



**CURRICULUM VITAE (CVA) (máximo length 4 pages)**

<b>Part A. PERSONAL INFORMATION</b>		<b>CV date</b>	27/02/2023
First name	Aurea		
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Open Researcher and Contributor ID (ORCID) (*)		<a href="http://orcid.org/0000-0003-0980-6409">http://orcid.org/0000-0003-0980-6409</a> WoS researcher ID <a href="#">M-6639-2019</a>

(\*) Mandatory

**A.1. Current position**

Position	Full Professor (Catedrática)		
Initial date	24/02/2023		
Institution	Universidad Carlos III de Madrid		
Department/Center	Statistics	School of Social Sciences and Law	
Country	Spain	Teleph. number	+34916249817
Key words			

**A.2. Previous positions (research activity interruptions, art. 14.2.b))**

Period	Position/Institution/Country/Interruption cause
01/12/1994-29/09/2005	Assistant/collaborating professor/Universidad de Barcelona/Spain
01/10/2005-23/11/2009	Visiting professor/Universidad Carlos III de Madrid/Spain
24/11/2009-23/02/2023	Associate professor/Universidad Carlos III de Madrid/Spain

**A.3. Education**

PhD, Licensed, Graduate	University/Country	Year
Licensed in Mathematical Sciences	Universidad de Barcelona	1994
PhD in Mathematics	Universidad de Barcelona	1999

**Part B. CV SUMMARY (max. 5000 characters, including spaces)**

My scientific contributions are in the research lines of goodness-of-fit, distance-based methods and data visualization, functional data analysis, computational methods for large financial series, whose common link are the development of non-parametric techniques based on distances and their applications to complex datasets. I currently have a total of 48 scientific publications (36 indexed in JCR), and 5 books and more than 29 publications related to transfer of knowledge to the society, in social context and lawmetrics. I received a total of 758 citations (h-index 15) in Google Scholar-GS.

My firsts works on goodness-of-fit are related to my PhD Thesis, developed under projects led by Prof. Cuadras (UB). I developed statistics based on Hoeffding's maximum correlation for uniformity and exponentiality tests. The most relevant methodological contribution is Fortiana and Grané (2003), as a result of which I was invited to international conferences like ERCIM, 1st ISNPS by Prof. Meintanis (Univ. Athens). Later, I developed new test statistics for censored data. There are 14 contributions in this line.

The research line on distance-based (DB) techniques is inherited from Prof. Cuadras research group, and I followed contributing to it in projects led by Prof. Delicado (UPC). When I led my own research group (with AEI funds for 14.5 years, ~300k €), this line was extended to distance-based techniques and data visualization. I contributed to the development of DB-PLS regression model, which is included in the R-package dbstats. DB methods are computationally demanding, and in recent publications we provide some solutions to the scalability problem (Baíllo and Grané 2021). Other recent contributions are related to statistical learning methods based on distances for heterogeneous data (Albarrán et al. 2015; Grané and Romera 2018). As a result, I was invited by Prof. Sibilo (Univ. Salerno) as member of the scientific committee of the international conference of Mathematical and Statistical Methods for Actuarial Sciences and Finance (MAF editions 2016, 2018, 2020, 2022) and to organize the conference



in Madrid in 2018. The latter is a pioneer work in the detection of outliers in heterogeneous datasets, and I am developing the FS-DB algorithm (Grané, Salini and Verdolini 2021, and Grané, Manzi and Salini 2021) to be incorporated in the new releases of the FSDA Matlab Toolbox (Riani et al. 2012). The PhD thesis of Guo Qi (in course) is in this line, where we are developing global longitudinal indicators based on common principal components (CPC) to track the health and wellbeing in the silver and golden age, trying to give an answer to one of the SDG of 2030 UN Agenda. There are 16 contributions in this line.

In functional data analysis, I contributed to developing new predictive models and to improving the estimation of healthy life expectancy (free of dependency) in the Spanish population, with important economic implications for the insurance sector (Albarrán et al. 2019, 2020). As a result, I was invited as guest editor of the journals *European Journal of Finance*, *Decisions in Economics and Finance* and *International Journal of Environmental and Public Health*. A relevant contribution is Baíllo and Grané (2009), with more than 120 citations, which is a pioneer methodological work, where we give solution to an open question of the seminal book by Ferraty and Vieu (2006). In this line, there are 8 contributions. These works started under the research group lead by Prof. Delicado (UPC) and continued under my own projects.

The works related to computational methods for large financial series started under the research group led by Prof. Peña (UC3M) and continued under my own projects. The most relevant methodological contribution is Grané and Veiga (2010), where I developed a new computationally efficient algorithm based on wavelets for the outlier detection in large financial series. The work received more than 120 citations and was TOP 25 in Science Direct from October-December 2010. As a result I was invited by Prof. La Rocca (Univ. Salerno) to international conferences such as 6<sup>th</sup> and 7<sup>th</sup> Workshop on Statistical Simulation, and to be part of the scientific committee of the ERCIM conference and member of the organizing committee of the 2<sup>nd</sup> ISNPS. In this line I supervised the PhD thesis of JM Cueto (PhD in Quantitative Methods in Business July-2021), where we developed portfolio construction proposals based on CPC, and new bootstrap-based test statistics to validate multifactor models. There are 8 contributions, with 152 citations.

In lawmetrics, I collaborate with Prof. Soletto (UC3M), within the framework of several European projects. I supervised the PhD thesis of EO Passolea (PhD in Law, June-2021), a pioneer thesis in Spanish Law, where a quality control protocol is designed based on global indicators to assess the quality along the mediation process. There are two publications in this line and five books.

## **Part C. RELEVANT MERITS** (*sorted by typology*)

### **C.1. Publications** (A selection of last 10 years)

1. Grané, A., Manzi, G. and Salini, S. (2022) Dynamic mixed data analysis and visualization. *Entropy* 24(10), 1399 (S.I. *Robust Methods in Complex Scenarios and Data Visualization*, Riani, M. Ed.) (Q2, Physics, Multidisciplinary)
2. Baíllo, A. and Grané, A. (2021) Subsampling and aggregation: A solution to the scalability problem in distance-based prediction for mixed-type data. *Mathematics* 9(18), 2247 (S.I. *on Multivariate Statistics: Theory and Its Applications*, Galindo, P. Ed.) (Q1, Mathematics).
3. Cueto, J.M., Grané, A. and Cascos, I. (2021) How to explain the cross-section of equity returns through Common Principal Components. *Mathematics* 9(9), 1011 (S.I. *on Advances in Multivariate Analysis and Their Applications in Actuarial and Financial Economics*, Sarabia, J.M. and Guillén, M. Eds.) (Q1, Mathematics).
4. Grané, A., Albarrán, I. and Merchán-Cano D.E. (2021) Impact of pandemic on European well-being: Visualizing scenarios from the SHARE database. *Journal of Environmental Research and Public Health* 18(9), 4620 (S.I. *on Advances in Measuring Health and Wellbeing*) (Q1-SSCI Public, environmental & occupational health; 4 JCR citations)
5. Grané, A. and Sow-Barry, A.A. (2021) Visualizing profiles of large datasets of weighted and mixed data. *Mathematics* 9(8), 891 (S.I. *on Statistical Data Modeling and Machine Learning with Applications*, Gocheva-Ilieva, S. Ed.) (Q1, Mathematics; citations 4 JCR; 6 GS)
6. Grané, A., Albarrán, I. and Guo, Q. (2021) Visualizing Health and Well-Being Inequalities Among Older Europeans. *Social Indicators Research*, 155, 479-503. (Q1 Social Sciences, General; 3 GS)
7. Goyanes, M., Demeter, M., Grané, A., Albarrán, I. and Gil de Zúñiga, H. (2020) A mathematical approach to assess research diversity: operationalization and applicability in communication sciences, political science, and beyond. *Scientometrics* 125, 2299-2322. DOI: <https://doi.org/10.1007/s11192-020-03680-6> (Q1, Social Sciences; citations 5 JCR 5; 7 GS)



8. Grané, A., Salini, S. and Verdolini, E. (2020) Robust multivariate analysis for mixed-type data: novel algorithm and its practical application in socio-economic research. *Socio-Economic Planning Sciences* 73, 100907 (Q1, Operations Research & Management Sciences; FI 4.9; 4 JCR, 10 GS).
9. Grané, A., Albarrán, I. and Lumley, R. (2020) Visualizing Inequality in Health and Socioeconomic Wellbeing in the EU: Findings from the SHARE Survey. *International Journal of Environmental Research and Public Health* 17(21) 7747. (S.I. on The Economics of Caring, Moya Martínez, P. and Del Pozo Rubio, R. Eds.) (Q1 SSCI, Public, environ. and occupational health; 3 JCR, 8 GS).
10. Hartikainen, S.M., Jach, A., Grané, A. and Robson, T.M. (2018) Assessing scale-wise similarity of curves with a thick pen: as illustrated through comparison of spectral irradiance. *Ecology and Evolution*, vol. 8 (20), 10206-10218. (Q2 Ecology; citations: 20 JCR, 24 GS)
11. Grané, A. and Romera, R. (2018) On visualizing mixed-type data: A joint metric approach to profile construction and outlier detection. *Sociological Methods and Research* 47 (2), 207-239. (Q1 Social Sciences, Mathematical Methods; citations: 5 JCR, 15 GS)
12. Albarrán, I., Alonso, P. and Grané, A. (2015) Profile identification via weighted related metric scaling: an application to dependent Spanish children, *Journal of the Royal Statistical Society: Series A- Statistics in Society* 178, 1-26. (Quality indicators: Q1 Stat & Prob; 5 JCR, 13 GS)
13. Grané, A. and Veiga, H. (2014) Outliers, GARCH-type models and risk measures: A comparison of several approaches. *Journal of Empirical Finance* 26, pp 26-40. (Q2 Economics; citations 9 JCR; 23 GS; TOP 25 in Science Direct from January-March 2014).
14. Grané, A. and Tchirina, A. (2013) Asymptotic properties of a goodness-of-fit test based on maximum correlations. *Statistics* 47, pp 202-215. (Q1 Statistics and Probability; 10 JCR; 17 GS)

### C.2. Congress (*invited conferences*- A selection)

1. Grané, A., Manzi, G. and Salini, S. “Smart visualization of mixed data”, *New Bridges between Mathematics and Data Science*, Valladolid 2021.
2. Grané, A., Albarrán, I. and Lumley, R. “Health and wellbeing profiles across Europe”, *Mathematical and Statistical Methods in Actuarial Sciences and Finance*. eMAF 2020, University of Venice, online conference 2020.
3. Grané, A. and Salini, S. “Robust multivariate analysis for mixed-type data”, IES 2019, Rome 2019.
4. Albarrán, I., Alonso, P. and Grané, A. “Long term care insurance pricing in Spanish population: A functional data approach”, UNISActuarial School 2018, Paestum (Italy) 2018.
5. Grané, A. and Veiga, H. “Outliers in multivariate GARCH models”, 7th Workshop on Statistical Simulation, Rimini 2013.

### C.3. Research projects

1. DDD4D- Distance & Depth Datascience for Dependency “Assessment of care needs in dependent and vulnerable population via distance and depth based statistical techniques” (TED2021-129316B-I00), Spanish Ministry of Science and Innovation. IPs: Aurea Grané, Irene Albarrán (UC3M); 01/01/2022-31/12/2023; 73.830,00 euros;
2. DDB-DataScience “Distance and Depth-Based statistical learning methods for Big Data, with applications in health and wellbeing” (PID2021-123592OB-I00). Spanish Ministry of Science and Innovation. IPs: Aurea Grané, Irene Albarrán (UC3M); 01/09/2022-31/08/2026; 107.448,00 euros.
3. AMBULATE-CM “Nuevo paradigma de gestión de servicios de transportes de emergencia: ambulancias”. Fondo Europeo de Desarrollo Regional – REACT-UE del Programa Operativo de Madrid 2014-2020. IP: Beatriz López Boada (UC3M); 01/01/2020-31/12/2022. 1.055.000 euros.
4. Desarrollo de un sistema de diagnóstico y tratamiento objetivo del TDAH a través de la ciencia de datos (DATHOS). Proyecto nacional DTS21/00091, Instituto de Salud Carlos III, Proyectos de investigación en salud (AES 2021). Modalidad Proyectos de Desarrollo Tecnológico en salud, Director: David Delgado-Gómez (UC3M). 01/09/2021-31/08/2023. 89.100,00 euros.
5. RE-TREAT: Reshaping treatment approaches towards victims of sexual violence within criminal proceedings (Grant Agreement 878566, Call JUST-AG-2019) European Commission Research Executive Agency. Director: H. Soletto (UC3M), 03/02/2020-02/02/2022. 87.856,60 euros.
6. RE-JUSTICE: Sustainable training in a challenging field (Grant Agreement 854042, Call JUST-JTRA-EJTR-AG-2018) European Commission Research Executive Agency. Director: H. Soletto (UC3M), 01/11/2019-31/10/2021. 77,740.85 euros.
7. FAIRCOM, Towards Fair and Effective Compensation Scheme to Victims of Sexual Violence (Grant Agreement 847360, Call JUST-AG-2018). European Commission Research Executive Agency. Director: H. Soletto (UC3M), 01/09/2019-30/04/2021. 370.000,00 euros.



8. MTM2014-56535-R, Selección de factores en la gestión del riesgo. Contribuciones al sector asegurador con especial atención a dependencia y longevidad. Ministerio de Economía y Competitividad. Director: Aurea Grané (UC3M), 01/01/2014-31/12/2018. 55.000,00 euros.
9. MTM2010-17323, Métodos semiparamétricos y basados en distancias con aplicaciones en bioinformática, finanzas y gestión del riesgo. Ministerio de Economía y Competitividad. Director: Aurea Grané (UC3M), 01/01/2011-30/06/2015. 54.571,00 euros.

#### **C.4. Contracts, technological or transfer merits**

##### **Contracts**

1. Creación del Servicio de Estudios y Análisis de Datos del CGAE. Contrato (I+D) Consejo General de la Abogacía Española. Director: Aurea Grané (UC3M). 05/07/2018-04/07/2020. 20.000 euros. One of the results of this contract was the following publication:
  - Grané, A. and Albarrán, I. (2018) Inversión en Justicia. Inversión en Justicia Gratuita. En XII Informe del Observatorio de Justicia Gratuita. Abogacía Española-Wolters Kluwer 2017. Wolters-Kluwer (ISBN: 978-84-9020-730-7).
2. Explotación de las bases de datos de la empresa ADCOMM CENTURY. Director: Aurea Grané (UC3M). 01/01/2018-31/12/2020. 20.000 euros.

Since 2008 I collaborate with the Spanish Red Cross, where several of the DB methodologies developed in my research projects have been applied to their databases, for instance, to better understand the changing profile of their social program users facing economic crisis, refugees emergency or the recent COVID-19 pandemic.

1. Estudios sobre vulnerabilidad social: boletines. Contrato (I+D) CRUZ ROJA ESPAÑOLA. Directors: R. Romera and Aurea Grané (UC3M). 01/01/2023 - 31/12/2024. 16.942,15 euros.
2. Estudios sobre vulnerabilidad social: boletines. Contrato (I+D) CRUZ ROJA ESPAÑOLA. Directors: R. Romera and Aurea Grané (UC3M). 01/01/2021 - 31/12/2022. 16.942,15 euros.
3. Estudios sobre vulnerabilidad social: boletines. Contrato (I+D) CRUZ ROJA ESPAÑOLA. Director: R. Romera (UC3M). Several contracts: 2010-2011, 2013, 2014, 2015-2016, 2017-2018, 2019-2020. As a result of these contracts, I am co-author of the “Bulletins of social vulnerability”, edited by the Spanish Red Cross, which have a very high impact on mass media and social media, and help the institution to visualize their programs of attention to vulnerable collectives. Another relevant result was a study on gender violence, which was published by the Spanish Ministry of the Presidency, Relations with the Courts and Equality:
  - Boletines de vulnerabilidad social (more than 20) <https://www2.cruzroja.es/vulnerabilidad>
  - Aycart, J., Gende, S., Malgesini, G., Monteros, S., Nebreda, M., Gil, P., Grané, A., Romera, R. (2019) Estudio sobre las mujeres mayores de 65 años víctimas de violencia de género. Ministerio de la Presidencia, Relaciones con las Cortes e Igualdad. NIPO: 042190767, Catálogo de publicaciones oficiales de la Administración General del Estado.
4. FECYT CC/2016/127, Reparación a las víctimas de violencia sexual. Fundación Española para la Ciencia y la Tecnología. IP: Helena Soletto Muñoz (UC3M), 08/06/2018-07/06/2019. 5110 euros. Micro crowdfunding project. One of the results of this project was the following publication:
  - Soletto, H. and Grané, A. (2019) La reparación económica a la víctima en el sistema de justicia. Dykinson (ISBN: 978-84-1324-178-4). The main conclusions of this book were collected in the First Evaluation Report of Spain on violence in January by Group of Experts of the Council of Europe on the Fight against Violence against Women and Domestic Violence (GREVIO), also some conclusions were mentioned in the inauguration speech of President Pedro Sánchez, and we were interviewed in the national journal El País.

##### **Other transfer merits (divulgarion activities)**

5. Participation in the workshop “Formas de Violencia de Xénero”, Violencia Comparada II, organized by Consello da Cultura Galega. <http://consellodacultura.gal/evento.php?id=201125> 16/03/2021.
6. Invited member of the social media campaign of the Spanish Ministry of Economic Affairs and Digital Transformation to commemorate the International Women’s Day, on March 2021, #8msinlímites#mujerstem. ([https://twitter.com/\\_minecogob/status/1368199694757756929?lang=es](https://twitter.com/_minecogob/status/1368199694757756929?lang=es)), March 2021.
7. Editor of the book MATHEMATICAL AND STATISTICAL METHODS FOR ACTUARIAL SCIENCES AND FINANCE (ISBN: 978-3-319-89823-0), Springer. (206k downloads) The book is recommended to practitioners and professionals in actuarial sciences and finance.