Biography

Prof. Dr. Eng. Eduardo Bayro-Corrochano

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Prof. Dr. Bayro-Corrochano is a distinguished leader and internationally recognized scientist and educator in Geometric Cybernetics. His expertise lies in applying Clifford geometric algebras across various fields, including pattern recognition, image processing, computer vision, artificial intelligence, neurocomputing, machine learning, control, robotics and quantum computing.

He has pioneered several advancements, including the geometric MLP, Clifford Support Vector Machines, quaternion quantum neural networks, and the innovative quaternion spike neural networks for pattern recognition and neuro control. Additionally, he developed the Quaternion Wavelet Transform and Quaternion Fourier Transform using space-time metrics, along with Quaternion Fractional FFT and Quaternion Quantum FFT for color image processing. His contributions also extend to the interpolation of geometric entities (such as lines, planes, circles, spheres, and hyperplanes) using motor algebra (SE(3)) and a Bézier approach in the Study manifold.

In the realm of geometric algebra, his groundbreaking work includes contributions to kinematics, dynamics, Euler-Lagrange and Newton-Euler recursive algorithms, port Hamiltonians, and the Koopman Operator for phase space computations. His research has significantly impacted nonlinear control, particularly in robot vision and general robotics. Furthermore, he is a strong advocate for geometric quantum computing within the Clifford geometric algebra framework.

His scientific contributions are particularly well represented in three of his eight books:

* *Geometric Algebra Applications Vol. I: for Graphics, Vision, and Neurocomputing* (Springer Verlag, 2018)
* *Geometric Algebra Applications Vol. II: Robot Modelling and Control* (Springer Verlag, 2019)
* *Geometric Algebra Applications Vol. III: Integral Transforms for Science and Engineering* (Springer Verlag, 2024)

These books serve as valuable resources for graduate courses and provide inspiration for researchers and engineers working in cybernetics and related fields.

Prof. Bayro-Corrochano has served as an Associate Editor for the *IEEE Transactions on Neural Networks and Learning Systems* and the *Journal of Mathematical Imaging and Vision*. He is also a member of the editorial boards for the *Journal of Pattern Recognition* and *Journal of Robotica*. His achievements have been recognized with the First Prize in Science and Technology from the State of Jalisco, Mexico, in both 2003 and 2009. He is a Fellow of the International Association of Pattern Recognition Society and a senior member of IEEE and IEEE/RAS Ad-Com Member (GEO Area 1 Representative).

He has played a key role in organizing major international conferences, serving as General Chair of ICPR 2016 (Dec. 4-8, Cancun, Mexico) and IEEE/RAS Humanoids 2016 (Nov. 15-17, Cancun, Mexico). He is also set to be the General Chair of IEEE/RAS Humanoids 2026 and IEEE/RAS ICRA 2028 both in Guadalajara, Mexico.

**Research stays**

2007-2008 Full Professor, Mercator DFG Guest Prof. Program, Robotik und Humanoid Lab., TH, Karlsruhe, Germany by Prof. Riguer Dillman.

2014-2015 Full Professor at Camera Culture Group of the Media Lab, MIT, Boston, USA, by Prof. Ramesh Raskar.

2021-2022 Full Professor, Visualistik Institute, University of Koblenz, Germany, by Prof. Dietrich Paulus.

2021-2022 Visiting Professor Informatik und Angewandte Mathematik University of Munster by Prof. Xiaoyi Jiang.

2021-2022 Visiting Professor Professor Alex Efland. Institute of Mathematics and Life Science, University of Bonn and General Hospital of Bonn, Germany.

**Invited speaker/plenary talk**

-July 1999,First Int. Workshop on Applied Clifford Algebra in Cybernetics, Robotics, Image Processing and Engineering : ACACSE'99 (Ixtapa, M\'exico, 28.06.99-- 03.07.99).Theme: Application of Geometric Clifford Algebras in Computer Vision

-April 2003, MATA'2003, Third International Conference on Multivariate Approximation: Theory and Applications. Cancun, Mexico, April 24-29, 2003.Theme: The quaternion wavelet transform: theory and applications.

-June 2004, ICAISC'2004, International Conference on Artificial Intelligence and Softcomputing. Zakopane, Poland, June 7-11, 2004.Theme: Geometric neurocomputing using Clifford geometric algebra for visual and robotic learning.

-October 2004, Iberoamerican Congress on Pattern Recognition, CIARP’2004, Puebla, Mexico, October 2004, Theme: (key note) Clifford geometric algebra: a promising framework for computer vision, robotics and learning.

-May 2005, plenary talk at the Int. Conf. on Clifford Algebras and their Applications, Toulouse France, May 19-29, 2005, Theme: Conformal geometric algebra for robotics vision.

-November 2005, Iberoamerican Congress on Pattern Recognition, CIARP’2005, Habana, Cuba, November 2005, Theme: (key note) Conformal computational geometry for perception and action.

-May 2008, plenary talk at the Int. Conf. on Clifford Algebras and their Applications, Sao Paolo, Campinas, Brazil, May 26-30, 2008, Theme: Conformal geometric algebra for robotics vision.

-Juli 2011**,** plenary talk at the Int. Conf. on Clifford Algebras and their Applications, ICCA9, Weimar, Germany, July 15-20, 2011, Theme: Geometric algebra for robot physics.

-Juli 2017**,** plenary talk at the Int. Conf. on Clifford Algebras and their Applications, Gent, Belgium, Theme: Geometric algebra for robotics vision.

-June 2019**,** plenary talk at IEEE/RAS ROMOCO’2019, July 8-10, 2019, Theme: Geometric Cybernetics for social robotics