Date of the CVA	27/04/2020

Section A. PERSONAL DATA

Name and Surname	Alejandro Linares Barranco		
DNI/NIE/Passport		Age	
Researcher's identification number	Researcher ID	B-7087-2011	
	Scopus Author ID	8960244800	
	ORCID	orcid.org/0000-0002-6056-740X	

A.1. Current professional situation

Institution	UNIVERSIDAD DE SEVILLA		
Dpt. / Centre			
Address			
Phone		Email	
Professional category	Profesor Titular de Universidad	Start date	2009
UNESCO spec. code	330404 - Central processing units; 330406 - Computer architecture; 330407 - Computer peripherals; 330412 - Control devices; 330417 - Real-time systems; 330703 - Circuit design		
Keywords	Robotics; Design of integrate circuits to reshape circuitry; Architectures of control of robots; Neuronal control; Real time control; Ultrafast processing; Vision on real-time; Sensorial fusion		

A.2. Academic education (Degrees, institutions, dates)

Bachelor/Master/PhD	University	Year
Doctor por la Universidad de Sevilla dentro del Programa de Informática Industrial	Universidad de Sevilla	2003
Diploma de Estudios Avanzados en Informática Industrial	Universidad de Sevilla	2002
Ingeniero en Informática	Universidad de Sevilla	1998

A.3. General quality indicators of scientific production

Number of CENAI research periods: 3 (1999-2005; 2006-2011, 2012-2017).

Number of CENAI transfer periods: 1 (2001-2015)

PhD supervised in last 10 years: 7

Journal papers in Q1: 18

Google Scholar (https://scholar.google.es/citations?user=oihgDkoAAAAJ&hl=es): for 203 publications until 03/2020, 2221 cites (1213 since 2015), h-index: 24 (18 since 2015), i10-index: 48 (28 from 2015).

ResearchGate (https://www.researchgate.net/profile/Alejandro_Linares-Barranco): for 174 publications until 03/2020, 17051 reads, 1677 cites, RG of 28.17, (over 85% of researchers of this network). RG index for publications is based on i10.

ScopusID (http://www.scopus.com/authid/detail.url?authorId=8960244800): for 147 publications, 1412 cites from 755 documents, h-index of 20. These number had their max in 2019, con 191 cites.

ResearcherID (http://www.researcherid.com/rid/B-7087-2011): 112 relevant publications until 2018 (2019 data is not updated yet), 966 cites, with an average of 9,9 cites per paper and an h-index of 17.

WOS: 125 publications, 1025 cites (685 without selfcitations), average of 8,2 cites per documento, h-index of 18.

From my CV publications, I would highlight:

- Journal IEEE-TNN: "CAVIAR: A 45k neuron, 5M synapse, 12G connects/s AER hardware sensory–processing–learning–actuating system for high-speed visual object recognition and tracking", 2009, 321cites.

- Conference NIPS: "AER building blocks for multi-layer multi-chip neuromorphic vision systems", 2005, 108cites.
- Journal IEEE-JSSC: "An event-driven multi-kernel convolution processor module for event-driven vision sensors", 2012, 91cites.
- Conference ISCAS: "A 5 Meps $100 USB2. 0 address-event monitor-sequencer interface", 2007, 85cites.
- Journal IEEE-TBIOCAS: "Multicasting mesh AER: a scalable assembly approach for reconfigurable neuromorphic structured AER systems. application to ConvNets", 2013, 82cites.

- Journal IEEE-TNN: "On real-time AER 2-D convolutions hardware for neuromorphic spike-based cortical processing", 2008, 79cites.
- Journal IEEE-TNN: "On algorithmic rate-coded AER generation", 2006, 70cites.
- Journal IEEE-TNNLS: "Nullhop: A flexible convolutional neural network accelerator based on sparse representations of feature maps", 2018, 66citas.
- Journal IEEE-TE: "An eLearning standard approach for supporting PBL in Computer Engineering", 2012, 56cites.
- Journal SENSORS: "A neuro-inspired spike-based PID motor controller for multi-motor robots with low cost FPGAs", 2012, 55cites.
- Conference ISCAS: "AER tools for communications and debugging", 2006, 54citas.
- Journal FRONTIERS in Neurosciences: "Comparison between frame-constrained fix-pixel-value and frame-free spiking-dynamic-pixel ConvNets for visual processing", 2012, 6554 vistas, 44cites.
- Journal IEEE-TCAS1: "A precise 90 quadrature OTA-C oscillator tunable in the 50-130-MHz range", 2004, 43cites.
- Journal IEEE-CommLetters: " Wireless sensor network for wildlife tracking and behavior classification of animals in Doñana", 2016, 36cites.
- Journal SENSORS: "Neuro-Inspired Spike-based motion: From dynamic vision sensor to robot motor open-loop control through Spike-VITE", 2013, 35citas.
- Conference ISCAS: "A USB3. 0 FPGA event-based filtering and tracking framework for dynamic vision sensors", 2015, 31cites.
- Journal IEEE-TNNLS: "A binaural neuromorphic auditory sensor for FPGA: A spike signal processing approach", 2016, 27cites.

Section B. SUMMARY OF THE CURRICULUM

The main research lines of my trajectory are the Neuromorphic Engineering and its Deep-Learning applications. Furthermore, the interfaces for Neuro-inspired systems based on Address-Event-Representation (AER) for FPGA, co-design systems, embedded computing, AER applied to robotics, vision and audio event-based processing for neuromorphic engineering, deep-learning for visual and audio processing / classification, medical diagnostics aids related to deep-learning, and e-learning. I worked on the EU project CAVIAR (and its proposal) in the development of interfaces for AER systems (chip-to-chip and chip-to-computer), both at physical level (PCB development), digital circuits design for FPGA (VHDL), and software tools for simulating synthetic generation of AER from digital images, main subject of my PhD dissertation. I have visited several research groups in USA and EU, what implied several important publications (journals and conferences indexed on GRIN-SICE). This Neuromorphic research line has allowed me to become PI on three projects from the Spanish Government on R&D (VULCANO, BIOSENSE, COFNET), a reginal project from the Andalusian Council (MINERVA), an EU CHISTERA-2018 recently approved, two ambitious projects funded by Samsung Electronics Ltd (NPP and NPP2). Furthermore, I have participated as researcher in other previous projects, like SAMANTA I & II, BrainSystems, VICTOR. This knowledge has been transferred to industry as agreements and contracts with companies under my supervision and/or collaboration for hardware and software products prototype development, student practices on companies, personnel courses, deep-learning applications for ehealth, online learning (with the PROMETEO technology transfer project). My working experience prior to academy was in ABENGOA (SAINCO) designing VHDL circuits for FPGA under INSONET EU project for PowerLine communications. In 2014 I co-founded an SpinOff company, called

COBER SL, for biomedical instruments fabrication and neuromorphic hardware distribution. Regarding to teaching, I have taught at several levels: bachelor (computer science engineering, electronic engineering degrees), master (for new high-school teachers on computer science, Computer Engineering and Networks, Informatics Engineering and recently in Biomedical and eHealth Engineering) and doctoral (Informatics Engineering, Industrial Informatics and lastly on Installations and Systems for Industry). I have supervised many end-of-degree projects and master thesis. Up to date, 7 PhD students have defended their thesis under my supervision. In management in the University I belong to several committees from my School and my department. I've been SECRETARY of my dept. from 2013 to 2017. I become HEAD of dept. on 2017 and still continue. I have visited several universities as visiting profesor, like Yale University (2010), University of Zurich (Institute of Neuroinformatics) (2014), University of Bielefeld (CITEC) (2018) and the Politechnic University of Cartagena (Spain) (2005, 2010). I've got three "sexenios" research periods awards from CNEAI (1999-2005, 2006-2011, 2012-2017), one transfer "sexenio" from CNEAI (2001-2015) and five research awards from regional Andalusia Council (up to 2018).

Section C. MOST RELEVANT MERITS (ordered by typology)

C.1. Publications

1 **Scientific 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 circuits and systems. IEEE. 11-5, pp.1133-1147. ISSN 1932-4545.

2 **Scientific paper**. A. Jimenez-Fernandez; et al. (7/6). 2017. A binaural neuromorphic auditory sensor for FPGA: a spike signal processing approach IEEE transactions on neural networks and learning systems. IEEE. 28-4, pp.804-818. ISSN 2162-237X.

3 **Scientific paper**. J.P. Dominguez-Morales; et al. (8/8). 2016. Wireless sensor network for wildlife tracking and behavior classification of animals in doñana IEEE Communications Letters. IEEE. 20-12, pp.2534-2537. ISSN 1089-7798.

4 **Scientific 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.

5 **Scientific paper**. F. Perez-Pena; 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.

6 **Scientific paper**. Jiménez-Fernández, Ángel Francisco; et al. 2012. A Neuro-Inspired Spike-Based PID Motor Controller for Multi-Motor Robots with Low Cost FPGAs Sensors MDPI. MDPI. 12-4, pp.3831-3856. ISSN 1424-8220.

7 **Scientific paper**. Camuñas-Mesa, Luis Alejandro; et al. 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.

8 **Scientific paper**. Zamarreño-Ramos, Carlos; et al. 2012. Multicasting Mesh AER: A Scalable Assembly Approach for Reconfigurable Neuromorphic Structured AER Systems. Application to ConvNets IEEE T BIOMED CIRC S. ISSN 1932-4545.

9 **Scientific paper**. D. Gutierrez-Galan; et al. 2020. NeuroPod: a real-time neuromorphic spiking CPG applied to robotics Neurocomputing. Elsevier. 381, pp.10-19.

10 **Scientific paper**. Manuel Dominguez Morales; et al. (6/6). 2019. Bio-Inspired Stereo Vision Calibration for Dynamic Vision Sensors ACCESS. IEEE. 7-1, pp.138415-138425. ISSN 2169-3536.

11 **Scientific paper**. Alejandro Linares Barranco; et al. (7/1). 2019. Low Latency Event-Based Filtering and Feature Extraction for Dynamic Vision Sensors in Real-Time FPGA Applications ACCESS. IEEE. 7-1, pp.134926-134942. ISSN 2169-3536.

12 **Scientific paper**. Ricardo Tapiador Morales; et al. (4/2). 2018. Neuromorphic LIF Row-by-Row Multiconvolution Processor for FPGA Transactions on Biomedical Circuits and Systems. IEEE. 13-1, pp.159-169. ISSN 1932-4545.

13 **Scientific paper**. Alessandro Aimar; et al. (11/9). 2018. Nullhop: A flexible convolutional neural network accelerator based on sparse representations of feature maps Transactions on Neural Networks and Learning Systems. IEEE. 30-3, pp.644-656. ISSN 2162-237X.

14 **Scientific paper**. Luis 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 - Topic on Neuromorphic Engineering. Frontiers. 12-63, pp.1-18. ISSN 1662-453X.

15 **Scientific paper**. D. Gutierrez-Galan; et al. 2018. Embedded neural network for real-time animal behavior classification Neurocomputing. Elsevier. 272-1, pp.17-26.

16 **Scientific paper**. Serrano-Gotarredona, Rafael; et al. 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.

17 **Scientific paper**. Linares-Barranco, Alejandro; et al. 2006. ON ALGORITHMIC RATE-CODED AER GENERATION IEEE trans. neural netw.17-3, pp.771-788.

C.2. Participation in R&D and Innovation projects

1 Spiking Memristive Architectures for Learning to Learn (SMALL) Comisión Europea. CHIST-ERA. Alejandro Linares Barranco. (Universidad de Sevilla). 01/11/2019-31/12/2022. 150.000 €.

2 PROTOTIPO DE DISPOSITIVO MÉDICO DE APOYO AL DIAGNÓSTICO DE CANCER DE PRÓSTATA MEDIANTE TEORÍAS DE CLASIFICACIÓN DE IMAGEN CON DEEP-LEARNING (PROMETEO) PAIDI2020-AYUDA DE TRANSFERENCIA. Alejandro Linares Barranco. (Universidad de Sevilla). 01/11/2019-31/01/2021. 64.000 €. Principal investigator.

3 NEURAL PROCESSOR PROJECT PHASE 2 SAMSUNG. Alejandro Linares Barranco. (FUNDACION PARA LA INVESTIGACION Y EL DESARROLLO DE LAS TECNOLOGIAS DE LA INFORMACION EN ANDALUCIA). 01/05/2018-30/04/2020. 155.000 €.

4 NEURAL PROCESSOR PROJECT SAMSUNG. Alejandro Linares Barranco. (FUNDACION PARA LA INVESTIGACION Y EL DESARROLLO DE LAS TECNOLOGIAS DE LA INFORMACION EN ANDALUCIA). 01/05/2015-30/04/2018. 273.000 €. Principal investigator.

5 Automatización y Desarrollo de Sistemas de Diagnóstico Molecular Multiplex para Detección de Paneles de Marcadores ARN/ADN y Proteínas en las Áreas de Patología Infecciosa y Alergología Centro para el Desarrollo Tecnológico Industrial. Saturnino Vicente Díaz. (Universidad de Sevilla). 01/09/2015-31/12/2017. 96.000 €.

6 Mota-Infraestructura de Sensado y Transmisión Inalámbrica para la Observación y Análisis de la Pauta de Animales Salvajes o en Semilibertad (Minerva) Junta de Andalucía. Proyectos de Excelencia. Alejandro Linares Barranco. (Universidad de Sevilla). 30/01/2014-29/01/2017. 93.630 €. Principal investigator.

7 BIOSENSE:Sistema bioinspirado de fusión sensorial y procesamiento neurocortical basado en eventos. Aplicaciones de alta velocidad y bajo coste en robótica y automoción. Ministerio de Ciencia e Innovación. Investigación. Alejandro Linares Barranco. (Universidad de Sevilla). 01/01/2013-31/12/2015. 138.645 €. Principal investigator.

C.3. Participation in R&D and Innovation contracts

1 Desarrollo, Mantenimiento y Testeo del Software de Control: HYBRISOFT VITRO, S.A.. Saturnino Vicente Díaz. 25/04/2017-25/04/2019. 36.000 €.

2 Desarrollo y Prototipado de Circuitos Electrónicos para Sistemas de Laboratorio de Hibridacion de ADN VITRO, S.A.. Saturnino Vicente Díaz. 11/11/2013-P1Y6M. 78.000 €.

3 Plataforma Robotizada para la Automatización de la Detección y Diagnóstico de Enfermedades Infecciosas y Tumorales VITRO, S.A.. Saturnino Vicente Diaz. 26/11/2012-P3Y1M4D. 45.000 €.

C.4. Patents