Presentation ceremony of the SEIO-BBVA Foundation Awards

The Statistics and Operations Research Awards celebrate the power of these scientific tools to optimize data-driven decision-making

- **The award-winning studies have found multiple applications in a wide range of areas,** including cancer prevention, organ transplants, environmental monitoring, energy efficiency, optimization of industrial processes and the ethical development of artificial intelligence.

- **"These awards are our chance to showcase the huge potential of statistics and operations research,** which have come a long way in the realm of data and decision-making, but also in their ethical dimension, addressing issues like the elimination of bias, information confidentiality and the representativeness of results," remarked SEIO President, Begoña Vitoriano.

- **"With the leadership of people like the winners here tonight who operate within an ethical, humanistic framework,** the value of statistics and operations research in empowering our society to deal with the great challenges of the 21st century is beyond question," said Silvia Churruca, the BBVA Foundation's Director of Communications and Institutional Relations

- **The aim of the awards is to support the efforts of the best researchers in statistics and operations research,** and to educate society on the importance of these two still largely unknown scientific fields

From the prevention of cancer and the optimization of organ transplants to the monitoring of environmental disasters and the ethical development of artificial intelligence, the presentation ceremony of the 2024 Society for Statistics and Operations Research (SEIO)–BBVA Foundation Awards celebrated the cross-cutting power of these two disciplines in the society of the 21st century. The contributions recognized in the fifth edition of the awards reflect how data science is a vital force in driving the advancement of knowledge across all fields of research, and in successfully

addressing today's major challenges in areas like health, the environment and the economy.

"Awards like these are our chance to showcase the huge potential of statistics and operations research, which have come a long way in the realm of data and decision-making, but also in their ethical dimensions, addressing such issues as the elimination of bias, information confidentiality, the representativeness of results, explainability in decision-making and the criteria governing their choice." The President of SEIO, Begoña Vitoriano, pronounced these words during her opening address at the ceremony held last Thursday in the Palacio del Marqués de Salamanca, Madrid headquarters of the BBVA Foundation, adding that "we have many challenges ahead of us, and it is our duty to science and society to address them and to disseminate our work."

"With the leadership of people like the winners here tonight who operate within an ethical, humanistic framework, the value of statistics and operations research in empowering our society to deal with the great challenge of the 21st century is beyond question," said Silvia Churruca, Director of Communications and Institutional Relations at the BBVA Foundation. "As we see each year with these awards, both disciplines are eminently transversal, generating valuable contributions in fields as diverse as logistics, biology, neuroscience, the environment, epidemiology and health management and, in general, any context where decisions are made in conditions of uncertainty."

Awardees in the 2024 edition

The SEIO-Fundación BBVA Awards, funded with 6,000 euros in each of their five categories, have been bestowed annually since 2020 for pioneering contributions made at a university or scientific center in Spain. Their aim is to support the efforts of the best researchers in Statistics and Operations Research, and inform society of the importance of their work.

In the category **Best Methodological Contribution in Statistics,** the winners were **María Alonso Pena**, Assistant Professor of Statistics and Operations Research at the University of Santiago de Compostela; **Irène Gijbels**, Professor of Statistics at KU Leuven, Belgium; and **Rosa Crujeiras**, Professor of Statistics and Operations Research at the University of

Santiago de Compostela, for their paper "A general framework for circular local likelihood regression," published in the *Journal of the American Statistical Association* (JASA).

The awardees in the **Best Methodological Contribution in Operations Research** category were **Jordi Castro**, Professor of Statistics and Operations Research at BarcelonaTech (UPC); **Laureano Escudero**, a retired Professor of Statistics and Operations Research and *ad honorem* research fellow at Rey Juan Carlos University (URJC); and **Juan Monge**, Professor of Statistics and Operations Research at Miguel Hernández University, Elche, for their paper "On solving large-scale multistage stochastic optimization problems with a new specialized interior-point approach." published in the *European Journal of Operational Research*.

Jesús López Fidalgo, Professor of Statistics at the University of Navarra; **Caterina May**, Associate Professor of Statistics at the University of Eastern Piedmont, Italy; and **José Antonio Moler**, Associate Professor of Statistics and Operations Research at the Public University of Navarra (UPNA) received the award for **Best Applied Contribution in Statistics** for their paper "Designing experiments for estimating an appropriate outlet size for a silo type problem," appearing in *Annals of Applied Statistics*.

The award for **Best Applied Contribution in Operations Research** went to **Péter Biró**, Senior Researcher at the Centre for Economic and Regional Studies HUN-REN and Associate Professor at the Corvinus University of Budapest, Hungary; **Flip Klijn**, Scientific Director of the Institute for Economic Analysis, CSIC, and Research Professor at the Barcelona School of Economics; **Xenia Klimentova**, Senior Researcher at the Centre for Enterprise Systems Engineering of the Institute of Engineering, Technology and Systems and Computer Science, INESC TEC Porto, Portugal; and **Ana Viana**, Coordinating Professor in the School of Engineering of the Polytechnic of Porto and Senior Researcher in the Centre for Industrial Engineering and Management of the Institute of Engineering, Technology and Systems and Computer Science, INESC TEC Porto, Portugal, for their paper "Shapley–Scarf housing markets: respecting improvement, integer programming, and kidney exchange," published in *Mathematics of Operations Research*.

Emilio Carrizosa, Professor of Statistics and Operations Research at the University of Seville; **Jasone Ramírez-Ayerbe**, a postdoctoral researcher at the Université de Montréal, Canada; and **Dolores Romero**, Professor of Operations Research at Copenhagen Business School (Denmark), shared the award in the category of **Best Contribution in Statistics**

and Operations Research Applied to Data Science and Big Data for their paper "Mathematical optimization modelling for group counterfactual explanations," published in the *European Journal of Operational Research.*

2024 SEIO medals

The ceremony was also the occasion for the SEIO to present its annual medals to two outstanding figures in statistics and operations research in honor of their academic careers. This year's medallists were **Emilio Carrizosa**, Professor of Statistics and Operations Research at the University of Seville, for his exceptional track record in the areas of operations research, primarily in applied mathematics and data science, along with his extraordinary labors in knowledge transfer to diverse sectors of industry; and **Dolores Ugarte**, Professor of Statistics and Operations Research at the Public University of Navarra (UPNA), for the scope and excellence of her research in spatial statistics, which has generated important methodological contributions published in leading international journals.

Versatile tools to address challenges in health, the environment and the economy

Throughout the ceremony, the awardees highlighted the power of statistics and operations research tools to solve real-world problems in multiple fields including health, the environment and the economy. Jesús López Fidalgo spoke of how statistics research can have tangible, real-world outcomes like those achieved by his own studies. López Fidalgo shared the award with his colleagues Caterina May and José Antonio Moler for a project aimed at optimizing the design of experiments to simulate jams in mine tunnels by calculating the exact outlet diameter that would stop blockages from forming. In his speech, the researcher referred to "the not inconsiderable repercussions" of this kind of jam: "Clearing a blocked tunnel may entail blasting with explosives, with the attendant economic and environmental cost." For this reason, he argued, "we statisticians have to roll up our sleeves and strive to familiarize society with our work and the practical application of the statistical models we use."

After being presented with the SEIO medal for her numerous achievements in mathematical statistics, Professor Dolores Ugarte talked of the importance of "stepping out of our comfort zone and working as part of interdisciplinary teams to solve the big problems like those to do with climate change or environmental monitoring." Among the

new medallist's main contributions are the development of models in spatial statistics that serve to make reliable estimates of, for instance, the risks of cancer mortality in Spanish provinces and how they have varied over time, the application of statistics to analyze satellite images of natural disasters, and even the prevention of gender violence, by calculating the risk of dowry deaths in India. It is precisely the versatility of statistics which, in her view, should encourage actors in the discipline to "propose concrete actions and mechanisms that give us greater weight in the big policy-making decisions."

The challenge of decision-making under uncertainty

For the awardees, one of the most pressing challenges facing society is the management of uncertainty, and it is here precisely that the tools of these two disciplines can be put to greatest use. Jordi Castro, Laureano Escudero and Juan Monge have devised a new mathematical optimization method for decision-making under uncertainty that can run the relevant calculations far faster than before. "In certain problems – said Castro during the ceremony – our method found the solution in one day's calculations, while professional packages would take more than 50 days. What this means in practice is lower energy consumption and fewer CO_2 emissions." Speed is increasingly of the essence in this type of calculation, he added, since "being able to make optimal decisions amid future uncertainty is of vital importance in the uncertain world we are leaving to our children."

Similar sentiments were voiced by Flip Klijn, recognized with Péter Biró, Xenia Klimentova and Ana Viana for their algorithm to improve paired kidney transplant programs, designed to assist patients needing a kidney who cannot find a compatible donor among their family and friends. In such cases, one possible solution is to enroll in a registry of incompatible pairs, in the hope that a match can be found among all the pairs in the donor/recipient pool. In their award-winning study, the team tested the effectiveness of a novel game-theoretical strategy which encourages patients to recruit more than one donor to paired kidney transplant programs. "Making optimal decisions in conditions of uncertainty and risk is of prime importance in sectors like finance, energy or defense," said Klijn in his speech. "We live in a complex world, with global challenges like resource scarcity, economic inequalities and public health problems. Operations research provides us with the tools we need to optimize resources and ensure the proposed solutions are equitable and fair."

Transparent, accountable and unbiased artificial intelligence

The fairness of the recommendations made by data analysis tools is another concern shared by the awardees. Emilio Carrizosa, winner of the SEIO Medal for his contributions in operations research and knowledge transfer to industry, highlighted the importance of operations research in meeting the challenges posed by artificial intelligence. "Now that AI has become omnipresent, we might even say omnipotent, sometimes self-servingly biased, and always obscure, the methods and models of operations research may serve to reduce bias and shine a light into the black box of AI, so its predictions are, of course, accurate, but the decisions made with them are also transparent and fair."

Dolores Romero too insisted on the "all-important" role of operations research "in improving the transparency, fairness and accountability of AI algorithms." Distinguished alongside Carrizosa and Jasone Ramírez-Ayerbe for developing mathematical models to construct explainable solutions to certain AI algorithms, she explained that "the use of these algorithms in decisions that directly affect citizens has been and continues to be a cause for concern. Our fear is that artificial intelligence may exhibit discriminatory behavior – the awardee continued –, but with our operational research and mathematical optimization machinery we can correct biases in the data used to build the algorithms."

Laureates were clear that statistical tools are altogether the best way to arrive at decisions that are informed by data in the most objective way possible. For María Alonso Pena, recognized with Irène Gijbels and Rosa Crujeiras for proposing a general method to analyze directional data, "statistics is an essential mechanism to analyze data, identify patterns and make reasoned decisions. In its absence, we run the risk of falling into biased interpretations, manipulation of information and unforeseen outcomes that could have been avoided. Recent history – she concluded – has given us examples of what can happen when political or social decisions are based more on erroneous perceptions than on objective, validated analyses."

International committee

The international committee has a membership proposed by SEIO and the BBVA Foundation. Chairing the committee on this occasion was **Daniel Peña**, Emeritus Professor of Statistics at Carlos III University of Madrid (UC3M), with fellow members **Michael Greenacre**, Professor of Statistics at Pompeu Fabra University and the

Barcelona School of Economics; **Martine Labbé**, Professor of Operations Research at the Université Libre de Bruxelles (Belgium); **Alfredo Marín**, Professor of Statistics and Operations Research at the University of Murcia; **María Dolores Ruiz**, Professor of Statistics and Operations Research at the University of Granada; and **Carla Marina Vairetti**, Associate Professor of Industrial Civil Engineering at the Universidad de los Andes (Chile).

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, which it sees as the best means to enlarge our individual and collective choices. The Foundation centers its activity 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. 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.