



CVA date	Jan-2023
-----------------	----------

Part A. PERSONAL DATA

Name and Surname	ALEJANDRO LINARES BARRNCO		

A.1. Current Position

Institution	UNIVERSIDAD DE SEVILLA		
Dpto./Centre	ARQ Y TEC COMPUTADORES / ETSI INFORMÁTICA		
Address	AV. REINA MERCEDES S/N, 41012, SEVILLA		
Phone	email	alinares@us.es	
Current position level	Full Professor	Start Date	JUNIO-2021
UNESCO codes	330404 - Unidades centrales y de proceso; 330406 - Arquitectura de ordenadores; 330407 - Periféricos de ordenadores; 330412 - Dispositivos de control; 330417 - Sistemas en tiempo real; 330703 - Diseño de circuitos		
Key words	Embedded Systems; Edge-Comuting; Deep-learning; Neuromorphic Engineering. VLSI design (FPGA); Robotics; Neuro-inspired motor control; Real-Time OS;		

A.2. Education (degree, institution, date)

Bachelor/Master/PhD	University	Year
PhD: Industrial Informatics program. "Study and evaluation of interfaces for connection of neuromorphic AER systems"	Universidad de Sevilla	2003
MsDiploma Industrial Informatics program. "Estudio de Interfaces PCI para Address-EventRepresentation."	Universidad de Sevilla	2002
Degree in Computer Engineering	Universidad de Sevilla	1998

A.3. General quality indicators of the research results

CNEAI awards (sexenios): 3 Research awards for periods: 1999-2005, 2006-2011, 2012-2017), 1 Knowledge Transfer award until year 2015.
 PhD advisor concluded in last 10 years: 6 (9 in total)
 Number of papers at JCR-Q1: 19 (JCR), 25 (SJR) (<https://prisma.us.es/investigador/2199>)
Google Scholar (<https://scholar.google.es/citations?user=oihgDkoAAAAJ&hl=es>): 200 papers, 3379 cites (1715 since 2018), h-index: 29 (20 since 2018), i10: 71 (41 since 2018).
ResearchGate (https://www.researchgate.net/profile/Alejandro_Linares-Barranco): 203 papers, 37858 reads, 2675 cites, RIS=1153, (above 94% of researchers in this network).
ScopusID (<http://www.scopus.com/authid/detail.url?authorId=8960244800>): for 170 papers, 2125 cites from 1254 papers, h-index: 24. 2022 shown the max collected cites: 247.
ResearcherID (<http://www.researcherid.com/rid/B-7087-2011>): 146 papers until 2021 (web of science), 1575 cites and h-index of 21.

Part B. CV SUMMARY (máximo 3.000 caracteres, incluyendo espacios en blanco)

The research is focused on: co-design hw/sw embedded systems; microcontrollers & real-time OS; FPGAs; Study and development of interfaces for event-driven Neuro-inspired systems (AER); application of AER to robotics; event-driven sensor processing (vision/audio) within neuromorphic engineering; deep-learning for image and audio processing. I started my research in the European project CAVIAR in 2002 with the development of chip to chip / chip to computer interfaces for neuromorphic AER systems (PCB, VHDL, FPGA, microcontrollers, Java) and simulation tools for



theoretical studies on the transformation of static images to AER format, central focus of my doctoral thesis. This allowed me to perform several visits abroad, which resulted in numerous publications both in Q1 journals (IEEE TCAS, IEE ELECTRONIC LETTERS, IEEE TNN, NEUROCOMPUTING AND MP&MS) and in multiple high impact conferences (CORE & GRIIN databases). To date, this neuromorphic line has allowed me to serve as IP at an European project (SMALL), four projects of the Spanish R+D+i plan (VULCANO, BIOSENSE, COFNET and MINDROB), two Excellence projects of the Andalusian Government (MINERVA, DAFNE), one industrial transfer project (PROMETEO) and two international projects with private funding (Samsung Ltd.) from 2015 to 2020 (NPP and NPP2). This participation and others as a researcher have allowed to accumulate the publications and research merits expressed in this CVA. The PROFESSIONAL EXPERIENCE I had in SAINCO-ABENGOA in 1999-2000 (design of digital circuits in VHDL for FPGA and ASIC for Power Line communications stage) gave me perspective and experience for the development of my current research. In 2014 we created a Spinoff company of the Univ. of Seville (EBT COBER SL - www.t-cober.es) of which I am a partner and with which we manufacture robotic biomedical analysis instruments for VITRO SL. I have taught in the second cycle of computer engineering of the 1997 syllabuses, in the current degrees of Computer Engineering and Industrial Electronics Engineering (2010 syllabuses); master degrees of Computing, Computer and Network Engineering (until 2017), Computer Engineering, Biomedical Engineering and Digital Health, and Teaching Staff (MAES); and in the PhD programs of Industrial Informatics, Systems and Installations for Industry and other universities such as UZH/ETHZ, Univ. Cádiz, Univ. Politécnica de Cartagena. I have directed more than 70 PFC, TFG, DEA and TFM and 9 doctoral theses to date. Regarding MANAGEMENT in the university, I belong to several commissions of both School and Department, including the CGCT of several degrees. I have been SECRETARY of my dept until 2017 and DIRECTOR of the ATC dept until 2021. I am secretary of the doctoral program of Installations and Systems for the Industry. I serve as IP at several European, national and regional research projects, and collaboration agreements between several companies (national and foreign) or associations and the Fidetia foundation, based in my School of Computer Engineering in Seville. These agreements have been oriented to internships in companies in some cases, to training of company personnel in others and to the transfer of knowledge with software and hardware applications for FPGA and microcontrollers, currently being exploited by third companies, as well as the production and tutoring of on-line training courses approved by the Junta de Andalucía and oriented to teachers. The Junta de Andalucía has recognized me five research tranches for the “Complementos Autonómicos” in 2019.

Part C. RELEVANT MERITS

C.1. Publications *(Num authors / ALB position)*

1 Journal paper. D. Gutierrez-Galan et al. (6/6). 2021. “An event-based digital time difference encoder model implementation for neuromorphic systems”. *Trans. On Neural Networks and Learning Systems*. IEEE. Vol 33. **JCR index of 14.255, Q1.**

2 Journal paper. Lourdes Duran-Lopez et al (7/7). 2021. Wide & Deep neural network model for patch aggregation in CNN-based prostate cancer detection systems. *Computers in Biology and Medicine*. Elsevier. Vol 136. ISSN 0010-4825. **JCR index of 6.698, Q1.**

3 Journal paper. E. Piñero-Fuentes et al (6/6). 2021. A Deep-Learning Based Posture Detection System for Preventing Telework-Related Musculoskeletal Disorders. *Sensors*. MDPI. Vol 21. **JCR index of 3.847, Q2.**

4 Journal paper. D. Gutierrez-Galan et al. (5/4). 2021. “OpenNAS: Open Source Neuromorphic Auditory Sensor HDL code generator for FPGA implementations”. *Neurocomputing*. Elsevier. Vol 436. **JCR index of 3.317, Q1.**

5 Journal paper. JP. Dominguez-Morales et al (6/5). 2021. Wildlife monitoring on the edge: A performance evaluation of embedded neural networks on microcontrollers for animal behavior classification. *Sensors*. MDPI. Vol 21. **JCR index of 3.847, Q2.**



- 6 Journal paper.** A. Linares-Barranco; et al. (4/1). 2020. “ED-BioRob: a neuromorphic robotic arm with FPGA-based infrastructure for bio-inspired spiking motor controllers”. *Frontiers in Neurorobotics*. Vol 14, pp 1-18. **JCR index of 2.574, Q2.**
- 7 Journal paper.** Lourdes Duran-Lopez et al (5/5). 2020. PROMETEO: A CNN-based Computer-Aided Diagnosis System for WSI Prostate Cancer Detection. *IEEE ACCESS*. Vol 8. pp. 128613-128628. ISSN 2169-3536. **JCR index of 4.098, Q1.**
- 8 Journal paper.** L. Duran-Lopez et al (5/5). 2020. COVID-XNet: A custom deep learning system to diagnose and locate COVID-19 in chest X-ray images. *Applied Sciences*. MDPI. Vol 10. **JCR index of 2.679, Q2.**
- 9 Journal paper.** R. Tapiador-Morales et al (6/6). 2020. Event-based gesture recognition through a hierarchy of time-surfaces for FPGA. *Sensors*. MDPI. Vol 20. **JCR index:3.576, Q1.**
- 10 Journal paper.** D. Gutierrez-Galan, et al. (5/5). 2020. “NeuroPod: a real-time neuromorphic spiking CPG applied to robotics”. *Neurocomputing*. Elsevier. Vol 381. **JCR index of 3.317, Q1.**
- 11 Journal paper.** M.J. Domínguez-Morales, et al (6/6). 2019. “Bio-Inspired Stereo Vision Calibration for Dynamic Vision Sensors”. *IEEE Access*. Vol 7. **JCR index of 4.098, Q1.**
- 12 Journal paper.** A. Linares-Barranco, et al (7/1). “Low Latency Event-Based Filtering and Feature Extraction for Dynamic Vision Sensors in Real-Time FPGA Applications”. *IEEE Access*. Vol 7. **JCR index of 4.098, Q1.**
- 13 Journal paper.** R. Tapiador-Morales, et al (4/2). 2019. “Neuromorphic LIF row-by-row multiconvolution processor for FPGA”. *IEEE transactions on biomedical circuits and systems*. Vol 13, N 1, pp 159-169. **JCR index of 2.937, Q1.**
- 14 Journal paper.** A. Aimar, et al. (11/9). 2019. “Nullhop: A flexible CNN accelerator based on sparse representations of feature maps”. *IEEE transactions on neural networks and learning systems*. Vol 30, N 3, pp 644-656. 2018. **JCR index of 4.854, Q1.**
- 15 Journal paper.** L. Camuñas-Mesa; et al. (5/3). 2018. “A Configurable Event-Driven Convolutional Node with Rate Saturation Mechanism for Modular ConvNet Systems Implementation”. *Frontiers in Neuroscience*. Section in Neuromorphic Engineering. Vol 12, pp 1-18. **JCR index of 3.566, Q2.**
- 16 Journal paper.** D. Gutierrez-Galan, et al (9/9). 2018. “Embedded neural network for real-time animal behavior classification”, *Neurocomputing*, Elsevier. **JCR index of 3.317, Q1.**
- 17 Journal paper.** A. Yousefzadeh, et al. (10/4). 2017. “On Multiple AER Handshaking Channels Over High-Speed Bit-Serial Bidirectional LVDS Links With Flow-Control and Clock-Correction on Commercial FPGAs for Scalable Neuromorphic Systems”, *IEEE Transactions on Biomedical CAS*, 2017. **JCR index of 2.937, Q1.**
- 18 Journal paper.** A. Jiménez-Fernández, et al. (7/6). 2017. “A binaural neuromorphic auditory sensor for FPGA: a spike signal processing approach”, *IEEE Transactions on NN and Learning Systems*, 2017. **JCR index of 4.854, Q1.**
- 19 Journal paper.** J.P. Dominguez-Morales, et al. (8/8). 2016. “Wireless sensor network for wildlife tracking and behavior classification of animals in doñana”, *IEEE Communication Letters*. **JCR index of 1.291, Q2.**
- 20 Journal paper.** F. Perez-Pena; A. Linares-Barranco, et al. (7/3). 2013. Neuro-Inspired Spike-Based Motion: From Dynamic Vision Sensor to Robot Motor Open-Loop Control through Spike-VITE. *Sensors*. MDPI. 13-11, pp.15805-15832. ISSN 1424-8220. **JCR index of 2, Q1.**
- 21 Journal paper.** F. Perez-Pena; A. Morgado-Estevez; A. Linares-Barranco. (3/3). 2015. Inter-spikes-intervals exponential and gamma distributions study of neuron firing rate for SVITE motor control model on FPGA. *neurocomputing*. elsevier. 149-B, pp.496-504. ISSN 0925-2312. **JCR index of 2.392, Q1.**
- 22 Journal paper.** Zamarreño-Ramos, Carlos; et al. (4/2). 2013. Multicasting Mesh AER: A Scalable Assembly Approach for Reconf. Neuromorphic Structured AER Systems. Application to ConvNets. *IEEE T BIOMED CAS*. ISSN 1932-4545. **JCR index: 3.149, Q1.**
- 23 Journal paper.** A. Jiménez-Fernández, et al. (6/3). 2012. A Neuro-Inspired Spike-Based PID Motor Controller for Multi-Motor Robots with Low Cost FPGAs. *Sensors*. MDPI. 12-4, pp.3831-3856. ISSN 1424-8220. **JCR index of 1.953, Q1.**



- 24 Journal paper.** L. Camuñas-Mesa, A. Linares-Barranco, et al. (6/3). 2012. An Event-Driven Multi-Kernel Convolution Processor Module for Event-Driven Vision Sensors. IEEE J. of Solid-State Circuits. 47-2, pp.504-517. ISSN 0018-9200. **JCR index of 3.063, Q1.**
- 25 Journal paper.** C. Farabet; A. Linares-Barranco, et al. (9/5). 2012. Comparison between frame-constrained fix-pixel-value and frame-free spiking-dynamic-pixel convNets for visual processing. 6-32, pp.1-12. Frontiers in Neuromorphic Engineering. **JCR index of 3.6, Q2.**
- 26 Journal paper.** Serrano-Gotarredona, Rafael; et al. (18/4). 2009. “CAVIAR: A 45k Neuron, 5m Synapse, 12g Connects/S Aer Hardware Sensory-Processing- Learning-Actuating System For High-Speed Visual Object Recognition And Tracking”. IEEE trans. neural netw.20-9, pp.1417-1438. ISSN 1045-9227. **JCR index of 2.889, Q1.**

C.2. Projects

- 1 DAFNE:** Assisted diagnosis of biomedical signals by classification with incremental Deep-Learning. Andalusian Council Excellence Research project. PAIDI-2020. 01-01-2022 – 31-07-2023. 90000 €. IP: Alejandro Linares-Barranco (University of Seville).
- 1 SMALL:** Spiking Memristive Architectures for Learning to Learn. EU – CHIST-ERA. IP: Alejandro Linares Barranco (Universidad de Sevilla). 01/01/2020 – 31/12/2022. 150000 €.
- 2 MINDROB:** Percepción y Cognición Neuromórfica para Actuación Robótica de Alta Velocidad. IP: Alejandro Linares Barranco (Universidad de Sevilla). 01/06/2020 – 31/05/2024. Ministerio de Ciencia, Innovación y Universidades. 212000 €.
- 3 PROMETEO:** Prototype medical device to support prostate cancer diagnosis using Deep-learning image classification theories. IP: Alejandro Linares Barranco (Universidad de Sevilla). 01/02/2020 – 31/12/2021. PAIDI 2020: Actividades de Transferencia de Conocimiento. Consejería de Economía, Conocimiento, Empresas y Universidad. 64000 €.
- 4 COFNET:** Cognitive Event-Driven Sensory Vision and Audio Fusion System. Ministerio de Ciencia y Educación. IP: Alejandro Linares Barranco (Universidad de Sevilla). 2016-19. 185K€.
- 5 MINERVA:** Mota-Wireless Sensing and Transmission Infrastructure for the Observation and Pattern Analysis of Wild and Semi-Free Animals. Junta de Andalucía. IP: Alejandro Linares Barranco. (Universidad de Sevilla). 30/01/2014-31/12/2017. 93.630 €.
- 6 BIOSENSE:** Bio-inspired system for sensory fusion and event-based neurocortical processing. High-speed, low-cost applications in robotics and automotive. Ministerio de Ciencia e Innovación. Investigación. IP: Alejandro Linares Barranco. (Universidad de Sevilla). 01/01/2013-31/12/2015. 138.645 €.
- 7 VULCANO:** TEC2009-10639-C04-02, Ultra-fast event-driven and frameless vision. Application to automotive and anthropomorphic cognitive robotics. IP: ALEJANDRO LINARES BARRANCO. (Universidad de Sevilla). 01/02/2010-01/10/2013. 166.000 €.

C.3. Contracts, technological or knowledge transfer merits

- 1 RELIAR. INTEL.** Real-Time Loihi interface for Neuromorphic Auditory Sensor and ED-Scorbot. IP: Alejandro Linares Barranco. (FIDETIA: foundation for the research and development of information technology in andalusia). 01/04/2020- 31/12/2021.
- 2 NEURAL PROCESSOR PROJECT – PHASE 2. SAMSUNG.** IP: Alejandro Linares Barranco. (FIDETIA). 01/05/2018- 30/04/2020. 150.000 €.
- 3 NEURAL PROCESSOR PROJECT. SAMSUNG.** IP: Alejandro Linares Barranco. (FIDETIA). 01/05/2015- 30/04/2018. 273.000 €.
- 4** Desarrollo y Prototipado de Circuitos Electrónicos para Sistemas de Laboratorio de Hibridación de ADN. VITRO, S.A. IP: Satur Vicente Díaz. 11/11/2013-11/05/2015. 78K €.
- 5** Plataforma Robotizada para la Automatización de la Detección y Diagnóstico de Enfermedades Infecciosas y Tumores. VITRO, S.A. IP: Satur Vicente Diaz. 2012-13. 45K €.

C.4. Spin-off foundation

- COBER S.L. Control of Biomedical Embedded Robotics in 2014.