

# The ‘Portuguese School of Extremes and Applications’ (PORTSEA)

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**Abstract:** The ‘School of Extremes’ in Portugal is nowadays well recognized by the international scientific community. This recognition is mainly due to the scientific work of Tiago de Oliveira in the area. But I also need to mention the research developed by myself and Feridun Turkman in the field, while working for PhD in Sheffield, United Kingdom, and the organization of a NATO *Advanced Study Institute* (ASI) on *Statistical Extremes and Applications* (SEA), which took place at Vimeiro in the summer of 1983. Indeed, the organization of this 1983 NATO ASI (SEA 1983) was a landmark for the international recognition of the group and the launching of what I dare to call the *Portuguese School of Extremes and Applications* (PORTSEA). It is still sensible to refer that Laurens de Haan, one of the giants in the area of *Extremes*, came to Portugal in 1999, becoming then a member of the ‘Centro de Estatística e Aplicações’, the main pole of development of *Extremes* in Portugal, and consequently a member of the PORTSEA. The dynamic of publication has been very high, and I consider it quite above the average of our international partners. The topics under investigation in the area of *Extremes* are quite diverse. Apart from a large group working in the area of *Parametric, Semi-parametric and Non-parametric Estimation of Parameters of Rare Events*, the PORTSEA has strong groups in *Univariate, Multivariate, Multidimensional and Spatial Extremes*. We thus think that the dynamism of the Group will provide a healthy growing of the field, with a high international recognition of a ‘*School of Extremes in Portugal*, a country of ‘*good extremists*’ in an extreme of Europe.

## 1 The beginning of PORTSEA

After getting an undergraduate degree in *Pure Mathematics (Algebra)*, in 1970, at “*Faculdade de Ciências da Universidade de Lisboa*” (FCUL), I took the decision to go on with research in the area of *Probability, Statistics and Stochastic Processes*. I became then a member of the *Statistics* group, and began working at “*Departamento de Matemática*”, FCUL, in the field of *Non-parametric Methodologies*, under

the supervision of Professor José Tiago da Fonseca Oliveira (Tiago de Oliveira), already a prominent international reference in the area of *Statistics of Extremes and Applications* (SEA), with several articles in the area since 1959.

During the period I worked in Portugal as a research assistant, first at “*Centro de Matemática Aplicada*”, and next at “*Centro de Estatística e Aplicações da Universidade de Lisboa*” (CEAUL), a Research Centre founded in 1975 by Tiago de Oliveira, and despite the fact that I had not so far worked in the field of *Extreme Value Theory* (EVT), I was well acquainted with the potentialities and beauty of EVT.

The investment policy inspired by Veiga Simão, a true reformer of Higher Education in Portugal, opened up great prospects for researchers considered promising, who were sent to major cultural centres abroad. My husband, Dinis Pestana, and I got a Calouste Gulbenkian fellowship and were accepted at the University of Sheffield, *United Kingdom* (UK), where Joe Gani had created the *Applied Probability Trust*, still responsible for the publication of two of the main journals in *Probability* (*Journal of Applied Probability* and *Advances in Applied Probability*).

Taken the decision of going to Sheffield, UK, for PhD, in the area of *Non-parametric Statistics*, possibly under the supervision of Joe Gani, a friend of Tiago de Oliveira, I met Clive Anderson, who had finished his PhD thesis in 1971 in the field of *Extremes*, at the *Imperial College of London*, and who was well acquainted with the work of Tiago de Oliveira. Clive turned out to be my PhD supervisor, and from the beginning of 1976 onwards I began doing research ‘almost full-time’ in the field of *Extremes*.

Working also for PhD in Sheffield, in a related area, but under the supervision of Morris Walker, was Kamil Feridun Turkman, now Full Professor (already retired) of the “*Departamento de Estatística e Investigação Operacional*” (DEIO), and Antónia Amaral (now Antónia Amaral-Turkman), a colleague and friend of mine at FCUL, who began working for PhD by the end of 1977, also in Sheffield, but in the area of *Bayesian Statistics*, under the supervision of Ian Dunsmore.

SEA was then (and it is still now . . .) considered as a quite relevant area in the field of *Statistics*, with a lot of topics to be exploited. Indeed, in the first decades of the twentieth century, under the powerful influence of Paul Lévy, *Probability Theory* was mainly concerned with generalizations of the *Central Limit Theorem* (CLT), related to the asymptotic behaviour of sums—a problem of great importance, since averages, variances and many other relevant statistics are simple sum functions. But Fréchet, in 1927, had the interesting idea of using an analogue of the Lévy stability equation for sums, just noticing that the maximum of maxima is still a maximum. He then just replaced powers of characteristic functions by powers of distribution functions, that is, he treated a problem analogous to that of sums, but for maxima

of independent, identically distributed random variables. He thus came to the first law of extremes, rightly called Fréchet distribution, with a functional form of the type

$$\Phi_\alpha(x) = \exp(-x^{-\alpha}), \quad x \geq 0 \quad (\alpha > 0).$$

At the same time, Fisher and Tippett, in 1928, discovered the three types of solutions to which the max-stability equation can lead,

$$\begin{aligned} \text{Type I (Gumbel)} : & \quad \Lambda(x) = \exp(-\exp(-x)), \quad x \in \mathbb{R}, \\ \text{Type II (Fréchet)} : & \quad \Phi_\alpha(x) = \exp(-x^{-\alpha}), \quad x \geq 0 \quad (\alpha > 0), \\ \text{Type III (max-Weibull)} : & \quad \Psi_\alpha(x) = \exp(-(-x)^\alpha), \quad x \leq 0 \quad (\alpha > 0). \end{aligned}$$

Meanwhile, von Mises, in 1936, proposed an expression encompassing these three laws,

$$G(x) \equiv G_\xi(x) := \begin{cases} \exp(-(1 + \xi x)^{-1/\xi}), & 1 + \xi x > 0, \quad \text{if } \xi \neq 0, \\ \exp(-\exp(-x)), & x \in \mathbb{R}, \quad \text{if } \xi = 0. \end{cases}$$

Indeed, with  $\xi = 0$ ,  $\xi = 1/\alpha > 0$  and  $\xi = -1/\alpha < 0$ , respectively, we have  $\Lambda(x) = G_0(x)$ ,  $\Phi_\alpha(x) = G_{1/\alpha}(\alpha(1 - x))$  and  $\Psi_\alpha(x) = G_{-1/\alpha}(\alpha(x + 1))$ . Currently (for more details, see the reasonably recent overview by [Gomes and Guillou, 2015](#)), these results are unified in a general theory, which recognizes that the *Extremal Types Theorem* (ETT) and other ETT generalizations are a reference for the study of extreme order statistics, while the CLT has to do with sums and central order statistics.

A little later, statistical EVT had a strong development under the vigorous impulse of Emil Julius Gumbel, in the late sixties. And the *School of Extremes* (and *Risk Evaluation*) in Portugal, or the ‘*Portuguese School of Extremes and Applications*’ (PORTSEA), is nowadays well recognized by the international scientific community, And such a recognition is mainly due to the scientific work of Tiago de Oliveira, Effective Member of the ‘*Academia das Ciências de Lisboa*’ (ACL) from 1985 until his premature death in 1992.



Figure 1: José Tiago da Fonseca Oliveira (1928-1992), with his famous pipe

But I also need to mention the research developed by myself and by Kamil Feridun Turkman in the field, while working for PhD in Sheffield, United Kingdom, in the late seventies—early eighties.

I got the PhD degree by the end of 1978 (Gomes, 1978), under the supervision of Clive Anderson, an eminent scientist in the field of *Extremes*. Dinis Pestana, my husband, also got his PhD in Sheffield, in 1978, in topics related to sums of random variables, under the supervision of Damodar N. Shanbhag. We both came then back to FCUL in 1979, and collaborated actively in the foundation in 1980 of the “*Sociedade Portuguesa de Estatística e Investigação Operacional*” (SPEIO), with Tiago de Oliveira as the first President. SPEIO was profoundly restructured in 1991, with the current designation “*Sociedade Portuguesa de Estatística*” (SPE), and has had a big impact in the development of *Statistics* in Portugal. I myself was the first President of SPE (1990-1994), followed by João A. Branco (1994-2000), Fernando Rosado (2000–2006), Carlos Braumann (2006–2012), Carlos D. Paulino (2012–2015), Maria Eduarda Silva (2015–2020), and now, since the beginning of 2021, Miguel de Carvalho, a researcher with a lot of work in the field of *Extremes* and who I also consider as a member of PORTSEA.

In 1981, and after getting his PhD in 1980 (Turkman, 1980), also in Sheffield, in the area of *Extremes in Stochastic Processes* and under the supervision of Morris Walker, Feridun Turkman joined us at FCUL and at the ‘*Centro de Estatística e Aplicações da Universidade de Lisboa*’ (CEAUL), the main pole of development of *Extremes* in Portugal. Antónia Amaral-Turkman, Dinis Pestana, Feridun Turkman and I, Ivette Gomes, together with Cristina Sernadas (also from *Statistics*) and colleagues from *Operations Research* (J. Dias Coelho) and *Computing* (Amílcar Sernadas), all young people who had also got their PHDs abroad, worked hard, jointly with Tiago de Oliveira, in the foundation, in 1981, of the “*Departamento de Estatística, Investigação Operacional e Computação*” (DEIOC), now DEIO, with the first degrees in the area of *Statistics*, in Portugal, one in *Probability and Statistics* and another one in *Statistics and Operations Research*.

In the mid of 1981, after the formation of DEIOC, Feridun and I, jointly with Tiago de Oliveira, have proposed the organization of a NATO *Advanced Study Institute* (ASI) on SEA, which took place at Vimeiro in the summer of 1983 (SEA 1983). As already mentioned here, and also in Gomes (2005, 2007), two articles written in Portuguese, at SPE Bulletin, the development of the ‘*School of Extremes*’ in Portugal undoubtedly had as its main responsibility the scientific work of Tiago de Oliveira in the area. But the organization of the 1983 NATO ASI was indeed a landmark for the international recognition of the group. Although they have not usually been considered as elements of this group, due to the fact that their main topics of research are not in the field of *Extremes*, I am sure that Antónia Amaral-Turkman and Dinis Pestana have also played a significant role in the construction of

the group, even co-authoring several relevant articles in this area. Indeed, the ASI on SEA had the three aforementioned organizers, but also two ‘shadow organizers’, Antónia and Dinis, whom I also consider as members of the PORTSEA, and who are also pictured in Figure 2.



Figure 2: Organizers (*top*) and shadow organizers (*bottom*) of the NATO ASI on *Statistics of Extremes and Applications* (SEA 1983)

## 2 SEA 1983 and the launching of PORTSEA

The SEA 1983 NATO ASI was held in Vimeiro, from 31st of August until September 14, and had the participation of prominent researchers in the area, with some of them present in the photo provided in Figure 3.



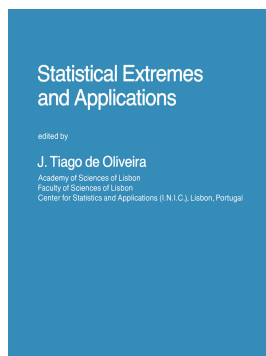
Figure 3: Photo of NATO ASI participants—Vimeiro (SEA 1983)

Among those participants, I mention the invited foreign speakers, Clive Anderson (Sheffield University, UK), Paul Deheuvels (Université Paris VI, France), Benjamin Epstein (Technion, Israel), Janos Galambos (Temple University, USA), Arne

Fransén (National Defence Research Institute, Sweden), Laurens de Haan (Erasmus University of Rotterdam, The Netherlands), Leon Herbach (Polytechnic Institute of New York, USA), A.M. Hasofer (University of New South Wales, Australia), Ross Leadbetter (University of North Carolina, USA), Georg Lindgren (University of Lund, Sweden), Nancy Mann (Department of Biomathematics, UCLA, USA), B. Marcus (Texas A&M University, USA), Yashaswini Mittal (Virginia Polytechnic Institute and State University, USA), James Pickands III (University of Pennsylvania, USA), Sid Resnick (Colorado State University, USA), Holger Rootzén (University of Copenhagen and UNC, Chapel Hill, USA), G.A. Schuëller (Institut für Mechanik, Universität Innsbruck, Austria), Masaaki Sibuya (Keio University, Japan), R. Sneyers (Royal Meteorological Institute, Brussels), Jef Teugels (Katholieke Universiteit Leuven, Belgic), Ishay Weissman (Technion, Israel), Vujica Yevjevich (International Water Resources Institute, George Washington University, USA).

Also, some of the students of the first DEIOC MSc course on *Probability and Statistics*, like Teresa Alpuim, Emília Athayde, Isabel Barão and Fátima Miguéns, as well as Fernando Rosado, a PhD student of Tiago de Oliveira and two PhD students of Dinis Pestana, Eugénia Graça Martins and Helena Iglésias Pereira, were young participants of this ASI. And in the list of authors of ‘*contributed papers*’ we can find names of giants in the area of *Extreme Value Analysis* (EVA), like Richard Davis, Anthony Davison, Jürg Hüsler, Rolf Reiss, Richard Smith . . .

As mentioned above, this NATO ASI on SEA is currently recognized as a milestone in the area of EVA. And repeating again what I said before in several occasions (see, for instance, the interviews in [Fraga Alves and De Carvalho, 2015](#); [Freitas ACM and Freitas JM, 2018](#)), it was indeed true that when Richard Davis, one of the organizers of EVA 2009 (The *Sixth International Conference on Extreme Value Analysis*), which was held at Fort-Collins, Colorado, USA, spoke about Vimeiro’s meeting as EVA–0, and when I read at EVA 2013 website: ‘*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*’ . . . I indeed felt some ‘Nostalgia’ . . .



In the Preface of the book associated with this NATO ASI, edited by Tiago de Oliveira ([Tiago de Oliveira, Ed., 1984a](#)) and dedicated to the memory of Emil Julius Gumbel, one of the pioneers in *Statistics of Extremes*, and a scientist with whom Tiago de Oliveira collaborated in the sixties, at Columbia University, one can find articles written by the aforementioned prominent researchers.

In such a Preface we can read: ‘... *the narrow and shallow stream* (of extremes) *gained momentum and is now a huge river, enlarging at every moment and flooding the margins*’. And Tiago de Oliveira ends the Preface with thanks to the members of the recently formed DEIOC/FCUL, now DEIO/FCUL, saying: ‘... *it is a very good group that crossed the desert during the organization time and continues to work on...*’

The urge to publish was then reduced. In reality, two of the most relevant results contained in my 1978 thesis,

- the derivation of the joint distribution of upper order statistics and their concomitants, or induced order statistics,
- and the study of rates of convergence and penultimate or pre-asymptotic behaviour of sequences of extremes,

were published only in 1981 and in 1984 (Gomes, 1981a; 1984c), respectively. This second result clarified an issue raised by Sir Ronald Fisher and Leonard Tippett, in their seminal 1928 article. And the clarification of an issue that over 50 years had been addressed with limited success by several experts, put me on the attention radar of some of the gurus in the area, namely Herbert David, Janos Galambos, Laurens de Haan, Ross Leadbetter, all participants of SEA 1983. And this topic has continued and still bears fruit, with recent applications to the reliability of high-dimension coherent systems (see Reis *et al.*, 2015, among other papers).

However, in the 10-years period, 1975–1984, and including ‘almost all’ published material in the field of *Extremes* by the Portuguese community, I could count **43** publications (Fransén and Tiago de Oliveira, 1984; Gomes, 1978, 1979a,b, 1980a,b, 1981a,b, 1982, 1984a,b,c,d,e; Gomes and Pestana, 1978, 1981a,b; Iglésias Pereira, 1983; Tiago de Oliveira, 1975, 1977a,b,c, 1978a,b, 1981, 1982a,b,c,d, 1983, 1984a,b,c,d,e; Tiago de Oliveira and Epstein, 1982; Tiago de Oliveira and Gomes, 1984; Turkman, 1980, 1982, 1984a,b; Turkman and Walker, 1983, 1984), but **20** of them (around 47%) were co-authored by Tiago de Oliveira.

In that distant 1983, the community of ‘extremists’ was just emerging. There were **15** days of intense exchange of ideas, which renewed my enormous enthusiasm for EVT. And EVT has developed rapidly in recent decades due to its importance in the assessment of catastrophic risks in the most diverse human activities, among which I mention, *Economy, Finance, Health, Industry, Insurance* and *Population Dynamics*. EVT is essential for the construction of large structures in which it is necessary to assess levels of exceedance, for example of wind speeds or of river flows during floods. And it is one of the instruments of research in *Climatology, Energy, Environment, Hydrology* —in short, EVT has invaded almost all fields of science and technology related to a collective survival, where parameters of rare events are relevant. That is why we welcome the important international impact of Portuguese ‘*extremism*’, whose success is bound to be increasingly visible.

At the time, research in mathematics was usually more solitary than it is today. The fashion for international collaborations was not yet in place. Anyway, the publication of research together with Martin van Montfort, from Wageningen University (van Montfort and Gomes, 1985; Gomes and van Montfort, 1986), and my collaboration with Laurens de Haan, from the Erasmus University of Rotterdam, were certainly auspicious consequences of this long congress. Regarding joint publications with Laurens de Haan, I am merely referring to the editions of books associated with international conferences organized by us (Gomes *et al.*, Eds., 2003; Fraga Alves *et al.*, Eds., 2007b, 2011) and the articles in international periodicals (Gomes and de Haan, 1999; Gomes *et al.*, 2002, 2004b, 2006, 2008c; Fraga Alves *et al.*, 2003, 2007a, 2009).

I now dare to say again (see, Gomes, 2005, 2007, 2013b, 2017) that the organization of the 1983 NATO ASI (or SEA 1983), with two Wednesday's afternoons and two whole weekends, full of social program, under my responsibility, despite of a bit 'traumatizing', in such a way that only after 1999 did I advance with the organization of conferences in Portugal, was indeed a landmark for the international recognition of the group and the launching of the PORTSEA, with an active life of almost 40 years, if we count it only after 1983.

With some work in the area of *Extremes*, although slight collateral to the subject of their PhD, I also mention Eugénia Graça Martins, with a PhD thesis discussed in 1983, and Helena Iglésias Pereira, who got her PhD degree at FCUL, in 1985, both supervised by Dinis Pestana. In the area of *Risk and Ruin Theory*, which can potentially be partially included in PORTSEA, something '*I hope for the future*', I mention Lurdes Centeno and Alfredo Egídio dos Reis, who got their PhD Degrees in 1985 and 1994 respectively, at Heriot-Watt University (UK), and who are now Full Professors at *Instituto Superior de Economia e Gestão* (ISEG).

In the meantime, Margarida Brito (University of Porto), who obtained her PhD degree in the area of *Extremes* at the University of Paris VI (Brito, 1987), under the supervision of Paul Deheuvels, came back to Portugal, being now an Associate Professor at O'Porto University. Prior to her PhD, she was already author of an article at an international periodical (Brito, 1986).

From the beginning of the 1980s, the investment policy inspired by Veiga Simão began to bear fruit, in the sense that a few groups with a reasonable critical mass were created here in Portugal. And, together with a few PhDs got in the best centres out of Portugal, those groups allowed the beginning of a '*banal*' supervision of PhD's in Portugal, together with PhDs obtained in the best foreign centres. I next sequentially mention the different PhD thesis:

- The first student to get a PhD degree in Portugal fully in the area of *Extremes* was Teresa Alpuim, now Full Professor at DEIO. She got her PhD degree in 1989, under my supervision, at *Universidade de Lisboa* (Alpuim, 1989). Her



thesis gave rise to seminal papers in the field of *Extremes for Dependent Sequences*, among which I refer only the three articles published prior to her PhD (Alpuim, 1986, 1988; Gomes and Alpuim, 1986), a record perhaps difficult to overpass . . .

- Almost simultaneously, but already in 1990, Manuela Neves (Neves, 1990), now Full Professor at the ‘*Instituto Superior de Agronomia*’ (ISA), ‘*Universidade Técnica de Lisboa*’ (UTL), now ULisboa, defended her PhD thesis, at ‘*Universidade Nova de Lisboa*’ (UNL), under the supervision of Tiago de Oliveira. She was thus the first PhD student of Tiago de Oliveira in the field of *Extremes*.
- Also pioneers in this area are my second and third PhD students, Luísa Canto e Castro and Isabel Fraga Alves, who defended their PhD theses in 1992 (Canto e Castro, 1992; Fraga Alves, 1992a). Prior to their PhD, they have also published articles in international periodicals (Canto e Castro, 1987; Fraga Alves, 1992b).
- Fernanda Oliveira defended her PhD thesis also in 1992 (Oliveira MF, 1992), under the supervision of Feridun Turkman. Prior to her PHD, she had two publications at international periodicals (Oliveira MF and Turkman, 1992; Turkman and Oliveira MF, 1992).
- Although in a collaborative way, I also consider Nuno Crato, who got his PhD degree at the University of Delaware (Crato, 1992), USA, under the guidance of Howard Taylor, being now a Full Professor at ISEG, as a pioneering name for the development of what I dare today to call the ‘*School of Extremes in Portugal*’.
- Professor Tiago de Oliveira only quite late decided for the supervision of PhD students in his most relevant area of research, and unfortunately, due to his premature death in 1992, when he was 63 years old, he has only seen the discussion of Manuela Neves’ PhD thesis. Two other PhD students of Tiago Oliveira, in the area of *Extremes*, and members of DEIO/FCUL, Isabel Barão and Teresa Themido Pereira, have finished their PhD thesis, already under my supervision (Barão, 1993; Themido Pereira, 1994).
- Also in 1994, Emília Athayde (Athayde, 1994) at FCUL, and Helena Ferreira (Ferreira H, 1994) at the University of Coimbra, got PhD degrees under my supervision. Emília Athayde managed to have a book chapter published prior to the obtention of her PhD degree (Athayde and Gomes, 1987) and an article in a reputed international periodical (Alpuim and Athayde, 1990). And Helena Ferreira published an article in a highly reputed international journal (Ferreira H, 1993), prior to the obtention of her PhD degree.

This was the beginning of the Portuguese ‘*extremism*’. First under the direct guidance of the aforementioned researchers, and next by the scientific ‘grandchildren’

and ‘great-granchildren’ of initial members, was created the PORTSEA, recognized internationally, whose members are spread throughout all Portuguese universities, and even around the world. For some, the passage through the universe of *Extremes* was fleeting, directing their interests to other areas, but most of the researchers who got their PhD in the area continued to publish firmly in the wide range of EVA, and many others whose usual research activities are developed in other areas have occasionally produced valuable work in the field of *Extremes*.

### 3 The growth of PORTSEA—Further PhD Thesis and Habilitation Degrees

From the beginning of 1994 and until the end of 2003, in a period of 10 years, the PhDs of Portuguese researchers in the area of *Extremes* have followed at a quite interesting rhythm. And apart from the **3** aforementioned PhD thesis written by Teresa Themido Pereira, Emília Athayde and Helena Ferreira, in 1994, **16** additional PhD thesis were mentioned in [Gomes \(2005\)](#):

- One of my MSc students, João Gomes ([Gomes J, 1996](#)), worked under the supervision of M. Teresa Alpuim, being thus my first scientific ‘grandson’.
- Under my supervision, it is possible to count three additional thesis, in this period, written by M. Adelaide Valente de Freitas ([Valente de Freitas, 1998](#)), Andreia Hall ([Hall, 1998](#)) and Orlando Oliveira ([Oliveira O, 2003](#)). Regarding publications prior to their PhDs, I refer [Hall \(1996\)](#), [Gomes J and Oliveira O \(1997\)](#), [Gomes MI and Oliveira O \(2001\)](#).
- Fátima Brilhante ([Brilhante, 1999](#)) and Sandra Mendonça ([Mendonça, 2001](#)) worked under the supervision of Dinis Pestana.
- M. Graça Temido ([Temido, 2000](#)) worked under my co-supervision, jointly with L. Canto e Castro. Prior to her PHD, she published one article in an international periodical ([Temido, 1999](#)).
- Manuel Scotto ([Scotto, 2001](#)) and Patrícia de Zea Bermudez ([de Zea Bermudez, 2003](#)) worked under the supervision of Feridun Turkman. Regarding publications prior to their PhDs, I refer [Scotto and Guedes Soares \(2000\)](#) and [de Zea Bermudez et al. \(2001\)](#).
- M. João Martins ([Martins MJ, 2001](#)) worked under my co-supervision, jointly with M. Manuela Neves. Prior to her PhD, and just as happened with Teresa Alpuim, she had three articles published in international periodicals ([Martins et al., 1999](#); [Gomes et al., 2000](#); [Gomes and Martins, 2001](#)).
- Bruno Cecílio de Sousa, my MSc student, got his degree in 2002 ([de Sousa, 2002](#)), at Michigan, USA, under the joint supervision of Bruce Hill and G. Michailidis.

- M. Luísa Pereira ([Pereira ML, 2002](#)) got her degree at Universidade da Beira Interior, under the supervision of Helena Ferreira, being thus my second ‘granddaughter’. Prior to her PhD, she has one article published at an international periodical ([Pereira ML and Ferreira H, 2001](#)).
- Ana Ferreira, who got her MSc degree under my supervision, got her PhD degree at Tilburg University ([Ferreira A, 2002](#)), under the joint supervision of Laurens de Haan and John Einmahl.
- I still mention the thesis by Fernanda Figueiredo ([Figueiredo, 2003](#)), under my supervision and essentially in the field of *Statistical Quality Control*, but where we can find several results in the area of *order statistics and extremes*.
- I further mention Alexandra Ramos ([Ramos, 2003](#)), who got her PhD at Surrey University, under the supervision of Anthony Ledford, and Alexandra Dias ([Dias, 2003](#)), who got her PhD at ETH, Zurich, under the supervision of Paul Embrechts. Alexandra Dias had a publication in an international periodical prior to her PhD ([Dias and Embrechts, 2003](#)).

To the **19** aforementioned PhD thesis, in the period 1994–2003, I now also add two PhD thesis supervised by Laurens de Haan in this period ([Draisma, 2001](#), [Lin, 2002](#)), having only counted thesis under his supervision and discussed after 1999, the year Laurens joined CEAUL. Prior to their PhDs, they have articles published at international periodicals ([Draisma et al., 1999](#); [de Haan and Lin, 2001](#)).

It is indeed sensible to refer that Laurens de Haan, one of the giants in the area of *Extremes*, and author of a highly cited PhD thesis ([de Haan, 1970](#)), which I also include in the references, has regularly visited Lisbon since 1997, and this has led to the development of joint research work with several members of CEAUL. He came to Portugal in 1999, becoming then a member of CEAUL and of PORTSEA. Despite of his relevant contributions to the field prior to 1999, we have only included part of his scientific production from 1999 onwards. On the grounds of the strong cooperation developed between Laurens and members of DEIO/FCUL, and even more generally his cooperation with members of the Portuguese statistical community, DEIO has proposed a title of ULisboa ‘*Doutor Honoris Causa*’ to Laurens de Haan. He has accepted such a distinction and the title was awarded in 2000. And in 2013 another giant in the field, Ross Leadbetter, has honored the University of Lisbon by accepting the same distinction, since no doubt, and just as I wrote at *Info-Ciências Digital* ([Gomes, 2013a](#)), when the university honors researchers of this importance it is also honored. The group has thus two of the *ULisboa Honoris Causa Doctors*.

After 2004 and up to the end of 2018, in a period of 15 years, the growth rate decreased. Anyway, and being sure that a few PhD thesis are missing, I could count **29** additional PhD thesis in the field, most of them supervised by members of our PORTSEA:

- The fourth PhD student of Tiago de Oliveira in the field of *Extremes*, Maria de Fátima Miguéns, was working in an area quite close to the main area of Tiago de Oliveira, *Multivariate Extremes*, and with a reasonably difficult research path, defended her PhD thesis only in 2004 ([Miguéns, 2004](#)), under the supervision of M. Fátima Fontes de Sousa.
- Deyuan Li ([Li, 2004](#)) got his PhD at Erasmus Rotterdam School, under the supervision of Laurens de Haan. Prior to his PhD, I mention the publication of the article, [de Haan et al. \(2002\)](#).
- Ana Paula Martins ([Martins AP, 2005](#)) got her PhD at Universidade da Beira Interior, under the supervision of Helena Ferreira and Luísa Pereira. She is thus my first scientific ‘grand-grand-daughter’. Prior to her PhD, and just as happened with Teresa Alpuim and M. João Martins, I could count three articles in relevant international periodicals, [Ferreira H and Martins AP \(2003\)](#), [Martins AP and Ferreira H \(2004a,b\)](#).
- Maria Cristina Miranda ([Miranda, 2005](#)) got her PhD at DEIO/FCUL, under my supervision, jointly with Andreia Hall.
- Ana Cristina Moreira Freitas ([Freitas ACM, 2005](#)) got her PhD at Faculdade de Ciências, Universidade do Porto, under the supervision of Margarida Brito. She also published prior to her PhD ([Brito and Freitas ACM, 2003](#)).
- Frederico Caeiro ([Caeiro, 2006](#)) got his PhD at DEIO/FCUL, under my supervision. He has been co-author of five relevant articles prior to his PhD ([Caeiro and Gomes, 2002a,b](#); [Caeiro et al., 2005](#); [Gomes and Caeiro, 2002](#); [Gomes et al., 2004a](#)). Frederico has thus beaten the record of Teresa Alpuim, M. João Martins and Ana Paula Martins, with five articles published in international periodicals prior to his PhD.
- Cláudia Neves ([Neves, 2006](#)), currently working at University of Reading, UK, and my third ‘grand-daughter’, got her PhD at DEIO/FCUL, under the supervision of Isabel Fraga Alves and Laurens de Haan. She has co-authored two relevant articles prior to her PhD ([Neves and Fraga Alves, 2004](#); [Neves et al., 2006](#)).
- Sandra Dias ([Dias, 2007](#)) and Marta Ferreira ([Ferreira M, 2008](#)) got their PhD at DEIO/FCUL, under the supervision of Luísa Canto e Castro. I have thus got two additional ‘grand-daughters’, who fortunately had their jobs already in Portugal, and no need to go abroad.
- Under the joint supervision of Laurens de Haan and Casper de Vries, I mention Chen Zhou’s PhD thesis ([Zhou, 2008a](#)). Prior to his PhD, I could count one article in a high quality journal ([de Vries and Zhou, 2006](#)).

- Dora Prata Gomes ([Prata Gomes, 2008](#)) got her PhD at Departamento de Matemática, Faculdade de Ciências e Tecnologia, UNL, under the supervision of Manuela Neves and Tiago Mexia.
- Miguel De Carvalho ([De Carvalho, 2009](#)), currently working at University of Edinburgh, UK, got his PhD at Faculdade de Ciências e Tecnologia, UNL, under the supervision of J. Tiago Mexia and Manuel Esquível.
- Lígia Henriques-Rodrigues ([Henriques-Rodrigues, 2009](#)), who was working at IME, San Paulo, Brazil, by the mid of 2018, the time I began writing this historical preprint, is now working at University of Évora, and has got her Ph.D. at DEIO/FCUL, under my supervision. Prior to her PhD, I could find [Gomes and Henriques-Rodrigues \(2008\)](#).
- Clara Cordeiro ([Cordeiro, 2011](#)) got her PhD at ISA, UTL, under the supervision of M. Manuela Neves. The thesis is slight away from EVT, but she has now been working in the subject. However, two of her papers prior to PhD ([Cordeiro and Neves, 2009, 2010](#)) appear to be of high relevance to the field of *Extremes*.
- Clara Viseu ([Viseu, 2011](#)), who was my MSc student, got her PhD at Universidade da Beira Interior, under the supervision of Helena Ferreira and Luísa Pereira, being thus my second ‘grand-grand-daughter’. Prior to her PhD, I could count a book chapter and two articles in international periodicals ([Gomes et al., 2007b, 2008d,e](#)), in a sub-field of *Extremes*, slight out of the framework of her PhD and closer to her MSc thesis.
- Paulo Araújo Santos ([Araújo Santos, 2011](#)), another ‘grand-son’, got his degree in DEIO/FCUL, under the supervision of Isabel Fraga Alves. Prior to his PhD, I could find two articles in periodicals ([Araújo Santos et al., 2006](#); [Gomes et al., 2008a](#)).
- Paula Reis ([Reis, 2012](#)) got her PhD at DEIO/FCUL, under the supervision of Luísa Canto e Castro and José António Caldeira Duarte. I have thus got another ‘grand-daughter’. The article, [Reis and Canto e Castro \(2009\)](#), was published prior to her PhD.
- Hale Aytaç ([Aytaç, 2013](#)) got his PhD at *Faculdade de Ciências da Universidade do Porto* (FCUP), under the supervision of Jorge Milhazes Freitas, a colleague from FCUP, who got his Ph.D thesis in the area of *Dynamical Systems*, in 2006, but enthusiastically joined the group of *Extremes* around 2005. I indeed recall his enthusiasm about the *extremal index* in the *Workshop on Risk Analysis and Extreme Values*, at Laboratoire de Statistique Appliquée, in Paris, June, 2005, when he was only an accompanying person.

- Jointly with John Einmahl, Laurens de Haan also supervised the PhD thesis of Juan-Juan Cai ([Cai, 2012](#)), at Tilburg University. Juan-Juan has an article prior to her PhD ([Cai et al., 2011](#)).
- Cecília Fonseca ([Fonseca, 2013](#)) and João Renato Sebastião ([Sebastião, 2013](#)) got their PhD at Universidade da Beira Interior, under the joint supervision of Luísa Pereira and Ana Paula Martins. They can thus be considered as my first ‘grand-grand-grand’ daughter and son. João Sebastião had one article prior to his PhD ([Sebastião et al., 2010](#)).
- Paula Pereira ([Pereira P, 2014](#)) got her PhD at DEIO/FCUL, under the supervision of Feridun Turkman. Two of her articles ([Turkman et al., 2010](#); [Pereira P et al., 2013](#)) have been published prior to her PhD.
- Laura Cavalcante ([Cavalcante, 2014](#)) got her PhD at Universidade do Porto, under the joint supervision of Ana Cristina Moreira Freitas and Margarida Brito.
- Délia Gouveia Reis ([Gouveia Reis, 2014](#)) got her PhD at Universidade da Madeira, under the joint supervision of Luiz Carlos Guerreiro Lopes and Sandra Mendonça.
- Eduardo Sousa Costa ([Sousa Costa, 2015](#)), got the degree in 2015, at IST, Universidade de Lisboa, under the co-supervision of António Gonçalves Henriques and Anabela Leitão. I was one of the members of the ‘Accompanying Committee’.
- Helena Penalva ([Penalva, 2017](#)) got her PhD at ISA/ULisboa, under my co-supervision, jointly with M. Manuela Neves and Sandra Nunes. Prior to her PhD, she published two papers in international periodicals ([Penalva et al., 2013, 2016](#)).
- Andrêssa Lima de Souza ([Lima de Souza, 2017](#)) got her PhD at Universidade Federal da Bahia, under the supervision of Jorge Milhazes Freitas.
- Artur Tiago Silva ([Silva AT, 2017](#)) got a PhD at Civil Engineering, IST, ULisboa, under the supervision of Manuela Portela and Mauro Naghettini. The applied research conducted in this PhD thesis enabled the publication of four relevant articles ([Silva AT and Portela, 2012](#); [Silva AT et al., 2012, 2014, 2016](#)).
- Soraia Pereira ([Pereira S, 2018](#)) got her PhD at DEIO/FCUL, under the supervision of Feridun Turkman. Her PhD is a bit aside from the field of *Extremes*, but, apart from a paper published prior to her PhD ([Soraia et al., 2018](#)), she began recently working hard in the field as can be attested by the recent ArXiv preprints, [Amaral Turkman et al. \(2020\)](#), [De Carvalho M et al. \(2020\)](#), [Pereira S et al. \(2020\)](#).

Indeed, on the basis of a nucleon formed by some of the aforementioned Doctors, the research group in the area of *Extremes* has increased at a high rate and in a healthy way, I think. Including mine and Kamil Feridun Turkman PhD thesis, I had counted up to the end of 2003 (Gomes, 2005), **28** PhD thesis in the area (**13** of them in the period 1999-2003, with the high rate of **2.6** PhD thesis per year), written by Portuguese researchers, doing now research necessarily no longer in the field of *Extremes*. Including now Laurens de Haan thesis and the 2 PhD thesis supervised by him in 2001, 2002, I could count **31** PhD thesis in the area and in that same period (**15** of them in the period 1999-2003, with the high rate of **3** PhD thesis per year). And such a rate has increased to **3.4** in the 5-years periods ending at 2005. There was then a decrease in such a rate, with around to **1.6**/per year in the 5-years periods ending at 2010 and up to 2018. But as ‘*a picture is worth a thousand words*’, I present Figure 4.

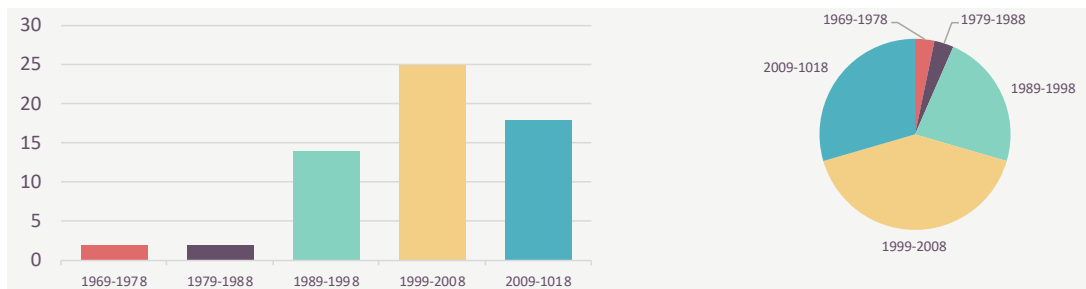


Figure 4: Number of PHD's (*left*) and percentages (*right*), along ten-years' periods

The number of Habilitation Degrees has not been as high as expected. Apart from the **5** initial members of the group, I could count only **11** additional people with an *Habilitation Degree* (Teresa Alpuim, 2002; Manuela Neves, 2003; Isabel Fraga Alves, 2003; Helena Ferreira, 2004; Manuel Scotto, 2012; Luisa Pereira, 2008; Jorge Milhazes de Freitas; 2014; Ana Cristina Moreira Freitas, 2014; Fátima Brilhante, 2015; Ana Ferreira, 2016; Miguel De Carvalho, 2018). But I may be forgetting somebody and I believe that a few members of the PORTSEA will soon apply for such a degree.

## 4 Conferences' organization under PORTSEA umbrella

After the organization of the 1983 NATO ASI on SEA, Feridun Turkman (jointly with Vic Barnett, University of Sheffield) organized in 1993, a SPRUCE meeting on *Statistics for the Environment*, in Lisbon, where *Extremes* played a very important role (see Barnett and Turkman, Eds., 1993). Other SPRUCE meetings have been co-

organized by Feridun, out of Portugal. But we can say that after a wide interregnum of about 15 years, these last two decades have been fruitful in the organization of international conferences in Portugal in the area of *Extremes*, with the inclusion of the area of *Risk Analysis*, where tails are also quite relevant. The 5 organizations referred to in [Gomes \(2007\)](#) are now 14, as follows:

1. *Workshop on Statistical Modelling—Extreme Values and Additive Laws*, Estoril, October 2–7, 1999. This workshop run under the sponsorship of CEAUL and the *Foundation for the Science and Technology* (FCT) project ‘MODEST—*Statistical Modeling*’, a project developed in the interaction of two sub-projects: the subproject ‘MECAES—*Stochastic Models in Environment, Ecology and Health Sciences*’, led by Kamil Feridun Turkman, and the subproject ‘VELA—*Extreme Values and Additive Laws*’, led by M. Ivette Gomes (1997-2000). For details, on all accepted conference papers, see [Gomes et al., Eds. \(1999\)](#).
2. *Workshop on Extreme Values and Resampling Techniques*, Coimbra, November 1–3, 2002. This was the first international workshop running under the sponsorship of the project ‘VEXTRA—*Extreme Values and Resampling Techniques*’, POCTI, FCT (2000-2003), and also CEAUL (see [Temido and Ferreira, Eds., 2002](#)).
3. *Workshop on Extremes, Risk and Resampling Techniques*, Tomar, November 20–23, 2003. This was the final international workshop running under VEXTRA’s project (see [Gomes, et al., Eds., 2003](#)).
4. EVA 2004: *Third International Symposium on Extreme Value Analysis: Theory and Practice*, Aveiro, July 19–23, 2004. After Gothenburg (1998) and Leuven (2001), the III Conference on *Extreme Value Analysis* was held in Portugal, in a certain sense as a recognition for what we already had done in the field (see [Hall et al., Eds., 2004a](#)).
5. *Extremes Day in Honor of Laurens de Haan: Extremes, Risk, Safety and the Environment*, Lisboa, FCUL, February 22, 2006. In 2004, Isabel Fraga Alves and I put forward a proposal for the award of a Gulbenkian Professorship (naturally granted) to Laurens. Under this Gulbenkian Professorship, Laurens de Haan had a temporary job of visiting professor at FCUL (DEIO), from the 1st of January until the 31st of December 2005. And on the occasion of his Gulbenkian Lecture, entitled ‘*On Extreme Value Theory or How to learn from almost Disastrous Events*’, under the sponsorship of CEAUL and the ERSE—*Extremes, Risk, Safety and the Environment* project, POCI/MAT 58876/2004 (2005–2008), we have organized this successful workshop, where we tried detecting the new advances in the main topics of ERSE project (see [Fraga Alves and Gomes, Eds., 2006](#)).



6. SEER 2007: *Statistical Extremes and Environmental Risk*, Lisboa, February 15–17, 2007. This was the final international workshop running under ERSE’s project (see [Fraga Alves et al., Eds., 2007b](#)).
7. ISI 2007: *56th Session of the International Statistical Institute*. This large event, with more than 2000 participants, was held in Lisbon, Portugal, 22–29 August. I was the Chair of the Local Program Committee and member of the International Program and National Organizing Committees. There was a strong co-operation between CEAUL and INE, the *National Statistical Institute*, with a high recognition of the field of *Extremes* (see [Gomes et al., Eds., 2007c, 2008f](#)). Such a recognition led to an invited volume of *Revstat—Statistical Journal* (Volume 6:1, 2008), edited by Jan Beirlant, Isabel Fraga Alves and Ross Leadbetter ([Beirlant et al., Eds., 2008](#)).
8. *Workshop on Risk and Extreme Values in Insurance and Finance*, Lisboa, June 6–7, 2011. This conference represented a unique event which brought together in Portugal the three authors of the book *Modelling Extremal Events for Insurance and Finance* — Paul Embrechts (Zurich, Switzerland), Claudia Klüppelberg (München, Germany), and Thomas Mikosch (Copenhagen, Denmark). This international workshop run under the sponsorship of CEAUL and the project ‘EXTREMA: *Extremes in Today’s World*’, PTDC/MAT/101736/2008 (2010–2013), under the leadership of M. Ivette Gomes, and the project ‘*Extremes in Space*’, PTDC/MAT/112770/2009 (2011–2013), under the leadership of Laurens de Haan (see [Fraga Alves et al., Eds., 2011](#)).
9. *Workshop on Multivariate and Spatial Extremes: WMSE 2011*, Universidade da Beira Interior (UBI), Covilhã, October 13–14, 2011. The Workshop was organized jointly by the Center of Mathematics (CMUBI) and the FCT research project *Structure of Random Fields* (PTDC/MAT/108575/2008), under the leadership of Luísa Pereira.
10. *Symposium on Recent Advances in Extreme Value Theory honoring Ross Leadbetter*, Lisboa, March 18–20, 2013. This Symposium, held around the day Ross Leadbetter has been awarded a ‘*Honoris Causa*’ degree by the University of Lisbon, was organized by CEAUL, jointly with the FCT research projects *Extremes in Space*, PTDC/MAT/112770/2009, and *Statistical Methods in Environmental and Epidemiological Processes*, PTDC/MAT/118335/2010, and Strategic Project CEAUL: PESt-OE/MAT/UI0006/2011 (see [Turkman et al., Eds., 2013](#)).
11. *5th International Conference on Risk Assessment (ICRA5)*, May 29–31, June 1, Tomar, 2013. After 4 meetings organized by the *International Statistical Institute–Committee on Risk Analysis (ISI-CRA)*, organized in Athens, San-

torini, Porto Heli and Limassol, ICRA5 was organized as part of the *Celebrations of the International Year of Statistics* and was held at the ‘*Instituto Politécnico de Tomar*’ (IPT). This meeting was organized in honour of Lutz Edler, under the umbrella of CEAUL, UAb—Universidade Aberta, IPT and EXTREMA FCT project (see Oliveira T *et al.*, Eds., 2013), and gave rise to an invited volume of *Revstat—Statistical Journal* (Volume 14:2, 2016), edited by Christos Kitsos, Teresa Oliveira and Milan Stehlík (Kitsos *et al.*, Eds., 2016).

12. EVT—*Extremes in Vimeiro Today*, Vimeiro, September 8–11, 2013. This international conference was organized by Antónia Amaral-Turkman, Isabel Fraga Alves and Manuela Neves (see Fraga Alves and Neves, Eds., 2013), on the occasion of my 65th birthday and for the celebration of the 30 years of the NATO ASI on SEA, in 1983.
13. *Satellite Meeting ISI-CRA*, in honour of Professor David Banks, jointly with 10th *Workshop on Statistics, Mathematics and Computation*, Lisboa, July 10 and Portalegre, July 11-12, 2017 (see Oliveira T *et al.*, Eds., 2017).
14. The *Workshop on New Frontiers in Statistics of Extremes* was organized by Patrícia de Zea Bermudez and Miguel de Carvalho, under the sponsorship of CEAUL and the Research Project, *Data Fusion and Calibration Methods for Spatial Risk Analysis* (PTDC/MAT-STA-28649/2017), from FCT (see Program and Book of Abstracts at [https://workshopnfsextremes2020.weebly.com/uploads/1/0/1/7/101754332/book\\_of\\_abstracts.pdf](https://workshopnfsextremes2020.weebly.com/uploads/1/0/1/7/101754332/book_of_abstracts.pdf)).

Among the aforementioned organizations and to make a comparison with SEA 2013, I would like to further say a few words about EVT 2013 (*Extremes in Vimeiro Today*), organized by my colleagues and great friends, Antónia Amaral Turkman, Isabel Fraga Alves and Manuela Neves, to commemorate the thirty years of the Vimeiro meeting in 1983.

This was indeed another of the great PORTSEA milestones.



Figure 5: Photo of participants of EVT 2013 (*Extremes in Vimeiro Today*)

- Of the **40** participants in SEA 1983, only around 30% were young, and only ten (25%) were women, seven of whom became (or were) PhD students in Portugal.
- And of the **81** participants in EVT 2013, more than 50% were women, and more than 40% were young people, something that I saw as very promising for the future of the area . . .

And among the aforementioned conferences, I must also further say that I was very impressed by:

- EVA 2004, in which the ‘extremists’ and PORTSEA members Andreia Hall and Manuel Scotto played a very important role.
- ICRA5, where I highlight the relevant role of Teresa Oliveira, currently ‘Chair’ of ISI-CRA, and who I also consider a member of PORTSEA.
- Finally, the last international conference held in Portugal in the area, the WNFSE 2020, organized by the ‘*extremists*’ Patrícia de Zea Bermudez and Miguel de Carvalho, current President of SPE, was held by the end of February 2020, in Lisbon, just before we went into confinement, due to COVID-19, and left me extremely satisfied and grateful, seeing that PORTSEA is still very much alive, and with the very active collaboration of several researchers from Banco de Portugal who can have a strong effect in the development of PORTSEA.

Internationally, I refer only to the following:

- All EVA conferences, organized since 1998, have had members of our PORTSEA in their Scientific Committees. And the same happens with EVA 2021, which will take place virtually in Edinburgh, UK, next June/July, and which will further have two members of PORTSEA, Miguel de Carvalho and Cláudia Neves, in the Organizing Committee.
- KLIMATEXT—*International Conference on Precipitation Extremes in a Changing Climate*, Technical University of Liberec, Hejnice, Czech Republic, September 24-26, 2013. This conference run under the umbrella of CZ.1.07./2.3.00/20.0086, ‘*Strengthening International Cooperation of the Klimatext Research Team*’ (EU Project: EU structural funds through the Czech ministry of Education, 2012–2014), with Jan Picek as co-ordinator, and M. Ivette Gomes as an international expert.
- The ‘*Centre International de Rencontres Mathématiques*’ (CIRM) *International Conference on Extreme Value Theory and Laws of Rare Events*, which took place in July 14-18, 2014, Marseille, France, had two other members of PORTSEA in the Organizing Committee, both from the University of Porto,

Ana Cristina Moreira Freitas and Jorge Milhazes Freitas, Corresponding Member of ACL since January 2020, and considered by many, and also by me, one of the founders of *Extremes in Dynamical Systems*.

- The 7th *International Conference on Risk Analysis* (ICRA7), which took place in Chicago, in May 2017, had Teresa Oliveira in the Executive Committee. ICRA7 was held in my honour, and as *Risk Analysis* is not my main research topic, this international tribute had a special flavour, as it seemed more like a global recognition of my contribution to *Probability and Statistics*.

## 5 The ‘heart’ of PORTSEA

I consider that the excellence of the PhD students that we have had is actually what has contributed the most to the internationalization of the ‘*Escola de Extremos*’ in Portugal. But I cannot fail to mention the importance of the co-orientation of a great diversity of foreign graduate students, from different Universities: Charles University Prague, Fudan University of Shanghai, KULeuven, Pierre-et-Marie-Curie, Siegen, among others. Over the years, and the increasing number of publications, collaboration with researchers from other countries has increased significantly, as can be seen in Figure 6. We there represent **65** universities to which belong co-authors of PORTSEA members, in articles published in high-profile scientific journals.

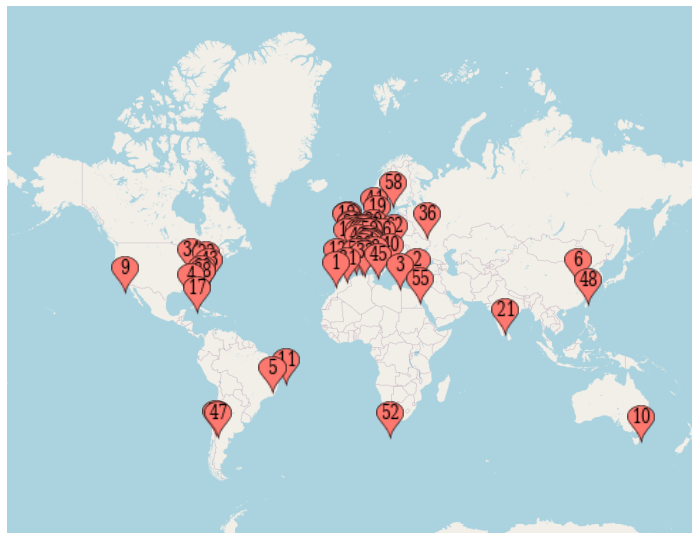


Figure 6: Universities around the world with co-authors of members of PORTSEA

The involvement of various members of PORTSEA as Editors of scientific journals is another source of satisfaction. Among the wide range of international periodicals where members of PORTSEA have played an important role, I would like to highlight only:

- The fact that three of these members, Ana Ferreira, Laurens de Haan and myself, are in the body of Associate Editors of *Extremes*, the most prestigious journal in the area, edited by Springer, with Thomas Mikosch as current Editor-in-Chief (since 2015), following Holger Rootzén (1998–2006) and Jürg Hüsler (2007–2014).
- And the fact that I was Editor-in-Chief of *Revstat–Statistical Journal*, from 2003 until the end of 2018 (a position currently held by another member of PORTSEA, Isabel Fraga Alves), having managed to place this periodical, edited by *Instituto Nacional de Estatística* (INE), with whom we have had high collaboration, among the prestigious journals of *Statistics*, with an impact factor in *ISI Web of Knowledge* since 2007.

Again thinking only on the aforementioned periodicals, *Extremes* and *Revstat*, I would like to mention the following numbers:

- I could find **42** articles co-authored by members of PORTSEA, published at *Extremes* (Beirlant *et al.*, 2016; Caeiro and Gomes, 2006; Caeiro *et al.*, 2016a; Cai *et al.*, 2013, 2020; Canto e Castro and Dias, 2011; Dietrich *et al.*, 2002; Draisma *et al.*, 1999; Drees *et al.*, 2018; Einmahl *et al.*, 2013; Ferreira A and Huang, 2018; Ferreira H, 2000; Ferreira M and Canto e Castro, 2008; Fraga Alves, 2001a; Fraga Alves and De Carvalho, 2015; Fraga Alves *et al.*, 2009, 2017; Gomes and de Haan, 1999; Gomes and Henriques-Rodrigues, 2008; Gomes and Martins, 2002; Gomes and Oliveira, 2001; Gomes *et al.*, 2000, 2002, 2008b, 2012; de Haan, 2006; de Haan *et al.*, 2009, 2015; Hall, 2001, 2003; Hall *et al.*, 2004b; Leng *et al.*, 2019; Pereira ML *et al.*, 2017; Ramos and Ledford, 2005; Turkman *et al.*, 2010; Valente de Freitas and Hüsler, 2003; Veltohen *et al.*, 2019; de Vries and Zhou, 2006; de Zea Bermudez *et al.*, 2001; Zhou, 2008b, 2017, 2018).
- Regarding *Revstat*, I mention the edition of volume **6:1** (Beirlant *et al.*, 2012) and **14:2** (Kitsos *et al.*, 2016), as well as the co-authorship of **39** articles (Araújo Santos *et al.*, 2006; Beirlant *et al.*, 2012; Brilhante, 2004; Brilhante *et al.*, 2019; Caeiro and Gomes, 2008; Caeiro *et al.*, 2005; Caetano *et al.*, 2019; Cordeiro and Neves, 2009; De Carvalho and Ramos, 2012; Ferreira H, 2006a; Ferreira H and Ferreira M, 2020; Ferreira H and Martins AP, 2003; Ferreira M, 2010, 2013c, 2018; Ferreira M *et al.*, 2012; Figueiredo and Gomes, 2013; Figueiredo *et al.*, 2017; Fraga Alves *et al.*, 2007a; Gomes *et al.*, 2007a, 2016b; de Haan and Zhou, 2008; Hall and Scotto, 2006, 2008; Henriques-Rodrigues and Gomes, 2009; Henriques-Rodrigues *et al.*, 2011, 2014; Neves and Fraga Alves, 2008; Oliveira A *et al.*, 2016; Oliveira O *et al.*, 2006; Penalva *et al.*, 2016, 2019, 2020a; Pereira ML, 2004; Pereira S *et al.*, 2018; Reis and Canto e Castro, 2009; Scotto, 2007; Silva I and Silva ME, 2009; Turkman, 2014).

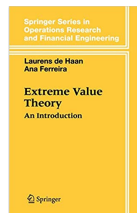
The PORTSEA has nowadays several internationally renowned names. I counted more than **60** PhD theses in the area or in very close areas, written by Portuguese

researchers, and associated with degrees obtained in Portugal and abroad. But, just as I mentioned before, the number of Habilitation Degrees needs to increase. The current number of PhD and Master students in the area, although not as high as a decade ago, still promises to expand the group in the near future. However, such a number is becoming smaller, being thus more difficult to widen the group in the near future, unless our policy is slightly changed. But I think it is pertinent to refer two current PhD students in the field and in Lisbon, whom I got to know well, Ivanilda Cabral and Jessica Lomba. Ivanilda is an Assistant at Departamento de Ciência e Tecnologia da Universidade de Cabo Verde, and has been working for PhD at UNL, under the co-supervision of Frederico Caeiro and I, Ivette Gomes. Prior to the discussion of her PhD, I refer the publication of a book chapter (Caeiro *et al.*, 2018) and two articles in international periodicals (Cabral *et al.*, 2020a,b). Jessica Lomba, an Assistant at UNL, Nova School of Business and Economics: Lisboa, has been working for PhD, at DEIO, under the supervision of Isabel Fraga Alves. Apart from several academic merit scholarships, she has received SPE Award 2019, a research incentive award for young researchers under 35, with original and quality work, and has already a publication at a highly reputed international periodical (Lomba and Fraga Alves, 2020).

The dynamic of publication has been quite high, clearly above international average standards, with more than five hundred articles published in prestigious international journals. I limit myself to refer to the **87** articles published in the last ten years (2011-2020), co-authored by only 3 of the members of PORTSEA, two of the three pioneers in the area (in view of the death of Tiago de Oliveira in 1992), and Laurens de Haan, a member of PORTSEA, still active, and ‘*ULisboa Doctor Honoris Causa*’ (Amaral-Turkman *et al.*, 2011; Beirlant *et al.*, 2012, 2016; Brillhante *et al.*, 2011, 2012, 2013a,b,c, 2014, 2019; Cabral *et al.*, 2020; Caeiro and Gomes, 2011a,b,c, 2013, 2015a,b; Caeiro *et al.*, 2014, 2016a,b, 2020; Cai *et al.*, 2011, 2013, 2014; Da Camara *et al.*, 2014; De Carvalho *et al.*, 2013; Drees and de Haan, 2015; Drees *et al.*, 2018; Einmahl *et al.*, 2013, 2016, 2019; Ferreira A and de Haan, 2014, 2015; Ferreira A *et al.*, 2012; Ferreira M *et al.*, 2012; Figueiredo and Gomes, 2013, 2016; Figueiredo *et al.*, 2012, 2017; Fougères *et al.*, 2015; Gomes, 2020; Gomes and Guillou, 2015; Gomes and Henriques-Rodrigues, 2016, 2017; Gomes and Neves, 2011; Gomes and Pestana, 2011; Gomes *et al.*, 2011a,b,c, 2012, 2013a,b,d,e, 2015a,b, 2016a,b, 2020a,b; de Haan, 2015; de Haan and Zhou, 2011; de Haan *et al.*, 2013, 2015, 2016; Henriques-Rodrigues and Gomes, 2018; Henriques-Rodrigues *et al.*, 2011, 2014, 2015; Leiva *et al.*, 2016, 2019; Neves C *et al.*, 2011; Neves MM *et al.*, 2015; Nunes *et al.*, 2019; Pekalp *et al.*, 2019; Penalva *et al.*, 2020a,b; Pereira JMC *et al.*, 2015, 2019; Pereira P *et al.*, 2013; Pereira S *et al.*, 2018; Pinto *et al.*, 2018; Reis *et al.*, 2015; Sousa *et al.*, 2016; Turkman, 2014; Turkman *et al.*, 2014a; Ursu and Turkman, 2012), not all in the *Extremes and Risk Assessment* area, but in very close areas involving statistical EVT.

It should also be noted that our *School of Extremes*, despite the high contribution at the international level, has not neglected publication at the national level. This contribution can be attested to by the publication of articles in Portuguese, in the different text collections associated with SPE Congresses and edited by SPE since 1992, where the production in the area of *Extremes* has been, on average, 17% per volume.

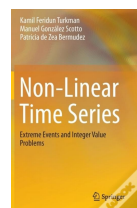
I cannot also fail to mention five relevant books, with PORTSEA members among the co-authors:



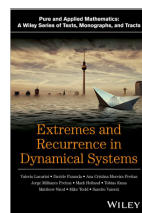
A generic book by Laurens de Haan and Ana Ferreira (de Haan and Ferreira, 2006), with more than 2500 citations, and published by Springer, which once again attest to the invaluable contribution of Laurens de Haan to the establishment of PORTSEA;



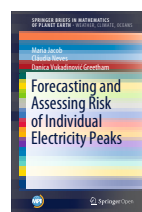
A book in Portuguese (Gomes et al., 2013c), co-authored by Ivette Gomes, Isabel Fraga Alves and Cláudia Neves, also generic, edited by SPE/INE and associated with a short course taught prior to the XXI Annual Congress of SPE, held in Aveiro;



A book on *Extremes of Nonlinear Time Series* (Turkman et al., 2014b), co-authored by Feridun Turkman, Manuel Scotto and Patrícia de Zea Bermudez, edited by Springer;



Another one about *Extremes in Dynamic Systems* (Lucarini et al., 2016), edited by Wiley, in which Ana Cristina Moreira Freitas and Jorge Milhazes Freitas are co-authors;



And a last one about *Risk Assessment and Extremes* (Jacob et al., 2020), edited by Springer, in which Cláudia Neves is co-author.

The fields of EVT, in which PORTSEA's contribution has been important, are very diverse. In addition to a vast group with innovative work in the area of Parametric, Semi-parametric and Non-parametric Estimation of parameters of extreme events, PORTSEA has strong groups in the areas of

- Statistical Choice of Extremal Models,
- Extremes and Risk Modelling,

- Environmental Extremes,
- Extremes of Dynamical Systems,
- Extremes of Dependent Sequences, and
- Spatial Extremes.

And, as a prediction, I hope that we shall soon have a group of

- Extremes in Genetics and another in
- Extremes in Epidemic Situations.

In view of the results obtained, I am led to believe that our ‘*Escola de Extremos*’ (or our PORTSEA) has in fact achieved a healthy growth in the area. The dynamism of the Group has allowed a high international recognition of the School of Extremes in Portugal, a country of ‘*nice extremists*’ at one end of Europe.

**Acknowledgements.** Research partially supported by FCT—Fundação para a Ciência e a Tecnologia, project UID/MAT/00006/2021 (CEA/UL).

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