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An interview with Ivette Gomes

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Abstract Maria Ivette Gomes was born July 21, 1948 in Almada, Portugal. After obtaining a BSc in Pure Mathematics in 1970 from the University of Lisbon, Ivette moved in to the University of Sheffield where she completed her PhD in Statistics in 1978, under the supervision of Clive Anderson. Research on statistics of extremes in Portugal has now a long tradition, with Ivette being one of the founders of the movement, along with Tiago de Oliveira (1928–1992). Ivette was co-founder of the Portuguese Statistical Society, and acted as its President from 1990 until 1994; since 1975 she played a key role in the Center of Statistics and Applications (CEAUL), being its scientific coordinator from 1999 until 2006. She was Professor at the Department of Statistics and Operations Research, University of Lisbon, from 1986 until her retirement in 2011. She has been an influential and distinguished scientist in the field of statistics of extremes, through her research, teaching and supervision activities, as well an ambassador of the ‘school of extremes’ in Portugal.

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This conversation took place during the preparation for the Workshop EVT2013 in honor of Ivette Gomes held in Vimeiro, Portugal, 8–11 September. The meeting also embraced the celebration of the 30 years of the conference *Statistical Extremes and Applications* held at Vimeiro in 1983, known as the zero-th EVA conference, since it pioneered the international EVA (Extreme Value Analysis) conferences.



Ivette as a child, Almada, 1954.

Childhood and schooldays nostalgia

Isabel (I): Hello, Ivette. It is a pleasure taking this opportunity to discuss with you your life, career, and main achievements over the last 40 years. Can you tell us about the times of your childhood and the environment where you grew up?

Ivette: I grew up in a mid-class family. My father was a typographer in one of Lisbon's daily newspapers, *Diário Popular*, and my mother was a housewife but also working as a dressmaker. My parents only received a primary education at school; they were compassionate, generous and big-hearted persons, who had an enormous influence in my personality and career. My maternal

grandmother, despite being illiterate—a common situation in Portugal at the time for women of her age—also taught me a lot, and I recall her deeply as an inspirational and influential person.

I: Can you tell us more about those days, say about school and your hobbies?

Ivette: I attended a private school, *Externato Liceal de Almada*, for the first five years of the secondary school; in the last two years I had to move to Lisbon. Contrarily to the majority of girl students from Almada—who were allocated to a lyceum close to Tagus river—I decided to choose *Liceu Filipa de Lencastre*, to have the chance of making longer trips and to keep closer to one of my best friends. I loved swimming, cycling, and playing table tennis. When I was twelve I won a table tennis championship which run among students of the first cycle in Almada. But I also loved gymnastics, high jump, and other sports. However, I have never been a professional in any of these modalities. Like my grandson, Vicente, I enjoyed almost all types of radical sports!

Miguel (M): Were you particularly interested in mathematics at school?

Ivette: I loved playing with numbers. I was always very fond of mathematics: for me mathematics was always like a game—and a quite enjoyable one, I should add. My maternal grandfather died when I was six months, and as far as I have been told by my family, he used to say that at that age I already had the idea of what numbers were, and was able to count up to five any time he was touching my toes... Just tickles, for sure! I think I learned to appreciate math with my school's Director, who was also my math teacher. He was very enthusiastic about my skills, my marks in the exams, and about all the joy I got from learning. I remember that once he actually came to our house, when he heard that I had obtained the highest mark (19.6 out of 20) in the national final exam at the secondary school. But although math was my joy, drawing, and painting were for me much more important at the time. The truth is that before deciding to study math, I actually wanted to study architecture, but I always had poor marks in History, which was a key course for entering into architecture at the time, and hence I lost my hope and had to give up my candidacy.

University life in Lisbon

M: Ivette, few people perhaps know that Abstract Algebra was actually your 'first passion'?

Ivette: That's true. I got a degree in Pure Mathematics at the Faculty of Sciences of Lisbon (FCUL), and my major topic was algebra. Actually, at a certain stage I was just ' ε '-apart from moving to the US, so to write my

PhD thesis there, in Goldie's Ring Theory [13] and other topics alike. By the end of my 5th year, Almeida Costa was able to provide me with a grant from the Calouste Gulbenkian Foundation, and with all the facilities to move abroad immediately after finishing my degree in Pure Mathematics.

I: Were you fully convinced about your choice on studying Pure Mathematics, or were you considering some other alternatives?

Ivette: At the time I made the choice, just after getting my BSc, I was absolutely sure about it. But in my 5th year, I had to choose a few optional courses in Applied Mathematics, and I decided to take the courses of Probability Theory, Mathematical Statistics, and Stochastic Processes. I became so fascinated about these subjects that I immediately decided to stay in Lisbon and to study Applied Mathematics, instead of moving to the US. In the middle of all this, I also started lecturing courses in Applied Mathematics after Tiago de Oliveira—who was the head of FCUL by then—offered me an academic position at FCUL, in the Section of Applied Mathematics. It was a tough but gratifying experience. I had to teach courses like Monte-Carlo Simulation, Population Dynamics, and I also had to use routinely a computer (a Heathkit®, I think) for the first time...

M: And Tiago de Oliveira, the other founder of the 'school of extremes' in Portugal, also started his career as an algebraist!

Ivette: Yes. Tiago de Oliveira, who was indeed the founder of the 'school of extremes' in Portugal, started also his career in algebra. Pure coincidence, I think? Tiago influenced me deeply at the different stages of my career, and I will surely keep mentioning his name, again and again, over this conversation.

I: And in the meanwhile you met Dinis Pestana, and became a couple of statisticians! Can you tell us about the way you met.

Ivette: We were colleagues, but he got in FCUL two years after me, because he went first to Literature, and only later to Mathematics. I only met him in the middle of my 5th year, when he kindly helped us [me and my colleagues] selling tickets to a movie and also raffles that would provide us with some money to go abroad in a final-year students trip through Spain, France, and Germany. In the following year, when I was already a teaching assistant and he was still a BSc student, I taught him Probability Theory. Can you imagine?! At the time I thought he was married, one of the many lies he was able to keep for more than one year... The truth was he had never been married, and we soon fell in love and decided to marry in a period shorter than three months—something that disturbed my mother quite a bit! But soon they became very, very good friends.

M: What is your view on the academic situation in Portugal before the April



Ivette and Dinis Pestana, 2008.

1974 revolution?

Ivette: The academic situation before the so-called 1974 Carnation Revolution was full of excitement. I was obviously against Salazar's regime—like the great majority of my colleagues—although I was not deeply involved in politics. We had regular lively secret meetings, to discuss the future of Portugal and the best way to develop science in our country. Part of the assembly of these meetings was formed by a bulk of distinguished and renowned professors from FCUL, which by the time was still located at the old building of the Polytechnical Institute, close to Príncipe Real, Lisbon. The academic situation deteriorated much in the period immediately after the revolution. Students somehow thought that democracy meant that everyone should get the same final mark—a complete anarchy as you may imagine. Fortunately, things had already 'reverted to normality' by the time I returned Lisbon, by the end of 1978.

I: How did you get interested in Applied Mathematics? Do you recall any milestone that made you get fascinated about Statistics?

Ivette: The first milestone is related to Probability, and it was the book by Boris Gnedenko [12]. At the time, there was a cheap MIR publication and I really loved the book. Still in Probability, I also cannot forget mentioning how influential Feller's book [6] was to me. The collection of books by Kendall and Stuart [*The Advanced Theory of Statistics*, Vols. I–III], which Tiago de Oliveira nicknamed 'The Bible of Statistics,' were possibly the most relevant milestones in Statistics at the beginning of my career.

Memories from Sheffield

M: What made you decide about Sheffield for your PhD?

Ivette: I was strongly influenced by Tiago de Oliveira, who was a good friend of Joe Gani. In Sheffield, Joe [Gani] founded the prestigious *Applied Probability Trust* (APT), and was already a renowned scholar by that time. Unfortunately, Joe Gani was no longer in Sheffield when I arrived there in September 1975. I met him only 30 years later, in 2005, at the WSC (World Statistics Congress) in Sydney, and I can't find the words to describe how gratifying it was meeting him finally. I first began in Sheffield in the MSc in Probability and Statistics, in the academic year of 1975/76. I took courses on Probability, Statistics, Weak Convergence Theory, Data Analysis, among others. But as both Dinis and I had Calouste Gulbenkian grants and got very high marks in the first term, the PhD committee decided it would be sensible to transfer us immediately to the PhD program in January 1976.

I: What sparked your interest in the topic of statistics of extremes?

Ivette: I already had some contacts in Lisbon with statistics of extremes, particularly in bivariate extremes through an article by Tiago de Oliveira [39]. The paper that influenced me the most at the early stages of my research career was possibly the one by Fisher and Tippett [9], particularly because of the topic of rates of convergence and penultimate approximations. I enjoyed the topic very much, but to diversify the research topics at our university, Tiago recommended me to get a specialization in another field, like density estimation, nonparametric statistics, or inference for stochastic processes. Although I agreed with him at the time, fate has led me to another direction.

M: Tell us about your PhD thesis. Did Clive Anderson suggest you a topic, or did you select a topic on your own?

Ivette: Clive Anderson sequentially provided me with different topics of research beginning with rates of convergence and penultimate approximations, extremes of random fields, concomitants of order statistics, maxima of different types of weak dependent structures, among others. In some of these topics I was able to get material to be incorporated in my PhD thesis. I am eternally indebted to Clive, not only for all his suggestions, but also because he provided me with enough degrees of freedom so that I could find my own way. Indeed, I almost always followed this path with my own PhD students.

I: By then, you were already married with Dinis, and had the small baby Pedro! How could you manage all this?

Ivette: It was definitely challenging, at the very least. Pedro was not yet two months when we left for Sheffield in September 1975. The period we stayed



Ivette and Antónia Amaral-Turkman in Sheffield around 1976.

there alone with Pedro was not very fruitful from a scientific viewpoint, because one of us had to take care of the baby at home, either in the morning or in the afternoon. My mother stayed there for a long period at the beginning of 1976, and after the death of my father by the end of 1976, she went to Sheffield to live with us and helped us a lot; without her help, we [Ivette and Dinis] would have not been able to finish our theses in due time, i.e. by the end of 1978.

Tiago de Oliveira's influence

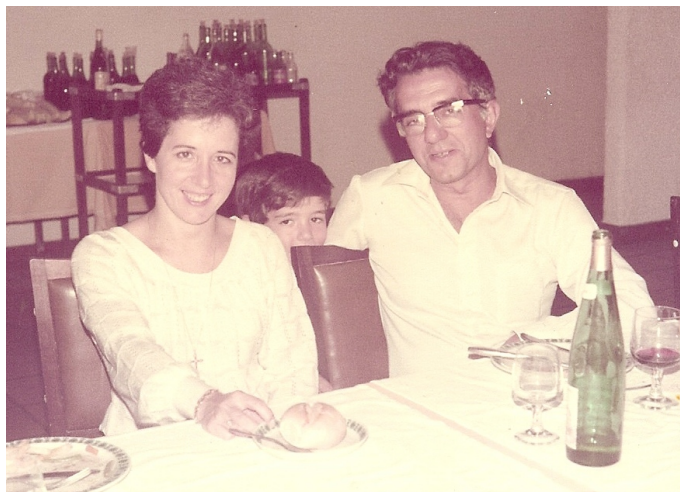
I: How much were you influenced by Tiago?

Ivette: Tiago de Oliveira was influential for the course of my research in Statistics. But not in Statistics of Extremes. Indeed, Tiago knew that Portugal was a small country and that a diversification of subjects was necessary. He taught me the introductory course on Probability and Statistics, in the 2nd year of my BSc; in the 5th year, he also taught me the optional courses of Mathematical Statistics and Stochastic Processes. Tiago was also very much

engaged in political matters: He was an assumed freemason and an outstanding member of the Socialist Party.

M: Tiago was also a collaborator of Emil Gumbel; have you ever met him?

Ivette: Unfortunately I have never met Emil Gumbel; I know Tiago visited Columbia University to work with him at some point, although I cannot say precisely whether this happened before my entrance to FCUL or during my stay at FCUL as a student.



Ivette with Tiago de Oliveira (and Pedro in the back), Vimeiro, 1983.

M: Did you and Tiago share the same views about the statistical modeling of extremes?

Ivette: At the time I did, but now I don't. Indeed I think that semiparametric or even nonparametric methodologies are able to provide more reliable answers than the parametric ones. But I am quite flexible, and even recently, I have worked with a new parametric model related to extreme value and Birnbaum–Saunders laws [7]. And despite not using Bayesian methods, I have nothing against their use, contrarily to Tiago.

I: And beyond Tiago, who else has influenced you the most in the first years of your research career?

Ivette: Beyond Tiago de Oliveira and Clive Anderson, I was, from the very beginning, influenced by Laurens de Haan, whom I only met in Vimeiro, 1983. Indeed, I was advised by Clive to read Laurens de Haan's PhD thesis by the

middle of my second year in Sheffield. Sir David Cox had also an indirect influence at the early stage of my career, essentially due to the fact that the topic that Clive Anderson proposed me for my thesis, had been earlier suggested to him by Sir David [Cox]. Other people who also influenced me during the first years of my career have been, among others, Robert Adler, Simeon Berman, Harald Cramér, Herbert David, Janos Galambos, Ross Leadbetter, and Bob Loynes.

Back to Lisbon

M: In 1978 you were done with your PhD, and moving back to Lisbon was a natural option. But were you considering other options at that time?

Ivette: Unfortunately, this was not possible at the time, as I had a contract with the Calouste Gulbenkian Foundation, according to which I had to teach in Portugal for at least three years after getting my PhD.

I: And only a few years after you arrived, in 1981, the Department of Statistics and Operations Research was created, and it is still nowadays the only Department of Statistics at the national level. What can you tell us about the Department during its early days?

Ivette: Around the same time that we were returning to Lisbon, by the end of 1978, a few other young PhD colleagues were also arriving from England, and joining FCUL: one with expertise on Operations Research (José Dias Coelho); two experts on Computation (Amílcar Sernadas and Cristina Sernadas); and two skillful statisticians (Antónia Amaral-Turkman and Feridun Turkman). Jointly with Tiago de Oliveira, we began planning to create a Department of Statistics, Operations Research, and Computing (DEIOC). The project was successful and DEIOC had a prominent role in the development of these areas. We all worked hard for the foundation of DEIOC in 1981, with the first degrees in Statistics, in Portugal, one in Probability and Statistics and another in Statistics and Operations Research. However, soon Computing gave rise to the Department of Informatics. Then, DEIOC became DEIO, just as it is still known today.

I: Over the years you have been contributing largely to the education of the younger generation. You have supervised PhD and MSc dissertations of around 40 students. How are they doing nowadays?

Ivette: Apart from one of my PhD students, Orlando Oliveira, who died too early and only a few weeks after getting his PhD degree, I think that all my PhD and MSc students are doing pretty well. They are spread among different Universities in Portugal (Minho, O'Porto, Aveiro, Coimbra, Beira Interior, etc), they have nice academic positions, and most of them have had brilliant

careers.

I: You were influential in the formation of two milestones for the development of Statistics in Portugal: the Portuguese Statistical Society (SPE) and Center of Statistics and Applications of University of Lisbon (CEAUL). Tell us about when it all started.

Ivette: CEAUL was founded in 1975 by Tiago de Oliveira, prior to our departure to Sheffield, and is older than SPE. They both have different roles, I think, but a similar importance. When we came back to Lisbon from Sheffield, we collaborated actively in the foundation of the SPEIO (Portuguese Society for Statistics and Operations Research) in 1980, and Tiago de Oliveira was its first President. SPEIO was profoundly restructured in 1991, with the current designation, SPE, and has had a big impact on the development of Statistics in Portugal. I had the honor to become the first President of SPE (1990–1994). CEAUL is the largest research group in Statistics in Portugal and one of the most active. CEAUL and SPE have cooperated substantially over the years, being now both actively engaged in the *2013 International Year of Statistics*.

M: You have coorganized several important meetings on statistics of extremes; I guess the NATO ASI on *Statistical Extremes and Applications*, which occurred in 1983 at Vimeiro, was one of the most influential meetings that you (co)organized?

Ivette: Scientifically, I think the meeting was excellent. Indeed, Richard Davis, after the last session at EVA 2009, in Fort Collins, called such a meeting the zero-th EVA conference. And when I read the EVA 2013 website, I felt a lot of nostalgia; there one could read:

“It has been 30 years since the so-called zero-th EVA conference took place in 1983 in Vimeiro, a small town near the beach in Portugal.”

When in the early eighties, Tiago de Oliveira, Feridun Turkman and I, proposed the organization of a NATO ASI on *Statistical Extremes and Applications*, we never envisaged the impact that this meeting would have in the next generation. Apart from the participation of prominent researchers in the field, this ASI was also attended by young researchers from abroad and some of the students of the first MSc in Statistics and Operations Research at DEIOC. Nowadays, I consider this ASI as the birth of a ‘school of extremes’ in Portugal. The first student to get a PhD in Portugal in statistics of extremes was Teresa Alpuim, now a Professor at DEIO. She got her PhD in 1989, under my supervision, at the University of Lisbon, with a thesis on *Extremes for Dependent Sequences*, which gave rise to seminal papers in the field. Almost simultaneously, but already in 1990, Manuela Neves, now a Professor at *Instituto Superior de Agronomia*, defended her PhD thesis on *Inference Methods for Extremes*, at the *Universidade Nova de Lisboa* under the supervision of Tiago de Oliveira. Both, Teresa Alpuim and Manuela Neves, attended the so-called

zero-th EVA conference. Another pioneer in this field is Margarida Brito, now Professor at the *Universidade do Porto*, with a PhD from the University of Paris VI, in 1987, under the supervision of Paul Deheuvels, as well as my second and third PhD students, Luísa Canto e Castro and you, Isabel, who defended your PhD thesis in 1992, respectively on *Rates of Convergence* and *Statistical Inference for Extremal Models*. After 1992, the PhD's in statistics of extremes have been following quite an interesting rhythm, and either in the country or abroad we can easily find more than twenty Portuguese students who completed a PhD in this field until the end of 2007 [23]. Including mine and Feridun Turkman PhD thesis, I have counted 28 PhD thesis in the area (12 of them in the last 6 years), written by Portuguese researchers in Portugal, but necessarily no longer working in the field of extremes. The dynamics of publication has been high, and I consider it quite above the average international patterns. The Portuguese 'school of extremes,' has also paid attention to national contributions, as can be proved by the publication of articles in Portuguese, essentially in the Proceedings of the annual SPE conference, since 1992. The number of topics under investigation is extensive. Apart from a large group working in semiparametric estimation of parameters of rare events, with pioneering work on invariant estimation, bias reduction through the use of the Jackknife methodology, smoothing through adequate linear combinations, and use of the bootstrap in the optimal sample fraction selection, we have strong groups in extremes and risk modeling, extremes and environment, extremes of dependent sequences, multivariate extremes, and spatial extremes. We thus think that the dynamism of our group will provide a healthy growth of the field, with an international recognition of a 'school of extremes' in Portugal, a country of 'good extremists.' And most of this actually started with zero-th EVA conference. I recently wrote some reviews on our 'school' on which further details on all this can be found [23, 24, 35].

I: In that event participated several key mentors in statistics of extremes, although only a few are possible to devise in the photo; for instance, in the second row left it is Tiago [de Oliveira] and nearby Anthony Davison and Antónia [Amaral-Turkman] and Feridun Turkman on the first row left; on the right, James Pickands near you, your son Pedro, your mother, and also Dinis. You should have some special stories from that event, could you share them with us?

Ivette: I can also recognize immediately Richard Smith, also close to me, and van Montfort behind him. Jürg Hüsler and Rolf Reiss also appear somewhere. And in the last row, we can see Barry Arnold, Ishay Weissman, and Sibuya. But other key mentors in statistics of extremes, like Paul Deheuvels, Janos Galambos, Laurens de Haan, Ross Leadbetter, Jef Teugels, among others, have also been in Vimeiro. Regarding funny episodes, I'll try referring to a few ones:



Statistical Extremes and Applications, Vimeiro, 1983.

- Imagine that Anthony Davison—currently editor-in-chief of *Biometrika*—rode his bicycle from England to Vimeiro! But as you can see in the photo he had a nice ‘papillon’ and a ceremony suit, brought in the plane by Richard Smith.
- We surprisingly got to know, during one of our Sunday trips, that ‘de Haan’ meant ‘rooster’, after we saw several ‘roosters of Barcelos’, which are a typical emblem of Portugal, originated after the legend of the rooster of Barcelos.

I: Another important event dates back to 1987, the *Conference on Extremwerttheorie in Oberwolfach*. In the photo we can recognize Jef Teugels, you, Rolf Reiss, James Pickands, Clive, Tiago, Jürg Hüsler, Ross Leadbetter, Holger Rootzén, and more in the last rows David Mason, Paul Deheuvels, Laurens de Haan and Michael Falk. Good memories from Oberwolfach?

Ivette: Yes, I got also very fond memories from Oberwolfach. Imagine that at the time there were only two women at the meeting, Ursula Gather and myself. The room doors were unlocked, something I found a bit strange at the beginning. The meeting was excellent from a scientific viewpoint, and possibly we have to renumber EVA meetings, not only because of Oberwolfach but also because of the Gaithersburg meeting in 1993, the *Conference on Extreme Value Theory and its Applications*, and the Rotterdam *Conference on Multivariate Extreme Value Estimation with Application to Economics and Finance*, in 1994.



Conference on Extremwerttheorie, Oberwolfach, 1987.

I: Ivette, you have been the lead coordinator on a long list of research projects. Which one has been your favorite?

Ivette: I am not sure whether I have a favorite one. They are always a big challenge and help us to develop interesting research topics. If I had to choose one of my successful projects, I think I would choose ERSE: *Extremes, Risk, Safety, and the Environment*, which was developed from 2005 until 2008. The main objectives of this research project were the development of new inferential techniques for estimation of parameters of extreme events in a semiparametric framework, with applications to Finance, Insurance, Reliability, Risk, Safety and the Environment. Indeed, one of the main components of the project was directly related to bias and volatility reduction techniques, where we have used not only parametric techniques, revisited under a semiparametric framework, but also nonparametric techniques of functional estimation. The need to reduce bias obviously implies the need to estimate adequately second order parameters, and interesting work was developed on the topic. Special attention was also given to penultimate and max-semistable approximations, to the testing of first and second order conditions in the general field of Extremes and to multi and infinite-dimensional extremes, with the main objective of developing techniques useful in the analysis of spatial data. The objectives of ERSE were indeed fully attained. On the other hand, and for sure, the most difficult project to run was this last FCT project, EXTREMA: *Extremes in Today's World*, possibly due to the financial crisis in Portugal. For the first time, I was not able to achieve an execution rate above 90%. Anyway, the

scientific objectives were fully attained.

M: You are the founder and the editor-in-chief of *REVSTAT—Statistical Journal*. Can you tell us how *REVSTAT* emerged?

Ivette: *REVSTAT* dates back to 2003, but the idea came in 2001, when we organized the *European Meeting of Statisticians* (EMS), in Funchal, Madeira, Portugal. At the time, Statistics Portugal (INE, *Instituto Nacional de Estatística*) was editing a journal called *Revista de Estatística*, and published three special issues containing extended abstracts of the invited papers presented at EMS 2001. INE then decided to internationalize the journal, and invited me to become the editor-in-chief, and a prestigious international editorial board was also invited.

Internationalization and research interests

I: You had a huge success in bringing together many top researchers in extremes from all over the world to Portugal, and many kept visiting our country over the years. How would you summarize the internationalization agenda of our ‘school of extremes’ over the last 40 years?

Ivette: The internationalization of our ‘school’ has indeed been increasing over the last 40 years and all members of our ‘school’ have been responsible for it, because they have kept deep international contacts and are well-recognized internationally not only in statistics of extremes, but also in spatial, environmental and financial statistics, risk assessment theory, and statistical quality control. The number of international collaborations was relatively modest at the beginning, but it has been gradually increasing, particularly after the integration of Laurens de Haan in CEAUL, since the late nineties or early two-thousands. Also, the internationalization of our ‘school’ has been responsible for the number of invited lectures of most of their members. There has been strong cooperation with researchers in the Erasmus School of Economics, Erasmus University Rotterdam, and the Tinbergen Institute. The research contacts with the Katholieke Universiteit Leuven have also become stronger in recent years, and, jointly with Jan Beirlant, we have been involved in the organization of an Invited Paper Meeting at ISI 2011, Dublin, and another one, jointly with Liang Peng, from Georgia Technical University, at ISI 2013. Other research contacts have also been kept with Adri Buishand (Royal Netherlands Meteor. Inst.), Dejuan Li (Fundan Univ., China), Holger Drees (Saarland Univ., Germany), Jan Picek (Liberec Univ., Czech Republic), Jap Geluk (The Petroleum Inst., United Arab Emirates), Jürg Hüsler (Bern University, Switzerland), Laszlo Markus (Eotvos Lorand Univ., Hungary), Rolf Dieter-Reiss (Siegen Univ., Germany), among others, and more recently with Victor Leiva (Valparaiso University, Chile), Natalia Markovich (Institute of Control Sciences, Russian Academy of Sciences), and Milan Sthelik (Johannes Kepler

Univ., Austria). Also as a result of the internationalization of our ‘school’, we can mention the enormous number of reviews produced by its members in the most diverse journals.



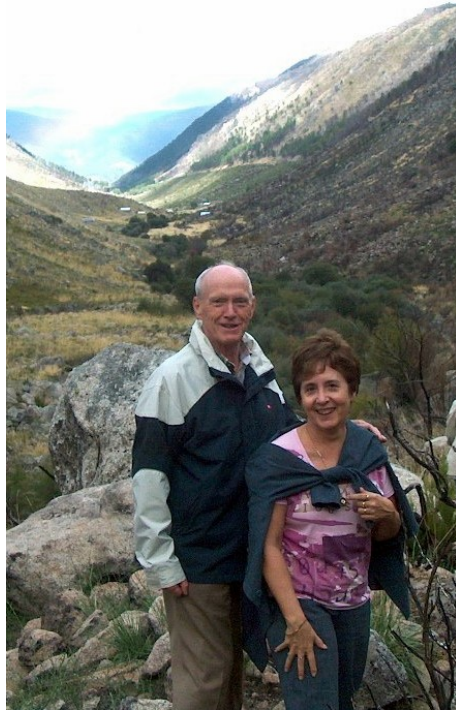
Ross Leadbetter, Feridun Turkman, and Ivette during Ross Leadbetter Honoris Causa in Lisbon, 2013.

I: Names like Ross Leadbetter, Jef Teugels, Jan Beirlant, Laurens de Haan, Rolf Reiss, Jürg Hüsler, and many others, have been integral part of your life as researcher. Would you like to say some words about it?

Ivette: I think that the group of people working in statistics of extremes is very special, being quite easy making friends, and research partners. I am not one of those people looking hard for partnerships, but things happen naturally. Only recently did I notice through Math SciNet that I had so many co-authors. Some of the people you mention have never been my co-authors, but all of them have helped us developing our ‘school of extremes,’ one way or the other, and I would like to sincerely thank them for helping us throughout the years.

I: The Portuguese extremists group is sometimes affectionately called ‘*the Portuguese gang*.’ What are the origins of this nickname?

Ivette: This nickname was affectionately given to us by Ross Leadbetter, possibly at the first EVA meeting, in 1998, in Gothenburg. But many other senior people recognize what we can now call a Portuguese ‘school of extremes.’



Jef Teugels and Ivette, SPE Conference, Serra da Estrela, 2006.

M: In a recent conversation with Jef Teugels [8] he mentions the following:

“I’ve been Visiting Professor in Coimbra in Portugal which I consider to be my second country. They had a vacancy for somebody in Statistics and a colleague mentioned to me that there was this vacancy and would I be willing to go and spend some time there. It is such a lovely place, I love Portugal, I think there is this beautiful mixture of being Atlantic and Mediterranean at the same time. I have taught there four or five times. Unfortunately, I was unable to start a Statistics school there. At a later stage, the centre of gravity in Portugal moved to Lisbon where the people in Extreme Value Theory started to have a very good group, but this was not due to me but to Tiago de Oliveira.”

Ivette: I agree with him, because I myself, despite having supervised excellent PhD students from Coimbra, was never able to convert them to Applied Statistics. They very much prefer Probability Theory, Stochastic Processes, and Theoretical Statistics. But they are finally doing some statistics as well... I know that Jef Teugels fell in love with Portugal in Coimbra and not in Lisbon. But he soon got very good friends in Lisbon, among whom I considered to be included. Indeed, I met Jef in the late seventies or early eighties, when Tiago de Oliveira asked me to pick up Jef at the airport, take him to the hotel, and afterwards to dinner. I remember that when Tiago asked me this, I was slightly frightened, because I was pretty sure I had to speak French with Jef, a citizen from Belgium. I have even trained a bit of French with Dinis, before

going to the airport, but it was indeed a relief to me when Jef declared that he would prefer speaking in English...

I: Of course the great impeller after Tiago's death, already twenty years ago, has been you, Ivette. You want to make comments about it?

Ivette: Chance placed Clive Anderson in my way, and I fell in love with Extreme Value Theory (EVT) and statistics of extremes. Then, I was lucky enough to have excellent PhD students, from all over Portugal, who undoubtedly have helped our school to grow. And just a joke: I never thought that my name could actually sound like 'EVT,' until I went this year to Shanghai, where the chairman of my session was a Chinese colleague, who pronounced Ivette, as EVT!

I: Early in your career you worked mostly on penultimate limiting forms in Extreme Value Theory, an area of focus in your Thesis in 1978 [14]. Later on, you have revisited intermittently this topic in some of your papers [15–17, 20, 22, 26, 32]. What made you return back to this topic over and over again?

Ivette: I think there is some kind of magic in the topic of penultimate approximations and uniform rates of convergence. I have often revisited the topic, and the last time I did it, I was able to find a possibly strong link between this topic and another field I love, statistical process control and reliability. And sincerely, I still think that apart from the penultimate models—that do not go beyond the extreme values models—there are other interesting penultimate models, like the ones that appear in [37] that could be quite relevant in the field. Frequently, the penultimate approximations are also max-stable. But sometimes I think we should go further, and I feel somehow divided between both approaches. Particularly when simulations show us the much better fit provided by those penultimate approximations.

I: Your interest in the parametric approach to statistical inference in extreme values [10, 18, 19, 21, 25] has gradually shifted to an approach typically classified as semiparametric [2, 11, 29, 33], sometimes combined with resampling methods [30, 31]. Can these approaches be viewed as complementary?

Ivette: I think that all these methodologies, and other which I have never used, like Bayesian approaches, can be viewed as complementary. And some resampling methodologies like the jackknife and the bootstrap are very effective for bias-reduction purposes and in the choice of optimal sample fractions, among other topics in the field of extremes.

I: Lately, you have been mostly dedicated to reduced-bias estimation for semiparametric statistical inference procedures [2, 3, 27–29, 34]. Is this an alternative solution to the classical question of the 'best threshold'?

Ivette: Reduced-bias estimation can be viewed as you say as an alternative solution to threshold selection, since usually the estimates are much more stable as functions of the number of top or low order statistics used in the estimation. But I indeed think that reduced-bias estimation is more than that, particularly if you are able to adequately estimate second-order parameters so that you do not increase the variance of the original estimator. Threshold selection for reduced-bias estimators is not at all difficult, and you are then able to get a much more reliable estimation.

A glimpse of the future

M: Some years ago, Bradley Efron [5] claimed that in the twenty-first century a combination of frequentist and Bayesian approaches should prevail, with no approach dominating the other. Do you feel this is already happening today in our field?

Ivette: Indeed, I get the impression that we are almost achieving such a status, but so far—for some strange reason—I have the impression that in statistics of extremes, frequentist approaches are still more often applied.

M: And is in a similar way the twenty-first century, demanding for a combination of models for the tails and the bulk of a distribution?

Ivette: I have indeed seen several articles, and we can also find it in the book by Natalia Markovich [36], where such a combination appears. And this type of combination of models for the tails and the bulk of a distribution will surely become more and more usual in the near future, I think.

I: Do you think that there are still unanswered important questions in the statistical modeling of univariate extremes?

Ivette: Yes, I think so. And threshold selection is unquestionably one of them. But there are many, many other relevant questions for the next ten years either at the univariate, multivariate, and spatial levels; some of these questions are discussed in [1].

I: How do you envisage in the next years the interplay between theoretical asymptotics, Monte Carlo simulation techniques, and real data applications for extreme values?

Ivette: The three topics are obviously quite relevant and more and more researchers feel that the development of nice asymptotic results is no longer enough in statistics. Monte Carlo is crucial to detect whether the asymptotic results are valid for small up to moderate samples. And in my opinion, Monte Carlo simulations, if well conceived, can help us understand the limitations or

even the erroneous behavior of an asymptotic result. As I mentioned earlier, I had to give a course on Monte Carlo simulation at my first year as a research assistant at FCUL, and after that I have always regarded the computer and Monte Carlo simulations as my laboratory. Before going deeply in the proof of an asymptotic or finite sample result, I often conduct numerical experiments through Monte Carlo simulations. And real data applications either in the field of extremes or in any other area of statistics are obviously the final goal for any statistician, and very challenging. I agree with Tukey and his Exploratory Data Analysis [41], encouraging scientists to *let the data speak for themselves*, and sometimes, particularly in the field of extremes, we are quite stuck to the limiting results and to extreme value or generalized Pareto models, forgetting that a lot of other models can appear when we consider for instance different kinds of thinning of either maxima or minima by a discrete random variable, just as an example.

On the role of the applied statistician in modern science

M: Has our communication with other scientists been improving over the years?

Ivette: I believe so, and I guess the main reasons for such an improvement are related to the facts that we have been trying to speak a less hermetic language, and that scientists from other fields have also been learning a lot in recent years on the relevance of statistical methodologies in their fields. I have had some experience with researchers in meteorology and hydrology, being for instance a member of the Accompanying Committee of a PhD student at the Technical Institute in this area. Something similar has happened in finance, insurance, and industrial management. However, my experience in this last topic is more related to statistical process control than to statistics of extremes.

M: Sir David Cox and Christl Donnelly claim that “interpretation is the ultimate objective” of a statistical analysis [4, p. 5]. Is our community currently devoting due attention to this?

Ivette: Possibly not. But I entirely agree with them. And statisticians should not be the only ones engaged in this step [interpretation], surely other scientists should also be involved. An expert in a certain applied area has for sure a more realistic interpretation than the statistician who performed the data analysis.

M: Outside the field extremes, what was the paper that influenced you most?

Ivette: Possibly the paper by Bradley Efron on the bootstrap methodology.

I: Now, at the end of the interview, is there any particular subject that you

would like to add?

Ivette: I would like to refer to a recent engagement related to ERCIM (European Consortium for Informatics and Mathematics). Jointly with Michael Falk, Armelle Guillou and Johan Segers, we have launched a ERCIM specialized working group (WG) on Statistics of Extremes and Applications (SEA). I would like to invite all interested people to pay attention to this new way of bringing extremes closer to the whole statistical community, possibly joining the SEA WG and going on with joint research projects in the field.



Ivette and Miguel de Carvalho, during the interview, Lisbon, July 19, 2013.

I: One characteristic present in your profile is your usual good mood: if we see you anytime you almost surely have a *'smile effect'* at your face... is this a life philosophy for you?

Ivette: You are right! This is something I learned essentially from my mother. It is without doubt much easier to cope with the difficulties of life when we are optimistic, and I somehow force myself to behave like that. And smiling surely helps changing our mood...

I: Thank you, Ivette, for giving us this chance to have a conversation with you. We feel in debt with you for the inspiration you represent and your legacy

to the community of statistics of extremes. We wish you the best for a very happy, healthy, and long productive life.

Ivette: I think I am the person who should thank you both for all the effort and energy you put in the preparation of this conversation.

M: Thank you very much, Ivette. It has been an honour.

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References and further reading

- [1] Beirlant, J., Caeiro, F., Gomes, M.I.: An overview and open research topics in the field of statistics of univariate extremes. *REVSTAT—Statist. J.* **10**, 1–31 (2012)
- [2] Caeiro, F., Gomes, M.I.: Semi-parametric second-order reduced-bias high quantile estimation. *Test* **18**, 392–413 (2009)
- [3] Caeiro, F., Gomes, M.I., Henriques-Rodrigues, L.: Reduced-bias tail index estimators under a third order framework. *Comm. Statist. Theory Meth.* **38**, 1019–1104 (2009)
- [4] Cox, D., Donnelly, C.A.: Principles of Applied Statistics. Cambridge University Press, Cambridge (2011)
- [5] Efron, B.: Bayesians, frequentists, and scientists. *J. Amer. Statist. Assoc.* **100**, 1–5 (2005)
- [6] Feller, W.: *An Introduction to Probability Theory and Its Applications*, Volume I Wiley, New York (1974)
- [7] Ferreira, M., Gomes, M.I., Leiva, V.: On an extreme value version of the Birnbaum–Saunders distribution. *REVSTAT—Statist. J.* **10**, 181–210 (2012)
- [8] Fisher, N.I.: A conversation with Jef Teugels. *Int. Statist. Rev.* **78**, 419–441 (2010)
- [9] Fisher, R.A., Tippett, L.H.C.: Limiting forms of the frequency distribution of the largest or smallest member of a sample. *Math. Proc. Cambridge Phil. Soc.* **24**, 180–190 (1928)
- [10] Fraga Alves, M.I., Gomes, M.I.: Statistical choice of extreme value domains of attraction—a comparative analysis. *Comm. Statist. Theory Meth.* **25**, 789–811 (1996)
- [11] Fraga Alves, M.I., Gomes, M.I., de Haan, L., Neves, C.: Mixed moment estimators and location invariant alternatives. *Extremes* **12**, 149–185 (2009)
- [12] Gnedenko, B.V.: *The Theory of Probability*. MIR, Moscow (1962)
- [13] Goldie, A.W.: The structure of prime rings under ascending chain conditions. *Proceedings of the London Mathematical Society* **8**, 589–608 (1958)
- [14] Gomes, M.I.: *Some Probabilistic and Statistical Problems in Extreme Value Theory*. PhD Thesis. University of Sheffield (1978)
- [15] Gomes, M.I.: Closeness of penultimate approximations in extreme value theory. *COMPSTAT 82* **2**, 119–120, Physica-Verlag (1982a)
- [16] Gomes, M.I.: Penultimate versus ultimate in extreme value theory—a simulation study. *14th European Meeting of Statisticians (Book of Abstracts)* 149–150 (1982b)
- [17] Gomes, M.I.: Penultimate limiting forms in extreme value theory. *Ann. Inst. Statist. Math.* **36**, 71–85 (1984)
- [18] Gomes, M.I.: Concomitants and linear estimators in an i-dimensional extremal model. *Trab. Estad. Inv. Oper.* **36**, 129–140 (1985a)
- [19] Gomes, M.I.: Statistical theory of extremes—comparison of two approaches. *Statist. Decis.* **2**, 33–37 (1985b)
- [20] Gomes, M.I.: Penultimate versus ultimate in statistical theory of extremes—a simulation study. *Comp. Statist. Data Anal.* **4**, 257–267 (1986)
- [21] Gomes, M.I.: Generalized Gumbel and likelihood ratio test statistics in the multivariate GEV model *Comput. Statist. Data Anal.* **7**, 259–267 (1989)

- [22] Gomes, M.I.: Penultimate behaviour of the extremes. In J. Galambos et al. (eds.), *Extreme Value Theory and Applications*, 403–418, Kluwer Academic Publishers (1994)
- [23] Gomes, M.I.: Memorial da escola (Document in Portuguese). *Boletim da Sociedade Portuguesa de Estatística* Primavera 37–51 (2007)
- [24] Gomes, M.I.: Extremistas da minha terra (Document in Portuguese). *Notícias da Faculdade de Ciências e Tecnologia, Universidade de Lisboa* (2013)
- [25] Gomes, M.I., Alpuim, M.T.: Inference in a multivariate generalized extreme value model—asymptotic properties of two test statistics. *Scand. J. Statist.* **13**, 291–300 (1986)
- [26] Gomes, M.I., de Haan, L.: Approximation by penultimate extreme value distributions. *Extremes* **2**, 71–85 (1999)
- [27] Gomes, M.I., de Haan, L., Henriques Rodrigues, L.: Tail index estimation for heavy-tailed models: accommodation of bias in weighted log-excesses. *J. Royal Statist. Soc. B* **70**, 31–52 (2008)
- [28] Gomes, M.I., Henriques-Rodrigues, L., Miranda, C.: Reduced-bias location-invariant extreme value index estimation: a simulation study. *Comm. Statist. Simul. Comput.* **40**, 424–447 (2011)
- [29] Gomes, M.I., Martins, M.J.: Asymptotically unbiased estimators of the tail index based on external estimation of the second order parameter. *Extremes* **5**, 5–31 (2002)
- [30] Gomes, M.I., Martins, M.J., Neves, M.M.: Alternatives to a semi-parametric estimator of parameters of rare events—the Jackknife methodology. *Extremes* **3**, 207–229 (2000)
- [31] Gomes, M.I., Oliveira, O.: The bootstrap methodology in statistics of extremes—choice of the optimal sample fraction. *Extremes* **4**, 331–358 (2001)
- [32] Gomes, M.I., Pestana, D.: Domains of attraction and penultimate behaviour. *16th European Meeting of Statisticians (Book of Abstracts)* 202–203 (1984)
- [33] Gomes, M.I., Pestana, D.: A sturdy reduced bias extreme quantile (VaR) estimator. *J. Amer. Statist. Assoc.* **102**, 280–292 (2007)
- [34] Gomes, M.I., Pestana, D., Caeiro, F.: A note on the asymptotic variance at optimal levels of a bias-corrected Hill estimator. *Statist. Probab. Lett.* **79**, 295–303 (2009)
- [35] Hall, A., Fraga Alves, M.I., Zea Bermudez, P., Mendes, J., Turkman, K.F., Temido, M.G., Gomes, M.I.: A ‘escola de extremos’ em Portugal: (Document in Portuguese). *Boletim da Sociedade Portuguesa de Estatística* Primavera, 37–51 (2007)
- [36] Markovich, N.: *Nonparametric Analysis of Univariate Heavy-Tailed Data: Research and Practice*. Wiley, New York (2008)
- [37] Smith, R.L.: Approximations in extreme value theory. *Preprint*, Univ. North-Carolina (1987)
- [38] Tiago de Oliveira, J.: Extremal distributions. *Rev. Fac. Cienc. Univ. Lisboa A*, **7**, 215–227 (1958)
- [39] Tiago de Oliveira, J.: Structure theory of bivariate extremes: Extension. *Estudos Math. Estat. Econom.* **7**, 165–195 (1962)
- [40] Tiago de Oliveira, J.: Regression in the nondifferentiable bivariate extreme models. *J. Amer. Statist. Assoc.* **69**, 816–818 (1974)
- [41] Tukey, J.W.: *Exploratory Data Analysis*. Reading, Addison-Wesley. (1977)
- [42] van Montfort, M.A.J., Gomes, M.I.: Statistical choice of extremal models for complete and censored data. *J. Hydrology* **77**, 77–87 (1985)