Press release
11 July, 2025

Award decision in the 6th edition

The 2025 SEIO-BBVA Foundation Awards recognize groundbreaking advances to refine data analysis and optimize decision-making

- **The winning projects have delivered substantial advances** in Statistics and Operations Research with applications in multiple fields; among them the modeling of daily record-breaking temperatures as a consequence of climate change, the optimization of industrial processes, artificial intelligence and neuroscience
- **The goal of the awards is to further the efforts of leading researchers** in both disciplines and support the transmission of their findings to society at large
- **The winning contributions have been published in top-flight international journals**, driving theoretical and methodological advances of widespread significance

The 2025 Spanish Society of Statistics and Operations Research (SEIO)-BBVA Foundation Awards recognize the creation of new cross-cutting tools to refine data analysis and optimize decision-making, with multiple applications in fields like the modeling of daily record-breaking temperatures as a consequence of climate change, the optimization of industrial processes, artificial intelligence and neuroscience. This is the sixth edition of an annual award program that honors Spanish contributions of broad international impact in two disciplines increasingly to the fore in knowledge generation across all areas of science, and, particularly, in the development of technologies like AI and Big Data that are vital to address the defining challenges of today's world.

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The goal of the awards, as stated in the call conditions, is "to advance the efforts of researchers of Spanish nationality working in statistics and operations research," and, by recognizing excellence in these two disciplines, "to support their transmission to society at large." The accolades in this edition have gone to five papers produced by researchers at universities and research centers in Madrid, the Basque Country and Aragón, with the collaboration of scientists from other countries including the United States, the United Kingdom and China. Their award-winning contributions have been published in high-impact international journals, driving new theoretical and methodological advances of widespread significance.

Statistics deals with data analysis, the relating of mathematical models to reality, while the aim of operations research is to optimize decision-making. Nowadays vast amounts of data are generated in many areas of research and industry, but in order for these data to be processed into useful information our increasingly powerful computers must be equipped with the right mathematical tools. Hence the growing centrality of statistics and operations research, the disciplines that provide the tools needed for data analysis across all branches of science, and which underlie many of the advances we now take for granted, from Internet search engines to our smartphone apps.

The awards, funded with 6,000 euros in each of their five categories, distinguish excellence in scientific contributions published in the last five years. Their authors must be Spanish nationals or nationals of other countries that have conducted their research in a university or scientific center in Spain. Awards may also go to researchers of any nationality for contributions made in collaboration with one or more Spanish nationals.

This partnership between the BBVA Foundation and SEIO to showcase the talent of Spanish researchers in statistics and operations research joins three more annual award programs that the Foundation co-organizes with Spanish scientific societies; namely the Physics Awards with the Spanish Royal Society of Physics (RSEF), the Vicent Caselles Mathematical Research Awards with the Spanish Royal Society of Mathematics (RSME), and the Computer Science Research Awards with the Spanish Society of Computer Science (SCIE).

AWARDEES

Best methodological contribution in Statistics

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Daniel García Rasines, Assistant Professor in Quantitative Methods at CUNEF University, and **G. Alastair Young**, Professor of Statistics at Imperial College London (United Kingdom), receive the award for the best methodological contribution in statistics for their paper "Splitting strategies for post-selection inference," published in *Biometrika*.

Although in classical statistics models and hypotheses are supposedly worked out prior to looking at the data, in practice – as applied in such diverse areas as genomics or machine learning – models are actually selected in light of the data, i.e., they are data-dependent. This procedure facilitates selection but could also undermine the validity of classical methods for extracting information from these data by statistical inference. Various solutions have been proposed in recent years to ensure such inference is valid. But the methods in question are either computationally burdensome or restricted to only the most simple selection algorithms, which severely limits their applicability. The winning paper offers a solution to both these issues by applying the selection algorithm to a randomized version of the data set, so information can be extracted with maximal efficiency even in the case of complex algorithms.

Best methodological contribution in Operations Research

The award for the best methodological contribution in operations research is shared by **Gorka Kobeaga**, data scientist at CDM Consultores, **Jairo Rojas-Delgado**, senior software development engineer at Archlet, **María Merino**, Associate Professor of Statistics and Operations Research at the University of the Basque Country (UPV/EHU), and **Jose A. Lozano**, Professor in the Department of Computer Science and Artificial Intelligence at the University of the Basque Country (UPV/EHU) and the Basque Center for Applied Mathematics (BCAM), for the paper "A revisited branch-and-cut algorithm for large-scale orienteering problems," published in the *European Journal of Operational Research*.

A delivery truck owner trying to prioritize which customers will get their goods first and which will be left until last (at the risk of the goods not being delivered) will have to factor both the distances between customers and the urgency of each one's needs. This optimization problem is known as the orienteering problem, and its importance is such that numerous developers have come up with approximate algorithms for its solution. Yet in recent years, little research has gone into finding exact algorithms to fit the purpose, and this is what the winning contribution sets out to do. Thanks to a novel formulation of the

problem, the authors have identified the optimal solution in a wider set of instances than with previous methods in a way that is also computationally efficient.

Best applied contribution in Statistics

Jorge Castillo Mateo, Assistant Professor of Statistics and Operations Research at the University of Zaragoza, **Alan E. Gelfand**, James B. Duke Distinguished Professor Emeritus at Duke University (United States), **Zeus Gracia Tabuenca**, Assistant Professor of Statistics and Operations Research at the University of Zaragoza, **Jesús Asín**, Associate Professor of Statistics and Operations Research at the University of Zaragoza, and **Ana C. Cebrián**, Associate Professor of Statistics and Operations Research at the University of Zaragoza, receive the award for the best applied contribution in statistics for their paper "Spatio-Temporal Modeling for Record-Breaking Temperature Events in Spain," published in the *Journal of the American Statistical Association*.

The winning paper presents a framework to analyze when temperatures in Spain exceed record levels, and to what extent these anomalies are due to climate change. The underlying research uses a detailed spatial model of the record temperatures registered in peninsular Spain over 60 years (from 1960 to 2021). Starting from the maximum daily temperatures recorded throughout this period, the study has modeled the indicators that define temperature trends, comparing real data with the expected behavior had anthropogenic climate change not happened. Further, the accompanying IT package enhances the practical implementation of the methodology for both researchers and practitioners.

Best applied contribution in Operations Research

The awardees in the best applied contribution in Operations Research category are **Antonio Alonso Ayuso**, Professor of Statistics and Operations Research at Rey Juan Carlos University, **Francisco Gortázar Bellas**, Associate Professor of Computer Science and Artificial Intelligence at Rey Juan Carlos University, **Micael Gallego Carrillo**, Associate Professor of Computer Science and Artificial Intelligence at Rey Juan Carlos University, **Javier Martín Campo**, Associate Professor of Statistics and Operations Research at the Universidad Complutense de Madrid, **María Sierra-Paradinas**, data scientist at Orquest, and **Óscar Soto-Sánchez**, predoctoral researcher at Rey Juan Carlos University, for their paper "SOC: Flat Steel Cutting Optimisation System for Cortichapa," published in

the *European Journal of Operational Research; Computers and Industrial Engineering* and *Journal of Heuristics*.

The project described brought a series of improvements in the cutting system at steel firm Cortichapa, providing both quality gains and cost savings. When steel coils are not fully utilized, the leftover pieces can in theory be reused, but their heterogeneity makes this difficult in practice. The dual challenge, then, was to plan the initial cut so as little steel as possible is left over at the end, and to design ways to select the leftover strips best suited for the target piece. The winning team proposed a mathematical methodology that reduces leftovers, improves service quality by optimizing their use, and reduces both the time required to generate cutting patterns and errors in the planning process.

Best contribution in Statistics and Operations Research applied to Data Science and Big Data

Santiago Mazuelas, Ikerbasque Research Associate Professor at the Basque Center for Applied Mathematics (BCAM), **Yuan Shen**, Professor in the Department of Electronic Engineering of Tsinghua University (China), and **Aritz Pérez**, postdoctoral fellow at the Basque Center for Applied Mathematics (BCAM) are recognized in the category of best contribution in statistics and operations research applied to Data Science and Big Data for their paper "Generalized Maximum Entropy for Supervised Classification," published in *IEEE Transactions on Information Theory*.

The algorithms that interpret medical images to predict whether a person is healthy or suffering from some disease are trained with real data from already diagnosed cases. Known as supervised classification algorithms, they exist in a range of variants applicable to different contexts (from neuroscience to species distribution modeling or natural language processing) and, above all, differing in their mathematical approach. Because of these differences, it is not always obvious which algorithm to choose for a given application. The winning paper provides a benchmark for comparing algorithm performance. As well as obtaining a common methodological framework based on the maximum entropy principle – a major advancement for data science and machine learning – the authors employ this framework to devise new classification algorithms.

International committee

The international committee has a membership proposed by SEIO and the BBVA

Foundation. Chairing the committee on this occasion was **Albert Satorra**, Professor Emeritus of Statistics at Pompeu Fabra University and Research Professor at the Barcelona School of Economics, with fellow members **Carlos Henggeler Antunes**, Professor and Director of R&D at the Institute for Systems Engineering and Computers of the University of Coimbra (Portugal); **Rosa Crujeiras Casais**, Professor of Statistics and Operations Research at the University of Santiago de Compostela; **Pinar Keskinocak**, Professor and Chair of the H. Milton and Carolyn J. Stewart School of Industrial and Systems Engineering at Georgia Institute of Technology (United States); **Martine Labbé**, Professor of Operations Research at the Université Libre de Bruxelles (Belgium); and **Dimitris N. Politis**, Distinguished Professor and Associate Director of the Halicioğlu Data Science Institute (Turkey).

About SEIO

SEIO is a non-profit organization whose purposes include the advancement of Statistics and Operations Research in Spain through the promotion of research, its dissemination to society, and the improvement of education at all levels. Its main goals are to communicate the quality and achievements of Statistics and Operations Research, to promote their teaching and learning, to apprise the public of the importance of both disciplines, and to serve as a reference point in all matters pertaining to science and technology.

About the BBVA Foundation

The BBVA Foundation is an expression of the BBVA Group's engagement with the promotion of knowledge and innovation. Its activity centers on support for scientific research (through research projects, grants and collaboration with scientific institutions), the recognition of talent through families of awards organized alone or in conjunction with scientific societies, and the wider dissemination of knowledge and culture, in the conviction that fostering and relaying science-based knowledge is among the most effective means to expand our individual and collective choices. Its diverse programs, run directly or in partnership with leading institutions and organizations, focus on the areas of Basic Sciences, Biology and Biomedicine, Ecology and Environmental Sciences, Economics and Social Sciences, Statistics, Big Data and Artificial Intelligence, Information and Communication Technologies, the Humanities, Music, and the Arts.

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