



CURRICULUM VITAE (CVA)

IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

CV date 4/12/2021

Part A. PERSONAL INFORMATION

First name	José Antonio		
Family name	Villacorta Atienza		
Gender (*)	Male	Birth date (dd/mm/yyyy)	27/10/1972
ID number	04843991F		
e-mail	josea@ucm.es	URL Web	
Open Researcher and Contributor ID (ORCID) (*)		0000-0002-9220-1226	

(*) Mandatory

A.1. Current position

Position	Associate profesor (profesor ayudante doctor)		
Initial date	3/5/2017		
Institution	Universidad Complutense de Madrid		
Department/Center	Dep. Biodiversity, Ecology and Evolution / Faculty of Biology		
Country	Spain	Teleph. number	(+34) 67992052
Key words	cognition, biophysics, neuroscience, mathematics, robotics		

A.2. Previous positions

Period	Position/Institution/Country/Interruption cause
2015 – 2016	Scientific Coordinator / Centre of Integral Domotics, Polytechnic University of Madrid, Spain
2011 - 2018	Collaborator of research at Faculty of Mathematics, Complutense University of Madrid, Spain
2013 - 2014	Team leader researcher at Centre of Biomedical Technology, Polytechnic University of Madrid (UPM), Spain
2011-2013	Researcher at Institute of Interdisciplinary Mathematics (IMI), Faculty of Mathematics, Complutense University of Madrid, Spain.

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD in Neuroscience	Autonoma University of Madrid, Spain	2007
M.S. in Neuroscience	Autonoma University of Madrid, Spain	2005
B.S. in Mathematics	Complutense University of Madrid, Spain	2001
B.S. in Physics (Theoretical Physics).	Autonoma University of Madrid, Spain	1996

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

Bachelor in Physics from the UAM (Spain), bachelor in Mathematics from the UCM (Spain), and PhD. in neuroscience from the UAM. At present I'm with the Unit of Biomathematics, Department of Biodiversity, Ecology and Evolution, in the Faculty of Biology of the UCM. I teach as assistant professor in the subjects of Mathematical Models, Mathematics, and Biostatistics.

My research is highly interdisciplinary, integrating biophysics and mathematics with computational and experimental neuroscience, and robotics. My main line of research is developed in the Cognitive Biology and Bio-robotics group, of which I'm leading researcher, and it is focused on the cognitive bases of the processing of dynamic environments in mammals and humans. In this field, we have developed a new conceptual framework according to which the brain encodes a situation that changes rapidly over time from the future interactions in it. According to this process, called time compaction, dynamic situations are represented internally as static maps (i.e. without time) that contain all the information necessary for the subject to deal with the situation (such as encoding a film in a single frame with the necessary information to understand the film). These maps would generalize the cognitive maps, internal representations of static environments (Nobel Prize 2014), to dynamic environments, involving similar neurophysiological processes. A significant milestone in our research has been the recent demonstration of the existence of time compaction as a central cognitive process in humans that has not been previously described. This finding could contribute significantly to explain how humans are capable of processing dynamic situations to make complex decisions in real time and effortlessly, and more important, how we are able to learn and memorize our dynamic world. We have proved the plausibility of time compaction by implementing it in robots to provide them with human-like abilities to navigate and manipulate in dynamic environments. The results of this research have been disseminated in high-impact scientific journals leaders in their fields, as well as in specialized and outreach conferences, and have been widely disseminated by the general and specialized media.

Other of my lines of research are: complex network physics, where my work has been focused on theoretical analysis of synchronization and anticipation in biological-inspired complex networks; neuroanatomy, working on mathematical and computational models of dendritic and axonal development to simulate and assess critical features of these neural structures, and neurodegeneration, studying plasticity and reorganization of functional networks after damage. My research has been developed in the context of 4 European projects, 1 international project (Russia) and 8 national projects, in collaboration with various Spanish research groups (UAM, URJC, UPM and UNED) and international (Russia, Czech Republic, etc.). I was scientific coordinator in three of the national projects and one European project. I have supervised Supervisor 1 PhD. Thesis, 4 Master Thesis, and 5 Bachelor Thesis. I'm reviewer for international scientific journals and conferences (IEEE Transactions on Autonomous Mental Development, Journal of Neuroscience Methods, Computational and Mathematical Methods in Medicine, etc.). My research work includes the development of four patents, which have received numerous international and national awards.

Part C. RELEVANT MERITS (sorted by typology)

C.1. Publications (10 most relevant)

- Rubio-Teves M, Díez-Hernando S, Porrero C, Sánchez-Jiménez A, Prensa L, Clascá F, García-Amado M and **Villacorta-Atienza JA**. *Benchmarking of tools for axon length measurement in individually-labeled projection neurons*, PLOS Computational Biology, accepted (2021)
- **Villacorta-Atienza JA**, Calvo-Tapia C, Díez-Hernando S. et al. *Static internal representation of dynamic situations reveals time compaction in human cognition*, Journal of Advanced Research, <https://doi.org/10.1016/j.jare.2020.08.008> (2020)
- Calvo Tapia C, **Villacorta-Atienza JA**, Díez-Hernando S, Khoruzhko M, Lobov S, Potapov I, Sánchez-Jiménez A and Makarov VA. *Semantic Knowledge Representation for Strategic Interactions in Dynamic Situations*. Front. Neurobot. 14:4. doi: 10.3389/fnbot.2020.00004 (2020)
- Calvo C, **Villacorta-Atienza JA**, Kastalskiy I, Díez-Hernando S, Sánchez-Jiménez A, Makarov V. *Cognitive Neural Network Driving DoF-Scalable Limbs in Time-Evolving Situations*. Proceedings of the International Joint Conference on Neural Networks IJCNN. (2018).

- **Villacorta-Atienza JA**, Calvo C, Lobov S, Makarov V. *Limb Movement in Dynamic Situations Based on Generalized Cognitive Maps*. Mathematical Modeling of Natural Phenomena Vol. 12(4), 15-29 (2017).
- **Villacorta-Atienza JA**, Calvo C., Makarov V. *Prediction-for-CompAction: Navigation in social environments using generalized cognitive maps*. Biological Cybernetics 109:307–320, (2015).
- Navas A. **Villacorta-Atienza JA**, Leyva I. Almendral JA, Sendinña-Nadal I, and Boccaletti S. *Effective centrality and explosive synchronization in complex networks*. Physical Review, E 92, 062820 (2015).
- Martin YB, Negredo P, **Villacorta-Atienza JA** and Avendaño C. *Trigeminal intersubnuclear neurons: morphometry, topology and input-dependent structural plasticity in adult rats*. Journal of Comparative Neurology, 522(7), 1597-1617, (2014).
- **Villacorta-Atienza JA** and Makarov V. *Neural Network Architecture for Cognitive Navigation in Dynamic Environments*. IEEE Transactions on Neural Networks and Learning Systems 24(12), 2075 – 2087, (2013).
- Castellanos NP, Bajo R, Cuesta P, **Villacorta-Atienza JA**, Paul N, del-Pozo F and Maestú F. *Alteration and reorganization of functional networks: a new perspective in brain injury study*. Frontiers in Human Neuroscience. 5:90. (2011).

C.2. Congresses (10 most relevant)

- Society for Neuroscience Meeting, November 2021 (poster)
- Federation of European Neuroscience Societies Meeting July 2020 (poster)
- Neuromatch 2.0 Conference May 2020 (talk)
- Neuroscience of Mindfulness Conference, Spain, June 2019 (talk)
- Society for Neuroscience Meeting, Chicago USA, October 2019 (poster)
- Volga Neuroscience Meeting, Russia, July 2018 (talk)
- International Conference on Mathematical Neuroscience, France, June 2016 (poster)
- Federation of European Neuroscience Societies Meeting, Italy, July 2014 (poster)
- Twenty Second Annual Computational Neuroscience Meeting: CNS, Paris, France. 2013 (poster)
- SPIE Microtechnologies in Bioelectronics, Biomedical, and Bio-inspired Systems. Prague, Czech Republic 2011 (talk)

C.3. Research projects

- Time Compaction in the Processing of Dynamic Situations as Biophysical Phenomenon Unifying Primary Cognition in Humans and Robots (COMPACTIME) FIS2017-82900-P. Spain. 2018-2021. IP: V. Makarov. Scientific Coordinator: JA Villacorta-Atienza.
- Biophysical Models of Recursive, Versatile and Abstract Cognition for Autonomous Navigation in Cooperative Environments (MOBICOR) FIS2014-57090-P. Spain. 2015 – 2018. IP: V. Makarov. Scientific Coordinator: JA Villacorta-Atienza.
- Personalised Centralized Authentication System (PCAS) FP7-ICT-2013-10. VII Framework European Union. 2013 – 2016. IP: C. Sánchez-Ávila. Scientific Coordinator: JA Villacorta-Atienza.
- The Dynamic GPS of the Brain: a New Paradigm of Cognition Based on Time Compaction. INCE2014-011. Foundation Initiative for Neuroscience (INCE). Spain. 2014-2015. IP: JA Villacorta-Atienza.
- Development of technologies for cognitive interaction with the external world and the brain-machine interfaces based on neural assemblies. 2012-1.5-12-000-2009. Russia. 2012 – 2014. IP: V. Makarov. Researcher: JA Villacorta-Atienza.

- Theoretical and Experimental Modelling of Neural Networks Involved in Cognitive Processes (TEMOCOP). FIS2010-20054. MCI. Spain. 2010 – 2013. IP: V. Makarov. Scientific Coordinator: JA Villacorta-Atienza.

C.4. Contracts, technological or transfer merits

Patents

- Device to facilitate domestic plugging (U 201430063). Villacorta-Atienza JA, Gella A, Villacorta-Atienza C. Spain, 2014.
- Clasp for bag sealing (U 201500269). Villacorta-Atienza JA, Gella A. Spain, 2015.
- Device to facilitate plugging in domestic G-type sockets (U 201500211). Villacorta-Atienza JA, Gella A. Spain, 2015.
- Socket protector adapted to devices for facilitating plugging (U 201500407). Villacorta-Atienza JA, Gella A. Spain, 2016.

Awards and Honours

- Leading-Edge Prize, by KEPCO (Korea Electric Power Corporation). Bixpo International Fair of Electric Power, Seoul 2016.
- Gold Medal Invention. 44th International Exhibition of Inventions. Geneva 2016.
- Best Invention Award. Spanish Patent and Trademark Office. 44th International Exhibition of Inventions. Geneva 2016.
- Best Invention Award. International DIY Fair EUROBRICO. Valencia 2016.
- Gold Medal Invention. International Fair INNOVA. Barcelona 2016.
- Special Award. Association of European Inventors. International Fair INNOVA. Barcelona 2016.
- Award from the French Federation of Inventors. International Fair INNOVA. Barcelona 2016.
- Silver Medal Invention, iENA International Trade Fair of Ideas - Inventions - New Products. Nuremberg 2016.
- Silver Medal Invention. 18th International Salon of Inventions and Innovative Technologies 'Archimedes'. Moscow 2016.
- Best Inventor Award by the Spanish Inventors Association (March 2015).

Dissemination and research impact (scientific transfer to society)

- <https://www.lavanguardia.com/vida/20200922/483627216010/el-cerebro-es-capaz-de-prescindir-del-tiempo-para-tomar-decisiones-rapidas.html> about the existence of time compaction in humans.
- Full-page article in *El Mundo* newspaper: '¿Hay futuro para los robots en nuestra sociedad?' about my group's neurorobotics research. 29/06/2016. (<http://www.elmundo.es/ciencia/2016/06/29/5772af3d46163f7d078b4578.html> - in Spanish).
- Summary of Europa Press news agency about my group's neurorobotics research. 28/06/2016. (<http://eldia.es/agencias/8753823-Agenda-Informativa-Europa-Press-Sociedad-hoy> - in Spanish).
- Tv report in *Spanish Television* about my invention *Plug-Int* (Device to facilitate domestic plugging). <http://www.rtve.es/alacarta/videos/a-punto-con-la-2/punto-la2-inventos-12abr/3565274/>
- Impact on media of my invention *Plug-Int* (Device to facilitate domestic plugging): http://www.oepm.es/es/sobre_oepm/noticias/2016/2016_04_16_Premios44EdicSalonIntInventosGinebra.html; <http://www.madrimasd.org/blogs/patentesymarcas/2016/el-salon-internacional-de-inventos-de-ginebra-2016-44a-edicion/>
- Tv report in *Spanish Television* tv broadcast about my group's neurorobotics research. 17/08/2015 – leader tv broadcast.
- Interview in *Emprendedores* magazine about my inventive activity July 2015. (<http://www.emprendedores.es/ideas-de-negocio/invento> - in Spanish)