in $\mathbb{R}^p$, which is absolutely continuous. We then have, as $n \to \infty$,

$$\sqrt{n}\xi_n \longrightarrow N\Big(0, \frac{2}{5} + \frac{2}{5}\mathfrak{q}_p + \frac{4}{5}\mathfrak{o}_p\Big) \text{ in distribution,}$$

where $\mathfrak{q}_p$ and $\mathfrak{o}_p$ are explicitly defined in Shi et al. [26, Equ. (3.2) and (3.3)] and, in particular, are independent of P_X and P_Y.

The following items summarize ξ_n's properties.

(1) Azadkia-Chatterjee's graph-based correlation coefficient satisfies the criterion (a) and a test of independence built on it is directly implementable without recurring to permutational critical values; cf. Theorem 1 above.

(2) It is further consistent in view of ξ's property; cf. Shi et al. [26, Proposition 2.3].

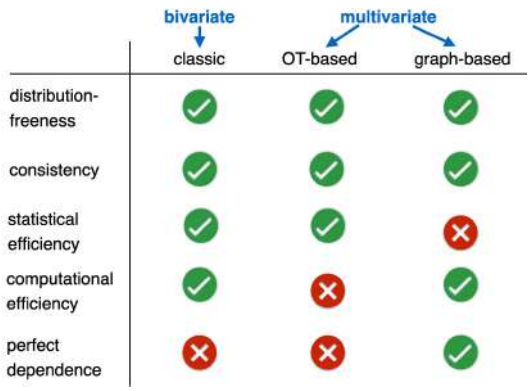
(3) Tests of independence built on Azadkia-Chatterjee's graph-based correlation coefficient are statistically *inefficient*. In the case $p = 1$, this is proved in [5] and [27] and the critical detection boundary is shown to be at the order of $n^{-1/4}$ in a regular model [1]; the higher dimensional result is first derived in Shi et al. [26, Theorem 4.1].

(4) For $p = 1$, we recently devised a revision of Azadkia-Chatterjee's original proposal that provably boosts the power to be nearly parametrically efficient; cf. [21].

(5) The correlation coefficient can be computed in $O(n \log n)$ time due to the fast speed to conduct a nearest neighbor search.

(6) Technically speaking, the theoretical results are built on large-sample properties of nearest neighbor graphs, central limit theorems under local dependence, conditional central limit theorem, and Le Cam's third lemma.

Figure 1 gives a summary of the results.



Summary of discussed correlation coefficients' properties.

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A Conversation in the Polish Space

On September 8th, 2021, Krzysztof Burdzy became the President of the Institute of Mathematical Statistics (IMS). The next day Adam Jakubowski obtained the "Bernoulli Book" — the symbol of presidency of the Bernoulli Society for Mathematical Statistics and Probability (BS). Both presidents of the sister societies grew up in Poland and graduated from college in the 1970s, majoring in mathematics. Later, their career paths were completely different but each one was representative of a large segment of the Polish scientific community in their generation.

IMS President Krzysztof (Chris) Burdzy

Bernoulli Society President Adam Jakubowski

A.J. What is the probability that the BS and IMS would have presidents of Polish origin at the same time?

K.B. Your question gives me an opportunity for a shameless plug and for a display of Polish pride. I have published two books on the philosophical foundations of probability, titled *The Search for Certainty* and *Resonance*. According to the followers of de Finetti, symmetries in probability are subjective, so I am free to apply a symmetry in the form of equally likely events as follows. The current world population is about 7.7 billion and the current Polish population is about 38 million. Hence, the probability that the Presidents of BS and IMS would be Polish in 2021 was

$$(38 \text{ million}/7.7 \text{ billion})^2 \approx 2.43548659 \times 10^{-5}.$$

According to the followers of von Mises, probability is equal to frequency. Out of 85 IMS Presidents preceding me, three were Polish: Jerzy Neyman, Bill Birnbaum and Mark Kac. Hence the probability of a Polish IMS President in 2021 was $3/85 \approx 0.03529$. None of the 24 BS Presidents preceding Adam was Polish. It follows that the probability of a Polish BS President in 2021 was $0/24 = 0$. The probability that both Presidents of BS and IMS would be Polish in 2021 was $0.03529 \times 0 = 0$. If you, the reader, do not like these probability calculations, please read my books on the philosophical foundations of probability.

A.J. You applied the same method as Alexander the Great when he cut the Gordian knot. I would rather expect you to construct a suitable configuration space of paths representing our scientific lives and to calculate the probability of a coupling—the coincidence in time of our presidencies.

The calculation could be simplified by the fact that the model has a fixed point—I have been anchored at the Nicolaus Copernicus University in Toruń, Poland, for almost fifty years now (but with many international collaborations and professional travel). My attachment to Toruń was so unusual in the 1980s, when many Polish mathematicians emigrated, that when I was a Humboldt fellow in Göttingen, people used to ask me whether I was the last probabilist in Poland. I was not, of course, but the question illustrated well those times.

I seem to recall that, in contrast, your scientific path had a high quadratic variation.

K.B. Indeed, I went to college in Lublin, Poland, and then I successively jumped to Wrocław, Poland; Berkeley, California; San Diego, California; Lublin, Poland; West Lafayette, Indiana (the home of Purdue University); and finally Seattle, Washington. Polish mathematicians emigrated not only in the 1980s. A number of them emigrated between the two World Wars, despite the fact (or because of the fact?) that this period was the heyday of Polish mathematics. The former Polish IMS Presidents, Jerzy Neyman, Zygmunt William (Bill) Birnbaum and Mark Kac, obtained their PhD degrees in Poland. In this sense, they were Polish. They were also American, having spent most of their lives in the US, and the last two were Jewish. All three were born before Poland re-emerged in November 1918, after more than a century of partitions. The last two scientists obtained their doctoral degrees in Lwów, a city then in Poland, now in Ukraine. The lives of all three researchers illustrate well the turbulent events of the twentieth century

A.J. Our concurrent presidencies, an extremely improbable event, are best explained by a conspiracy theory. Our friend, Jerzy Zabczyk, a member of the Polish

Academy of Sciences, pointed out that everything goes back to 1923. That year two papers were published in *Fundamenta Mathematicae*: Antoni Łomnicki's "Nouveaux fondements du calcul des probabilités" and Hugo Steinhaus' "Les probabilités dénombrables et leur rapport à la théorie de la mesure". Both papers influenced the axiomatic approach to probability theory as presented in the seminal Kolmogorov's short book *Grundbegriffe der Wahrscheinlichkeitsrechnung*. Moreover, Steinhaus was the PhD adviser of both Birnbaum and Kac (while Neyman's adviser was Wacław Sierpiński at the Warsaw University). If you put these facts together, everything becomes clear!

Our random walk in the space of historical events has brought us to the early 1920s. That was an exciting period for probability theory. In 1922 the direct part of what is nowadays called the Lindeberg–Feller Central Limit Theorem was published. Lindeberg's result was obtained by a new method that is still of interest. In 1924 Khintchine's Law of the Iterated Logarithm appeared in (once again) *Fundamenta Mathematicae*. These are just two of many examples of fundamental developments in that golden age of probability theory.

I plan to make the preparation for the celebrations of centennials of the above milestones in probability theory one of the main undertakings of my presidency. In particular, I am going to encourage organizing conference sessions placing the above cornerstone results in a historical context.

What will be the goals of your presidency?

K.B. I am afraid that my plans pale as mundane undertakings compared to your flirtation with grand historical events. The IMS faces a number of challenges of systemic nature. Among these are diversity, equity and inclusion issues; expanding our connection with various communities comprising "data science"; improving our appeal to junior researchers to enlarge our membership base; invigorating our outreach efforts via social media and other means; and reviewing our special lecture guidelines.

I have a feeling that we have somewhat different attitudes, styles and plans—this is good news. I hope to have regular conversations with you so that I can use your complementary ideas as an inspiration. Best wishes for your presidency

A.J. It was great talking to you. Best wishes!

Past Conferences, Meetings and Workshops

Organized, Sponsored and Co-Sponsored by Bernoulli Society for Mathematical Statistics and Probability

Bernoulli-IMS 10th World Congress in Probability and Statistics: July 13-19, 2021; online

The Bernoulli-IMS 10th World Congress in Probability and Statistics, jointly sponsored by the Bernoulli Society (BS) and the Institute of Mathematical Statistics (IMS), took place virtually at the Seoul National University, Korea from July 13 to 19, 2021.

The 10th World Congress was originally scheduled to be held during August 2020 but was postponed by a year due to COVID-19 pandemic. In March 2021 it was then decided to host it virtually and `https://wc2021.info/` was set up as the virtual host site for all talks (videos/slides) alongside `https://www.wc2020.org/` the original site of the congress.

The program featured 15 main speakers. Nine of these were named lectures sponsored by the two societies. They were – 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 (ICREA & Pompeu Fabra University); Doob Lecture: Nicolas Curien (Paris-Saclay University); Schramm Lecture: Omer Angel (University of British Columbia). There were five IMS Medallion Lectures. These were given by: Gerard Ben Arous (New York University); Andrea Montanari (Stanford University); Elchanan Mossel (MIT); Laurent Saloff-Coste (Cornell University); Daniela Witten (University of Washington). There was one public lecture and it was delivered by Young-Han Kim (UCSD and Gauss Labs Inc). Susan Murphy (Past president of IMS) gave the IMS presidential address. Claudia Klüppelberg (Past President of the Bernoulli Society) gave the closing remarks in the last session of the congress.

There were 41 invited sessions, out of which 36 were done by individual session organisers, two sessions organised by Korean Statistical Society, two sessions devoted to young researchers namely: Bernoulli Society New Researcher Award Session and IMS Lawrence D. Brown Ph.D. Student Award Session sessions, and Bernoulli Paper Prize Session. In addition to these, there were 30 organized contributed sessions, 35 individual contributed talk sessions, 5 Poster sessions.

There were 755 registered participants from 41 countries. All invited session, contributed session and contributed talk speakers pre-recorded their talks and provided slides which were updated to the website. Further the videos of the live sessions and also the 15 named and live lectures given by the speakers were also uploaded to the website. The live sessions were well attended and there were over 11000 views of the videos on the conference website (counting multiplicities) making it a very successful meeting. These we hope will be valuable resource as they will be hosted on the website for another year.

Siva Athreya and Hee-Seok Oh
Scientific Program Committee
Kolkata and Seoul

Bernoulli-IMS 10th World Congress in Probability and Statistics, Young Researchers Meeting 2021: 17–18 July, online

The Young Researchers Meeting of the Bernoulli-IMS 10th World Congress in Probability and Statistics was originally supposed to happen physically in Seoul, Korea, in the campus of the Seoul National University. However, due to the COVID-19 pandemic, this event eventually took place virtually during July 17-18, 2021 (weekend prior to the main congress dates). The main objectives of this two-day meeting were: (1) to stimulate interest of international young researchers (broadly defined as doctoral students, post-doctoral fellows or equivalent, and even early-stage assistant professors/lecturers) in a rapidly evolving field of data science by offering lectures/discussions at a level more tailored to this audience; (2) to give support and perspective to young researchers with regard to mapping out their future career - especially for participants from developing countries; and (3) to allow young researchers with common research interests to network amongst their peer group.

Bibhas Chakraborty (National University of Singapore, Singapore, and Duke University, USA) led the overall organization together with Jialiang Li (National University of Singapore, Singapore), Kyusang Yu (Konkuk University, Korea), Chae Young Lim (Seoul National University, Korea), Imma Curato (Ulm University, Germany), Zhenhua Lin (National University of Singapore, Singapore) and Ander Wilson (Colorado State University, USA). We also received various administrative and IT support from the Bernoulli Society and the Seoul National University (event host), without which it would have been impossible to realize the event.

Taking account of the fact that the meeting was aimed at young researchers from the developing world, the theme of "data science" was chosen. The first day was dedicated to the academic theme of data science. The second day was dedicated to a series of presentations and group discussions that pertain to career development. There was a good mix of senior and junior speakers. This was complemented by several other talks and a poster session by the young participants, as well as a group discussion. Many of the speakers participated in the softer discussion regarding career. There were ample networking opportunities for the young participants via the dedicated social event and the poster session through the innovative platform of Gather.

In total, there were 79 registered participants (including the speakers and organizers). We had registered participants from countries like Australia, Belgium, Brazil, China, Germany, India, Indonesia, Iran, (South) Korea, Morocco, Nigeria, New Zealand, Norway, Philippines, Singapore, Slovenia, Switzerland, UK, US and Uzbekistan.

Given the constraints and limitations of conducting a virtual event during the pandemic, it was overall a fantastic event. More details can be found at `https://www.wc2020.org/sub03_04.php`.

Bibhas Chakraborty
Chair of the Organizing Committee
Singapore

EVA 2021: 28 June-02 July; Edinburgh, UK

EVA 2021 was held on-line over 28 June-02 July 2021. This was the first-time ever online EVA (Extreme Value Analysis) conference, and it gathered more than 340 delegates from all over the world.

The organization of EVA 2021 was led by chairs of the local organizing committee, Ioannis Papastathopoulos and Miguel de Carvalho, in close collaboration with Belle Taylor and Liam Holligan (Centre for Statistics and ICMS—International Centre for Mathematical Statistics) as well as by Johan Segers (Scientific Committee). The meeting was co-hosted by the Centre for Statistics—University of Edinburgh and by ICMS as well as sponsored by the Bernoulli Society, Heilbronn Institute for Mathematical Research, Portuguese Statis-

tical Society (SPE), and Springer. The conference ran virtually in Sococo, with Zoom being used for the live talks; Slack was used to facilitate communication between attendees. A team of skilled, enthusiast, and hard-working local PhD students helped delegates over a virtual helpdesk over Sococo and with queries over Slack's chat.

The programme for EVA 2021 included Plenary Lectures (Dan Cooley, Colorado State Univ; Gabriele Clarissa Hegerl, Univ of Edinburgh), Invited Sessions, Contributed Sessions as well as Poster Presentations. The format was as close as possible to a traditional EVA face-to-face conference. Yet since the event took place online a range of time zones had to be taken into account when designing the programme, and organizers have chosen to set: Europe—Asia (10–1 p.m.), Americas—Europe—Asia (1–4 p.m.), and Americas—Europe (4–7 pm.) (All times are BST). EVA 2021 talks have, where permission has been granted, been recorded and are available from the site

https://edin.ac/3zrSvqX

A panel discussion took place that was chaired by Anna Kiriliouk, and that covered discussion on topics ranging from Causal inference, Machine Learning, Finance, Climate, Engineering, and Energy; panelists included a variety of world-authorities on the topics such as Jonas Peters (Univ Copenhagen), Anne Sabourin (LTCI, Télécom Paris, Institut polytechnique de Paris), Stilian Stoev (Univ Michingan, Ann Arbor), Jon Danielsson (London School of Economics), Jakob Zscheischler (Univ Bern), Thomas Kjeldsen (Univ Bath), and Claudia Neves (Univ Reading).

Two competitions—'Best Student Paper' and the 'Data Challenge'—ran at EVA 2021, both with monetary prizes. The award for the best student paper was given to Dr. Hrvoje Planinic (University of Zagreb). The awards for the Data Challenge competition were given to the following teams as follows:

- 1st place: Domagoj Vlah (University of Zagreb) and Tomislav Ivek (Institute of Physics, Zagreb);
- 2nd place: Jonathan Koh (EPFL);
- 3rd place: Arnab Hazra (KAUST), Daniela Cisneros (KAUST), Rishikesh Yadav (KAUST) and Yan Gong (KAUST).

The winners of competitions as well as the location and chair of EVA 2023 (Milan, Simone Padoan) were announced at a session chaired by Thomas Mikosch—a leading scientist on the field of extreme values and the current editor-in-chief of the journal Extremes.

A day of satellite R workshops (Tutorial on Statistical Computing for Extremes with R), organized by Léo Belzille, was held prior the conference. Further details on EVA 2021 can be found at:

https://www.maths.ed.ac.uk/school-of-mathematics/eva-2021

Miguel de Carvalho and Ioannis Papastathopoulos
Chairs of the Local Organizing Committee
Edinburgh

22nd European Young Statisticians Meeting: September 06–10, 2021; Athens (online), Greece

The 22nd European Young Statisticians Meeting was held during September 06–10, 2021 virtually in Athens, Greece. The European Young Statisticians Meetings (EYSM) is a series of conferences that is organised by and for young European statisticians, and are held every two years under the auspices of the European Regional Committee (ERC) of the Bernoulli Society. This year's was hosted for the first time in Greece, by the Depts. of Psychology and Sociology of Panteion University of Social and Political Sciences, with co-organizers the Athens University of Economics and Business (Department of Statistics) and the University of the Aegean (Department of Statistics and Actuarial-Financial Mathematics).

There were **32 European countries** participating at the 22nd EYSM. Following the tradition of EYSM, there were no parallel sessions, and **57 invited young scientists** gave 20-minutes lectures. The lectures of invited young scientists were divided into **15 sessions** (3 sessions per day). The topics presented include, but are not limited to: applied statistics in biology, medicine, etc., Bayesian inference, change-point detection, characterizations of probability distributions, extreme and record value theory, functional statistics, goodness-of-fit testing, high-dimensional statistics, MCMC methods, regression models, robust estimation, spatial statistics, stochastic processes, survival analysis, and time series analysis, among others.

Moreover, **5 eminent scientists** from the field of mathematical statistics and probability gave 60-minutes keynote lectures. Christian H. Weiss (Helmut Schmidt University, Germany) delivered a lecture titled *On Approaches for Monitoring Categorical Event Series*; Ingrid Van Keilegom (KU Leuven, Belgium) a lecture titled *On a Semiparametric Estimation Method for AFT Mixture Cure Models*; Markos V. Koutras (University of Piraeus, Greece) a lecture on *Distributions of statistics related to random samples of random size and pattern occurrences: theory and applications*; Narayanaswamy Balakrishnan (McMaster University, Canada) a lecture on *Efficient Likelihood-Based Inference for the Generalized Pareto Distribution*; Sylvia Frühwirth-Schnatter (Vienna University of Economics and Business, Austria) a lecture on *From here to infinity - bridging finite and Bayesian nonparametric mixture models in model-based clustering*.

There were many memorable talks, and participants remarked on the high quality of the science and the stimulating discussions they encountered. The meeting ran very smoothly and succeeded to bring together young researchers across Europe, both probabilists and statisticians, and give each group an opportunity to learn what is current in the other's discipline. The Local Organizing Committee (LOC) would like to thank the ERC of the Bernoulli Society for the opportunity given to organize this lovely event. The LOC is also thankful to the International Organizing Committee members for selecting prominent young scientists to attend this conference, as well as for reviewing the papers published in the Conference Proceedings. The help of the administrative staff of Panteion University is very much appreciated, and a special thanks goes to the Sponsors for their assistance. Last, but not least, the LOC would like to thank all Keynote Speakers and Young Participants for providing an excellent scientific program, and great vibes that made this event special, providing invited young scientists the opportunity to present their recent research results, exchange experience, gain new knowledge and establish contacts, in the hope that this event will be a driving force for their future academic achievements.

More information about the Conference, such as the Scientific Program, the Presentations, the Book of Abstracts, and the Conference Proceedings, can be found at the Conference website `https://www.eysm2021.panteion.gr`.

Christina Parpoula
Chair of the Local Organizing Committee
Athens

International Conference on Robust Statistics (ICORS 2021): September 20-24, 2021, Vienna, Austria

The ICORS conference series started off in 2001 in the small village of Vorau in Austria, with the aim to bring together researchers and practitioners interested in robust statistics, data analysis, and related areas. Since then it took place annually in nearly all continents: Europe, North and South America, Asia, and Australia. An exception was the year 2020, when the conference was planned in Vienna, but was postponed by one year due to Covid. Finally, ICORS 2021, the 20th conference of this series, took place at TU Wien from Sep. 20-24 in hybrid form. Around 40 participants could attend personally, and another 50 people attended virtually.

The first day was devoted to a workshop on "Robustness and R," held by Valentin Todorov (UNIDO), Alexander Dürre (Univ. Libre de Bruxelles) and Andreas Alfons (Erasmus Univ. Rotterdam), with presentations on robust PCA, time series analysis and high-dimensional regression, as well as hands-on exercises in the R software environment. The conference itself included Invited Sessions on robustness for functional data, time series, cellwise robustness, and sparsity. The Contributed Sessions covered various topics on robustness, from theoretical developments to methodologi-

cal contributions and applications. Conference highlights have been the keynote presentations by Peter J. Rousseeuw (KU Leuven) on *Flagging cellwise outliers using a robust covariance matrix*, and by Jianqing Fan (Princeton) on *High-dimensional robust inference*. Invited presentations given by Battista Biggio (Univ. of Cagliari) and Johan Suykens (KU Leuven) provided new insights in the role of robustness in Machine Learning and Deep Learning. The recordings of the presentations are accessible at http://cstat.tuwien.ac.at/filz/icors2020/icors2021_recordings.html.

Hybrid versions of conferences could become a standard for the future, being environmentally friendly, and also more inclusive for people from developing countries. The next ICORS will take place in the summer of 2022, in Waterloo, Canada, again in hybrid format.

Details about the meeting can be found at http://www.icors.eu.

Peter Filzmoser
Member of the Local Organizing Committee
Wien

Other Events
IWBPA21: April, 2021; online

Due to the global Covid 19 pandemic, the 5th International Workshop on Branching Processes and their Applications (IWBPA21) took place virtually in Badajoz (Spain), at the Faculty of Science of the University of Extremadura (UEx), organized by the research group *Branching Processes and their Applications* from the Department of Mathematics of UEx, and scientifically sponsored by the Spanish Society of Statistics and Operations Research (SEIO) and by the Advanced Computing Research Institute of Extremadura. The IWBPAs take place triannually in Badajoz. Their aim is to facilitate the exchange of research ideas in the field of branching processes and related processes, from both theoretical and practical viewpoints. The co-chairs were Miguel González and Inés M. del Puerto, with the help of an enthusiastic and efficient local Organizing Committee. Moreover, it was also worthwhile the labour of the Scientific Committee formed by Gerold Alsmeyer, Miguel González, Ollivier Hyrien, Peter Jagers, Manuel Molina, Vladimir Vatutin, Nikolay M. Yanev, and Elena Yarovaya.

Despite the challenge of being the first virtual/online one, this edition counted with 58 invited speakers and around 145 registered participants from 22 countries. It is very important to highlight, the excellent quality of the talks given in the workshop at all levels, not only those given by senior researchers but also the ones delivered by young researchers and PhD students. The active participation of the attendants has led to very interesting discussions which have enriched our knowledge on different topics of the branching processes' theory, related processes and their applications. The talks were arranged in 12 subject blocks covering branching process with competition, population growth models in varying and random environments, branching random walks, random trees, continuous-time and continuous state branching processes, branching processes with migration, coalescent and predator-prey models, multitype branching processes, statistical inference, applications in Epidemiology and Genetics, and branching Brownian processes and Brownian motion. The Organizing Committee thanks all the speakers, all participants, chairmen and chairwomen and Scientific Committee for contributing to the success and adequate development of the meeting.

Further information on the workshop, as well as a repository of recorded talks, can be found on the web https://sites.google.com/view/iwbpa21-branching-unex (for previous editions of this Workshop series see https://branching.unex.es).

Inés M. del Puerto, Miguel González
Chairs of the Organizing Committee
Badajoz

SPE 2021: 13–16 October; Évora, Portugal

The 25th Congress of the Portuguese Statistical Society—SPE 2021—was held on-line over 13–16 October 2021. This was the first-time ever online SPE conference, and it gathered more than 200 delegates from all over the world. The meeting was hosted by the University of Évora, Portugal; Évora is a charming and historical city that is a UNESCO world heritage site.

We had a fantastic program lined up including 4 plenary lectures, 31 sessions, and 22 posters. Plenary talks included Genevera Allen (Rice U, US), Anthony C. Davison (EPFL, Switzerland), António Pacheco (IST, Portugal), and Maurizio Sanarico (SDG Group, Italy).

A variety of institutions had virtual rooms at SPE 2021 including, for example, ABE (Brazilian Statistical Association), Bernoulli Society, CWS (Caucus for Women in Statistics), and ISBA (International Society for Bayesian Analysis); institutional members of SPE were also represented (e.g. Statistics Portugal, Banco de Portugal, PORDATA).

ISBA and Bernoulli Society welcomed SPE 2021 over their Twitter accounts

https://twitter.com/ISBA_events/status/1448215478929854465?s=20

https://twitter.com/BernoulliSoc/status/1447977511497998341?s=20

The meeting took place over Sococo. A screenshot of SPE 2021 virtual auditorium can be found below:

The meeting also included an Awards Ceremony. In that session, junior pupils received awards on a national statistical competition known as *Prémio Estatístico Júnior*, the SPE Lifetime Achievement Award 2021 (Prémio Carreira SPE 2021) was given to Prof. Manuela Neves (UTL, Portugal), and the winners of the "SPE 2021 best poster Springer award" were announced (namely, João Pereira, Constantino Caetano, Liliana Antunes, Maria Luísa Morgado, Paula Patrício, Baltazar Nunes). Two sessions entitled "Statistics of the Nation" were entirely devoted to Applied Statistics with an emphasis on the country, that were chaired by Francisco Lima (President - Statistics Portugal, Instituto Nacional de Estatística) and by Lisete Sousa (Head - CEAUL, U Lisbon). Students from Évora were actively involved in the organization, including Ana Januário, Leonor Rego, and Rodrigo César.

After the Congress, the Portuguese Statistical Society (SPE) will edit a "Livro de Atas", whereas Springer will publish the Proceedings of SPE 2021.

Further details on the Congress are available from

www.spe2021.uevora.pt/en/

The 26th Congress—SPE 2023—will take place in Guimarães, Portugal, and its organization will be led by University of Minho. Thanks to Raquel Menezes and Luís Meira-Machado for embracing the challenge.

We look forward to welcome you in SPE 2023, Guimarães!

Miguel de Carvalho
Chair of the Scientific Committee
Edinburgh
and
The Organizing Committee
Évora

Forthcoming Conferences, Meetings and Workshops, and Calendar of Events

Organized, Sponsored and Co-Sponsored by

Bernoulli Society for Mathematical Statistics and Probability

Frontier Probability Days 2021, Dec. 3-5, 2021

"Frontier Probability Days 2021" (FPD'21) is a regional workshop, taking place at the University of Nevada, Las Vegas, Nevada on Dec. 3-5 2021. Its purpose is to bring together mathematicians, both regionally and globally, who have an interest in probability and its applications. FPD aims to complement other regional conferences in Probability that are held annually elsewhere in the US.

The main speakers include David Anderson (University of Wisconsin), Antonio Auffinger (Northwestern University), Hakima Bessaih (Florida International University), Ioana Dumitriu (University of California, San Diego), Natesh Pillai (Harvard University), Samy Tindel (Purdue University), and Atilla Yilmaz (Temple University). There will also be many short talks. Further details on the conference can be found at:

`http://lechen.faculty.unlv.edu/FPD20/`

Le Chen, Tom Alberts
Chairs of the Organizing Committee
Auburn, Salt Lake City

Calendar of Events

This calendar lists all meetings that have been announced in this and previous issues of *Bernoulli News* together with forthcoming meetings organized under the auspices of the Bernoulli Society or one of its Regional Committees (marked by).

A more comprehensive calendar of events is available on the BS Website `www.bernoulli-society.org/index.php/meetings`.

December 2021

- December 3–5 (2021), *Frontier Probability Days*; Las Vegas, Nevada, USA.
- December 07 (2021), *Around the World with CWS*, online.

May 2022

- May 23–27 (2022), *40th Finnish summer school in Probability and Statistics*; Lammi, Finland.

June 2022

- June 20–23 (2022), *Renyi Centennial Conference*; Budapest, Hungary.
- June 27–July 01 (2022), *2nd Conference on Stochastic Processes and their Applications*; Wuhan, China.

July 2022

- July 18–22 (2022), *33rd European Meeting of Statisticians*; Moscow, Russia.

August 2022

- August 02–13 (2022), *São Paulo School of advanced science on singular stochastic partial differential equations and their applications*; Campinas, Brazil

Quote of the Issue:

"*We should thank at this place Claudia and her whole Team. It is my strong feeling that the Bernoulli Society will benefit from their devoted work over many years!*"

Adam Jakubowski

Recent Issues of Official Publications

Bernoulli

Vol. 27, No. 4: November 2021

Editors-in-Chief: M. Podolskij & M. Reiß
http://projecteuclid.org/current/euclid.bj

"On posterior contraction of parameters and interpretability in Bayesian mixture modelingl," A. Guha, N. Ho, X. Nguyen, 2159–2188.
"Optimal tests for elliptical symmetry: Specified and unspecified location," S. Babić, L. Gelbgras, M. Hallin, C. Ley, 2189–2216.
"On weak conditional convergence of bivariate Archimedean and Extreme Value copulas, and consequences to nonparametric estimation," T.M. Kasper, S. Fuchs, W. Trutschnig, 2217–2240.
"The Goldenshluger–Lepski method for constrained least-squares estimators over RKHSs," S. Page, S. Grünewälder, 2241–2266.
"The linear conditional expectation in Hilbert space," I. Klebanov, B. Sprungk, T.J. Sullivan, 2267–2299.
"Universal sieve-based strategies for efficient estimation using machine learning tools," H. Qiu, A. Luedtke, M. Carone, 2300–2336.
"Partial generalized four moment theorem revisited," D. Jiang, Z. Bai, 2337–2352.
"Finite-energy infinite clusters without anchored expansion," G. Pete, A. Timár, 2353–2361.
"Nonparametric estimation of jump rates for a specific class of piecewise deterministic Markov processes ," N. Krell, É. Schmisser, 2362–2388.
"Minimax semi-supervised set-valued approach to multi-class classification," E. Chzhen, C. Denis, M. Hebiri, 2389–2412.
"Recovering Brownian and jump parts from high-frequency observations of a Lévy process," J. González Cázares, J. Ivanovs, 2413–2436.
"Local continuity of log-concave projection, with applications to estimation under model misspecification," R. Foygel Barber, R.J. Samworth, 2437–2472.
"Minimum spanning trees of random geometric graphs with location dependent weights," G. Ganesan, 2473–2493.
"Online drift estimation for jump-diffusion processes," T. Bhudisaksang, Á. Cartea, 2494–2518.
"Universality and least singular values of random matrix products: A simplified approach," R. Chaudhuri, V. Jain, N.S. Pillai, 2519–2531.
"Scalable Monte Carlo inference and rescaled local asymptotic normality," N. Ning, E.L. Ionides, Y. Ritov, 2532–2555.
"Testing against uniform stochastic ordering with paired observations," D. Wang, C.F. Tang, 2556–2563.
"Over-parametrized deep neural networks minimizing the empirical risk do not generalize well," M. Kohler, A. Krzyżak, 2564–2597.
"Equidistribution of random walks on compact groups II. The Wasserstein metric," B. Borda, 2598–2623.
"Pure-jump semimartingales," A. Černý, J. Ruf, 2624–2648.
"Spectral-free estimation of Lévy densities in high-frequency regime," C. Duval, E. Mariucci, 2649–2674.
"A ridge estimator of the drift from discrete repeated observations of the solution of a stochastic differential equation," C. Denis, C. Dion-Blanc, M. Martinez, 2675–2713.
"Approximation of occupation time functionals," R. Altmeyer, 2714–2739.
"Extremal eigenvalues of sample covariance matrices with general population," J. Kwak, J. Oon Lee, J. Park 2740–2765.
"Asymptotic results for heavy-tailed Lévy processes and their exponential functionals," W. Xu, 2766–2803.
"Estimating the inter-occurrence time distribution from superposed renewal processes," X.Y. Li, Z.S. Ye, Cheng Y. Tang, 2804–2826.

Stochastic Processes and their Applications

Vol. 141: November 2021

Editor-in-Chief: Matthias Löwe
http://www.sciencedirect.com/science/journal/03044149

"Rough nonlocal diffusions," M. Coghi, T. Nilssen, 1–56.
"Wong–Zakai approximations for quasilinear systems of Itô's type stochastic differential equations," A. Lanconelli, R. Scorolli, 57–78.
"Telegraph random evolutions on a circle," A. De Gregorio, F. Iafrate, 79–108.
"Discrete-time simulation of Stochastic Volterra equations," A. Richard, X. Tan, F. Yang, 109–138.
"Probabilistic approach to singular perturbations of viscosity solutions to nonlinear parabolic PDEs," M. Hu, F. Wang, 139–171.
"Mean reflected stochastic differential equations with two constraints," A. Falkowski, L. Słomiński, 172–196.
"Mean field interaction on random graphs with dynamically changing multi-color edges," E. Bayraktar, R. Wu, 197–244.
"A Yaglom type asymptotic result for subcritical branching Brownian motion with absorption," J. Liu, 245–273.
"Moment bounds for dissipative semimartingales with heavy jumps," A. Kulik, I. Pavlyukevich, 274–308.
"Some properties of stationary continuous state branching processes,", R. Abraham, J.F. Delmas, H. He, 309–343.
"Large sample autocovariance matrices of linear processes with heavy tails," J. Heiny, T. Mikosch, 344–375.
"Locally Lipschitz BSDE driven by a continuous martingale a path-derivative approach," K. Nam, 376–411.

Bernoulli Society Bulletin e-Briefs

Vol. 47: September 2021

Editor-in-Chief: B. Milošević
http://goo.gl/G9AOgl

Co-Sponsored by

Have a look at http://goo.gl/7EP2cZ for the latest articles in *Electronic Communications in Probability*, *Electronic Journal of Probability*, *Electronic Journal of Statistics*, *Probability Surveys* and *Statistics Surveys*, as well as *International Statistical Review*.

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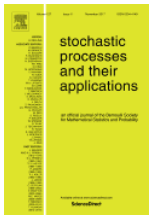
for Mathematical Statistics
and Probability

"If you are already a member, encourage your colleagues, postdocs and PhD Students to join the Bernoulli Society."



Publications and Meetings

The Bernoulli Society official journals are *Bernoulli* and *Stochastic Processes and their Applications*. In addition, the BS co-sponsors the following open-access online publications: *Electronic Communications in Probability*, *Electronic Journal of Probability*, *Electronic Journal of Statistics*, *Latin American Journal of Probability and Mathematical Statistics*, *Probability Surveys* and *Statistics Surveys*. Published twice a year, *Bernoulli News* provides detailed information about activities of the Society, while *Bernoulli* e-*Briefs* is a bimonthly electronic information bulletin that summarizes and draws the attention of relevant information to the membership.

The Bernoulli Society organizes or sponsors several international meetings which have a prominent relevance in the fields of mathematical statistics, probability, stochastic processes and their applications. These meetings are often held in conjunction with the ISI and other ISI Associations, the IMS or by the BS Regional and Standing Committees. Some of the meetings with a proud tradition are the *Bernoulli–IMS World Congress in Probability and Statistics* every four years, the *Conference on Stochastic Processes and their Applications* (SPA) organized every year, the *ISI World Statistics Congress* (formerly ISI Session), the *Latin American Congress in Probability and Mathematical Statistics* (CLAPEM) organized every two or three years, the *European Meeting of Statisticians* (EMS) organized every two years and the *European Young Statisticians Meeting* (EYSM) organized every two years.

Benefits of Joining the Bernoulli Society

- Reduced registration fees for meetings organized or sponsored by the Bernoulli Society.
- Free online access to *Bernoulli* (back to the first issue in 1995) and to *Stochastic Processes and their Applications* (back to the first issue in 1973).
- Receive the print version of *Bernoulli News* and the electronic information bulletin *Bernoulli* E-*Briefs*.
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- Members with a BS-IMS joint membership have free on line access to the IMS journals: *Annals of Statistics*, *Annals of Probability*, *Annals of Applied Probability*, *Annals of Applied Statistics* and *Statistical Science*. They also have reduced subscription rates to print IMS publications.

Membership Application and Fees

Online Applications for Membership

- Bernoulli Society membership
  `http://isi.cbs.nl/bern-form.asp`
- Joint BS–IMS membership
  `https://secure.imstat.org/secure/orders/IndMember.asp`
- Joint BS–IMS–ISI membership
  `http://isi.cbs.nl/bern_ims_isi-form.asp`

Membership Fees for 2021

- Full members: €84.
- First year of membership and first two years of postdoc for members from developed countries: €42.
- PhD students - developed countries: €30.
- PhD students - developing countries: €12.
- Members from developing countries, retired members and retired couples: €34.
- Joint BS–IMS memberhip: $150.
- Joint BS–IMS–ISI membership (only for elected ISI Members): €183.