CURRICULUM VITAE (CVA)

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

CV date	10/10/2023

Part A. PERSONAL INFORMATION

First name	Raúl		
Family name	Alcaraz Martínez		
Gender (*)	Male	Birth date (dd/mm/yyyy)	
Social Security, Passport, ID number			
e-mail	raul.alcaraz@uclm.es	URL Web:	
Open Researcher and Contributor ID (ORCID) (*)		0000-0002-0942-3638	

(*) Mandatory

A.1. Current position

Position	Full Professor (Catedrático de Universidad)		
Initial date	12/07/2021		
Institution	University of Castilla-La Mancha (UCLM)		
Department/Center	Electronic Engineering	Technical School of Cuenca	
Country	Spain	Teleph. number	
Key words	Biomedical Engineering, Biomedical Signal Processing, Artificial Intelligence, Information Theory, Machine and Deep Learning		

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

Period	Position/Institution/Country/Interruption cause
30/07/2018 – 11/07/2021	Associate Professor (Profesor Titular de Univ.), UCLM, Spain
25/05/2010 – 29/07/2018	Associate Professor (Profesor Cont. Doctor), UCLM, Spain
27/05/2009 – 24/05/2010	Assistant Professor (Profesor Ayud. Doctor), UCLM, Spain
26/07/2007 – 26/05/2009	Assistant Professor (Profesor Ayudante), UCLM, Spain
21/12/2005 – 25/07/2007	Part-time Professor (Profesor Asociado 6H), UCLM, Spain

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD in Biomedical Engineering	Universitat Politecnica de Valencia	2008
MSc in Electronic Engineering	Universidad de Alcalá de Henares	2005
BSc in Telecommunication Eng.	Universidad de Castilla-La Mancha	2003

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

Raúl Alcaraz is a **Full Professor** at Electronic Engineering Department of the University of Castilla-La Mancha. His research activity began with his doctoral thesis by 2006 in the field of **biomedical signal processing**, where has acquired a **solid experience** applying information theory and artificial intelligence methods to different physiological signals (mainly ECG and EEG) for the development of markers of diagnosis, risk stratification and monitoring of cardiovascular and mental disorders. Also, he has been made **two relevant contributions** to the study of the surface ECG with atrial fibrillation by introducing for the first time the beat-to-beat variability analysis of the P-wave, as well as the entropy-based regularity analysis of the fibrillatory waves as a surrogated marker of the electrical activity complexity within the atria.

This intensive activity has resulted in **80 full papers in SCI journals**, two thirds being in the top half of JCR ranking (Q1 and Q2) and 6 in the first decile (D1). Also, he has published **17 book chapters** and more than **220 conference papers** (10 invited). Based on queries to Scopus and Google Scholar, these publications have received **2469 and 3384 citations**, thus involving a mean of more than 250 citations per year in the last 5 years, and **an h-index of 27**

and 30, respectively. Based on Google Scholar information, the **i10-index is 72** for all publications and 50 for those available in the last 5 years.

Also of note is his participation in **competitive research grants** since 2006, being leader of several since the last 15 years. Thus, he has been the **PI of three research grants from the Spanish R+D+i Strategy** (DPI2017-83952-C3-3-R, PID2021-00X128525-IV0, TED2021-130935BI00) and other **three grants from the R+D+I Strategy of Junta de Comunidades de Castilla-La Mancha** (SBPLY/17/180501/000411, PPII-2014-026-P, and PII2C09-0224-5983), all involving a budget higher than 1M€. In all these projects, reputed **international researchers** have collaborated actively. In fact, he has co-authorized **more than 20 international joint papers** with collaborators from 12 institutions in 9 countries (e.g., USA, Canada, UK, Sweden, Italy, etc.). Also, he has done **pre- and post-doctoral visits** at different national and international universities (Universitat Politecnica de Valencia and University of Lund), today maintaining active many collaborations (e.g., with University of Lund, University of Hull, University of Trento or CONICET).

To bring the benefits of all this research activity to public, he has also participated in **dissemination activities** such as "Encuentros de la Fundación Tecnología y Salud con Pacientes y Sociedades Científicas", "Semana de la Ciencia", "European Researcher's Nigh", and "Investiga, que no es poco – CMM Radio", as well as in other conventional activities in traditional channels of radio, newspapers, and TV. Moreover, to also make a significant contribution to the society, several of his works have been translated to software applications and prototypes. Thus, he has participated and headed up **contracts and technological transfer agreements** with healthcare technology companies during last 10 years. As well, he has also participated as an **expert member in different committees of public institutions** (Spanish Ministry of Education and Spanish Ministry of Labour), which have resulted in official documents, such as RD 838/2015 (BOE 6/10/2016), Orden ESS/1897/2013 (BOE 17/10/2013) and Orden PRA/1880/2016 (BOE 15/12/2016).

Regarding the training of students, he has supervised **55 undergraduate** final projects, **18 master** theses and **4 PhD theses**, and is supervising 4 PhD students and 4 master theses. Also, in 2014 he founded a new research group (ELBIT), which is still headed by him, is recognized as a consolidated group by the UCLM, and is composed of 8 PhD doctors and 6 PhD students. On the other hand, he is serving as an **Editor-in-Chief** of Information Theory Section of Entropy (IF: 2.524, Q2) since 2015, as an **Associate Editor** of Complexity (IF: 2.3, Q2) since 2018 and Frontiers in Neuroinfomatics (FI: 3.5,Q2), as a **Guest Editor** of 12 special issues for different JCR-indexed journals, and as a **reviewer** for more than 25 international journals since 2008.

Finally, note that all this work has been recognized with **two 6-year research periods** (the last one being obtained in 2017), as well as with **diverse awards**, such as **Best Paper Award** in four international conferences (SCCC 2014, IEEE EHB 2019, IEEE EHB 2020, and CINC 2021), and **Finalist in Martin Black Awards** in the category "best paper published" in 2012 and 2014 by the Institute of Physics and Engineering in Medicine (UK).

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

C.1. Publications *(see instructions)*

- A. Huerta, A. Martínez, D. Carneiro, V. Bertomeu, JJ. Rieta, R. Alcaraz, "Comparison of supervised learning algorithms for quality assessment of wearable electrocardiograms with paroxysmal atrial fibrillation", IEEE Access, in press, 2023 (FI: 3.9, **Q2**).
- K. Vraka, V. Bertomeu, F. Hornero, A. Quesada, **R. Alcaraz**, JJ. Rieta, "Splitting the P-wave: Improved evaluation of left atrial substrate modification after pulmonary vein isolation of paroxysmal AF", Sensors, vol. 22, art. ID. 290, 2022 (FI: 3.567, **Q1**).
- B. García, A. Fernández, **R. Alcaraz**, A. Martínez, "Assessment of dispersion patterns for negative stress detection from electroencephalographic signals", Pattern Recognition, vol. 119, pp. 108094, 2021 (FI: 7.740, **Q1, D1**).

- B. García, A. Martínez, **R. Alcaraz**, A. Fernández, “A review on linear methods using electroencephalographic recordings for emotion recognition”, IEEE Transaction on Affective Computing, vol. 12, no. 3, pp. 801-820, 2021 (IF: 7.512, **Q1, D1**).
- A. Huerta, A. Martínez, V. Bertomeu, A. Quesada, J.J. Rieta, **R. Alcaraz**, “A deep learning approach for featureless robust quality assessment of intermittent AF recordings from portable and wearable devices”, Entropy, vol. 22 (7), pp. 733, 2020 (IF: 2.494, **Q2**).
- A. Martínez, B. García, **R. Alcaraz**, P. González, A. Fernández, “Multiscale entropy analysis for recognition of visually elicited negative stress from EEG recordings”, Int. Journal of Neural Systems, vol 29 (2), pp. 1850038, 2019 (IF: 6.400, **Q1, D1**).
- M. Martínez, J. Ródenas, **R. Alcaraz**, J.J. Rieta, “Waveform integrity in atrial fibrillation: The forgotten issue of cardiac electrophysiology”, Annals of Biomedical Engineering, vol. 45, pp. 1890-1907, 2017 (IF: 3.405, **Q1**).
- **R. Alcaraz**, F. Hornero, J.J. Rieta, “Electrocardiographic spectral features for long-term outcomes prognosis of atrial fibrillation catheter ablation”, Annals of Biomedical Engineering, vol. 44 (11), pp. 3307-3318, 2016 (IF: 3.221, **Q1**).
- M. García, J. Ródenas, **R. Alcaraz**, J.J. Rieta, “Application of the relative wavelet entropy to heart rate independent detection of atrial fibrillation”, Computer Methods & Programs in Biomedicine, vol. 131, pp. 157-168, 2016 (IF: 2.503, **Q1**).
- **R. Alcaraz**, A. Martínez, J.J. Rieta, “Role of the P-wave high frequency energy and duration as noninvasive cardiovascular predictors of paroxysmal atrial fibrillation”, Comp. Methods & Programs in Biomedicine, vol. 119 (2), pp. 110-119, 2015 (IF: 1.862, **Q1**).

C.2. Congress

- J. Cano, V. Bertomeu, L. Fácila, J. Moreno, **R. Alcaraz**, JJ. Rieta, “ECG and PPG-based hypertension screening under non-hypertensive blood pressure recordings”, Computing in Cardiology 2022, 4 pages, Oral Presentation.
- **R. Alcaraz**, “Recent advances in signal processing applied to cardiovascular interventionism”, Annual Spanish Conference of Cardiology (SEC), Zaragoza (Spain), 2021. **Invited** Oral Presentation.
- A. Huerta, A. Martínez, J.J. Rieta, **R. Alcaraz**, “ECG quality assessment via deep learning and data augmentation”, XXXXVII Computing in Cardiology Conference (CINC), Brno (Czech Republic), 2021, 4 pages, Poster Presentation. **Best Poster Award**
- A. Vraka, V. Bertomeu, F. Hornero, L. Sörnmo, **R. Alcaraz**, J.J. Rieta, “Alternative time-domain P-wave analysis for precise information on substrate alteration after pulmonary vein isolation for atrial fibrillation”, The 9th IEEE International Conference on E-Health and Bioengineering (EHB), Iasi (Romania), 2021, 4 pages. Oral Presentation.
- A. Vraka, V. Bertomeu, J. Osca, F. Ravelli, **R. Alcaraz**, J.J. Rieta, “Study on how catheter ablation effects atrial structures in patients with paroxysmal atrial fibrillation: The case of the coronary sinus”, The 8th IEEE International Conf. on E-Health and Bioengineering (EHB), Iasi (Romania), 2020, 4 pages. Oral Presentation. **Best Paper Award**
- A. Ruiz, M.A. Arias, M.I. Pachón, P. Langley, J.J. Rieta, **R. Alcaraz**, “Thorough assessment of a P-wave delineation algorithm thorugh the use of diverse electrocardiographic databases”. The 7th IEEE International Conference on E-Health and Bioengineering (EHB), Iasi (Romania), 2019, 4 pages. Oral Presentation.
- **R. Alcaraz**, B. García, A. Martínez, R. Zangróniz, “Recent advances and challenges in nonlinear characterization of brain dynamics for automatic recognition of emotional stress”, International Work-Conference on the Interplay Between Natural and Artificial Computation (IWINAC), Corunna (Spain), 2017, pp. 213-222.
- **R. Alcaraz**, J.J. Rieta, “Novel parameters for AF complexity”, First European Conference for Standardization of Advanced ECG Analysis in Arrhythmia Diagnostics, Lugano (Switzerland), 2013. **Invited** Oral Presentation.
- **R. Alcaraz**, F. Hornero, J.J. Rieta, “Validation of Surface atrial fibrillation organization indicators thorough invasive recordings”, 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS), Boston (USA), 2011, pp. 5519-5522. **Invited** Oral Presentation.

- A. Martínez, **R. Alcaraz,** J.J. Rieta, "Detection and removal of ventricular ectopic beats in atrial fibrillation recordings via principal component analysis", 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS), Boston (USA), 2011, pp. 4693-4696. **Invited** Oral Presentation.

C.3. Research projects

- PID2021-128525OB-I00, "Early Detection of Cardiac Arrhythmias Through Artificial Intelligence to Improve Secondary Prevention of Cryptogenic Stroke", Agencia Estatal de Investigación, Ministerio de Ciencia e Innovacion, Duration: 01/09/2022-31/08/2025. PI: **Raúl Alcaraz**, #Reserchers: 18, Total Amount: €225,907
- TED2021-130935BI00, "Innovative Digital Solution to Transform and Improve Current Suboptimal Management of Patients with Cryptogenic Stroke", Agencia Estatal de Investigación, Ministerio de Ciencia e Innovación, Duration: 01/12/2022-30/11/2024. PI: **Raúl Alcaraz**, #Reserchers: 18, Total Amount: €263,350
- SBPLY/17/180501/000411, "Atrial substrate characterization through signal processing as a supportive tool for catheter ablation-based treatment in atrial fibrillation", Consejería de Educación, Cultura y Deportes, Junta de Comunidades de Castilla-La Mancha, Duration: 01/09/2018 - 31/08/2021, PI: **Raúl Alcaraz**, # Researchers: 12, Total Amount: €139,954
- DPI2017-83952-C3-3-R, "Development of computational methods based on surface recordings during catheter ablation for the evaluation of the arrhythmogenic substrate in patients with atrial fibrillation", Agencia Estatal de Investigación, Ministerio de Economía, Industria y Competitividad, Duration: 01/01/2018 - 30/09/2021, PI: **Raúl Alcaraz**, # Researchers: 5, Total Amount: €178,233
- PPII-2014-026-P, "Application of non-linear analysis to the advanced estimation of organization as a tool for the improvement of diagnosis and therapy in atrial fibrillation", Consejería Educación y Ciencia, Junta de Comunidades de Castilla-La Mancha, Duration: 27/09/2014 - 26/09/2016, PI: **Raúl Alcaraz**, # Researchers: 10, Total Amount: €128,605.96
- PII2C09-0224-5983, "Application of non-linear methodologies for the robust and non-invasive organization estimation in atrial fibrillation", Consejería Educación y Ciencia, Junta de Comunidades de Castilla-La Mancha, Duration: 01/04/2009 - 31/03/2012, PI: **Raúl Alcaraz**, # Researchers: 7, Total amount: €95,200

C.4. Contracts, technological or transfer merits

- "Analysis of atrial fibrillation in cryptogenic stroke patients", Daiichi Sankyo SLU, Duration: 15/04/2022-14/03/2025, PI: **Raúl Alcaraz**, #Participant:8, Total Amount: €190,000
- "Software tool for IoT in the project Cuenca Ciudad Inteligente", ServiNet Sistemas y Comunicación SL, Duration: 15/02/2020 - 15/02/2020, PI: Arturo Martínez, # Participants: 3, Total amount: €12,100
- "Experimental development of a system for real-time location", ServiNet Sistemas y Comunicación SL, Duration: 01/02/2016 - 21/07/2016, PI: Roberto Zangróniz, # Participants: 4, Total amount: €36,300
- "Design of algorithms based on entropy to estimate organization in electrocardiographic recordings of atrial fibrillation", Mercé V. Electromedicina S.L., Duration: 17/11/2014 - 15/02/2015, PI: José J. Rieta, # Participants: 2, Total amount: €12,000
- "DSP-based implementation of algorithms for atrial activity extraction from long-term electrocardiographic recordings", Mercé V. Electromedicina S.L, Duration: 01/07/2011 - 30/12/2012, PI: **Raúl Alcaraz**, # Participants: 2, Total amount: €8,761.50
- "DEEROVERVIEW: Design, development and implementation of a technology tool for hunting control of rural farms", IN-NOVA Europa, Duration: 01/06/2017-31/12/2018. PI: Arturo Martínez, # Participants: 4, Total amount: €7,199.50