

## David Ramírez García

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Born in Santander, Spain, 28 May 1983

## Education

**Ph.D. in Telecommunication Engineering.** Dissertation title: “Detection and Estimation of Time Series using a Multi-sensor Array”. *Summa cum laude* (with honors). Univ. de Cantabria. July 2011  
**B.Sc. & M.Sc. in Telecommunication Engineering.** Univ. de Cantabria. July 2006

## Academic employment

- Assistant Professor (“Profesor Visitante”). Univ. Carlos III de Madrid. Sept. 2015 – Present
- Tenured Assistant Professor (“Akademischer Rat”). Univ. Paderborn. Nov. 2013 – Aug. 2015
- Research Associate (“Wissenschaftlicher Mitarbeiter”). Univ. Paderborn. Sept. 2011 – Oct. 2013
- Research Assistant (Ministry grant). Univ. de Cantabria. May 2007 – April 2011
- Contract Researcher. Univ. de Cantabria. Feb. 2007 – Mar. 2007
- Contract Researcher. Univ. de Cantabria. Nov. 2006 – Dec. 2006

## Research Interests

- Statistical signal processing
- Change-point management (detection, classification, prediction, . . .)
- Signal processing on graphs
- Signal processing for wireless communications
- Analysis of space-time random fields

## Prizes and Awards

- 2012 Young Author Best Paper Award by the IEEE Signal Processing Society for the paper “Detection of Spatially Correlated Gaussian Time Series”, co-authored by D. Ramírez, J. Vía, I. Santamaría and L. L. Scharf and published by the IEEE Transactions on Signal Processing, vol. 59, issue 8, pp. 3764–3774, August 2010

- 2013 Extraordinary Ph.D. Award by the University of Cantabria for the Thesis “Detection and Estimation of Time Series using a Multi-sensor Array”

## Teaching experience

### Universidad Carlos III de Madrid

- Lectures and Tutorials for Digital Communications. 2015–2017
- Lectures and Tutorials for Signal Processing in Communications. 2015–2017
- Tutorials for Applications of Digital Signal Processing to Transmission. 2016–2017
- Tutorials for Advanced Techniques in Signal Processing and Communications. 2015–2016

### Universität Paderborn

- Tutorials for Statistical Signal Processing. 2011–2015
- Tutorials for Probability for Engineers. 2011–2015
- Students supervision in Topics in Signal Processing. 2011–2012 & 2013–2014
- Projects supervision. 2012–2015
- Supervision/Co-Supervision for one Bachelor’s Thesis and three Master’s Theses

### Universidad de Cantabria

- Lectures (substituting I. Santamaría) for Digital Signal Processing. 2009–2011
- Digital Signal Processing Laboratory. 2009–2010
- Signals and Systems (laboratory). 2010–2011
- Two Master’s Theses co-supervision

## Current PhD students

- Stefanie Horstmann. Univ. of Paderborn. Since 2016  
Advisor: Peter J. Schreier. Co-Advisor: David Ramírez.

## Visiting researcher

- Department of Mathematics of the Colorado State University, USA.  
Dates: 7 – 13 November 2014. Topic: Detection of cyclostationary time series in multi-sensor arrays
- Department of Statistical Science of the University College London, United Kingdom.  
Dates: 29 September – 3 October 2014. Topic: The localized monogenic signal

- Department of Statistical Science of the University College London, United Kingdom.  
Dates: 8 – 12 April 2013. Topic: A localized measure of unidirectionality
- Department of Statistical Science of the University College London, United Kingdom.  
Dates: 13 – 17 February 2012. Topic: A measure of unidirectionality
- Signal and System Theory group of the University of Paderborn, Germany.  
Dates: 14 – 25 March 2011. Topic: The random monogenic signal
- Electronic Technology and Communications group of the University of Coruña, Spain.  
Dates: 25 – 29 October 2010. Topic: Experimental evaluation of interference alignment under imperfect channel state information
- Electronic Technology and Communications group of the University of Coruña, Spain.  
Dates: 30 June – 08 July 2010. Topic: Building a multiterminal MIMO platform and initial experiments on interference alignment
- Signal Processing in Communications group of the University of Vigo, Spain.  
Dates: 31 May – 4 June 2010. Topic: Detection of multiple primary users in cognitive radio networks
- Signal Processing Microelectronics group of the University of Newcastle, Australia.  
Dates: 13 October – 14 December 2009. Topic: New measures of linear correlation and mutual information in the frequency domain

## Selected research projects

- David Ramírez, Peter J. Schreier, A Unifying Framework for Detecting Cyclostationarity with Applications to Cognitive Radio. German Research Foundation. Nov. 2015 – Nov. 2017

## Collaboration in funded research projects

### Public funding

- Advanced Bayesian computation methods for estimation, prediction and control in multi-sensor complex systems (ADVENTURE). Ministry of Economy (Spain) and ERDF (European Commission). Jan. 2016 – Dec. 2018
- Intelligent Systems: Concepts and Applications (CASI-CAM). Comunidad de Madrid. Oct. 2014 – Sep. 2018
- Overhead-Throughput-Optimal Signaling Schemes for Next-Generation Wireless Networks (OTO-SiS). Ministry of Economy (Spain). Jan. 2014 – Dec. 2016
- Radio Access Techniques for Heterogeneous Wireless Networks (RACHEL). Ministry of Economy (Spain). Jan. 2014 – Dec. 2016
- Signal Processing for Identifying Coupled Effects in High-Dimensional Data. German Research Foundation. Aug. 2014 – Aug. 2017

- Nonparametric Techniques for Analyzing Directional Structure in Space-Time Random Fields. German Research Foundation. Aug. 2013 – Aug. 2015
- Computational Inference in High Dimensional Random Complex Systems (COMPREHENSION). Ministry of Economy (Spain). Jan. 2013 – Dec. 2015
- Cooperative and cognitive strategies for interference management in wireless communication networks (COSIMA). Ministry of Science and Innovation (Spain). Jan. 2011 – Dec. 2013
- Foundations and Methodologies for Future Communication and Sensor Networks (COMONSENS). Ministry of Science and Innovation (Spain). Dec. 2008 – Dec. 2013
- Advanced MIMO systems for maximum reliability and performance (MIMAX). European Commission. Seventh Research Framework Program. Jan. 2008 – Dec. 2010
- MIMO technologies for multiterminal wireless networks (MultiMIMO). Ministry of Education and Science (Spain). Oct. 2007 – Sept. 2010
- Development and hardware demonstration of new transmission techniques for MIMO systems (MIMESIS). Ministry of Education and Science (Spain). Dec. 2004 – Dec. 2007

### **Industry funding**

- Asesoramiento y Gestión para la industrialización del sistema de control y medida Sayme. Consultora y Software Innova S.L. Sept. 2007 – Dec. 2007
- Integration of Radio-Transceivers Multistandard in an SDR Platform. Advanced Communication Research and Development (ACORDE). Jul. 2007 – Sept. 2007

### **Membership or Activities in Professional Associations**

- IEEE Senior Member
- Signal Processing Society Member

### **Invited Talks**

- Power-CCA: Maximizing the correlation coefficient between the power of projections, Department of Statistical Science of the University College London, United Kingdom. 12 April 2013
- Detection of Cyclostationary Time Series in Multi-Sensor Arrays, Department of Mathematics of the Colorado State University. 12 November 2014
- Detection of Cyclostationary Time Series in Multi-Sensor Arrays, Department Signal Theory and Communications of the University Carlos III of Madrid. 1 June 2015
- Detection of Cyclostationary Time Series in Multi-Sensor Arrays, Forty-Six Years (and counting) of Statistical Signal Processing: A workshop in recognition of the career contributions of Louis Scharf. 10 November 2015

## Professional Service

- Publications chair of the 2018 IEEE Workshop on Statistical Signal Processing (SSP 2018)
- Co-Organizer of the 4th EURASIP-IEEE Spanish Workshop on Signal Processing, Information Theory and Communications
- Member of the IEEE Technical Committee on Signal Processing Theory and Methods
- Co-Organizer and Co-Chair (with J. Vía and L. Scharf) of Special Session, ICASSP 2015 “Theory and Application of Coherence in Signal Processing”
- Member of the Editorial Board of Signals
- Technical program committee member of the 2012 Workshop on Cognitive Information Processing, 2012 IEEE International Workshop on Machine Learning for Signal Processing, 2014 IEEE Symposium on Wireless Technology and Applications, 2016 IEEE GlobalSIP Symposium on Signal and Information Processing Over Networks, 2016 IEEE Global Conference on Signal and Information Processing, 2017 IEEE Annual International Symposium on Personal, Indoor, and Mobile Radio Communications (MAC and Cross-Layer Design), 2017 IEEE GlobalSIP Symposium on Graph Signal Processing

I usually review/reviewed for:

- IEEE Transactions on Signal Processing, IEEE Transactions on Information Theory, IEEE Transactions on Audio, Speech and Language Processing, IEEE Transactions on Wireless Communications, IEEE Transactions on Communications, Transactions on Biomedical Engineering, IEEE Signal Processing Letters, EURASIP Journal on Wireless Communications and Networking, IET Electronic Letters, IET Signal Processing, IET Communications, Applied and Computational Harmonic Analysis, Transactions on Vehicular Technology, Wireless Networks, Journal of Visual Communication and Image Representation, Digital Signal Processing, IEEE Communications Letters, Signal Processing, IEEE Transactions on Intelligent Transportation Systems, Mobile Networks and Applications
- First Wireless Euro-Mediterranean International Conference (WEMIC 2006), Mosharaka Multi-Conference on Communications, Networking and Information Technology (MM-CNIT 2007), IEEE 67th Vehicular Technology Conference (VTC 2008 Spring), 8th International Conference on Independent Component Analysis and Signal Separation (ICA 2009), IEEE Symposium on Personal, Indoor, Mobile and Radio Communications 2009 & 2010 (PIMRC), IEEE International Conference on Communications (ICC 2011), IEEE symposium on Computers and Communications (ISCC 2011), Third International Workshop on Cognitive Information Processing (CIP 2012), 19th International Conference on Systems, Signals and Image Processing (IWSSIP 2012), 2012 IEEE International Workshop on Machine Learning for Signal Processing (MLSP 2012), 21st International Symposium on Mathematical Theory of Networks and Systems (MTNS 2014), The Eighth IEEE Sensor Array And Multichannel Signal Processing Workshop (SAM 2014), 2014 European Signal Processing Conference (EUSIPCO 2014), 2014 International Telecommunications Symposium, The Eleventh International Symposium on Wireless Communication Systems (ISWCS 2014), IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2015), The Twelfth International Symposium on Wireless Communication Systems (ISWCS 2015), The 2016 IEEE Workshop on Statistical Signal Processing (SSP 16), The Ninth IEEE Sensor Array and Multichannel Signal Processing

Workshop (SAM 16), IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2017)

I served on the following Ph.D. Committees:

- Sadiq Ali, “Multi-sensor detection schemes using spatio-temporal models”, Ph.D. Dissertation, Department of Telecommunications and Systems Engineering, Universitat Autnoma de Barcelona.
- Julio César Manco Vásquez, “Experimental evaluation of new detection techniques for cognitive radio”, Ph.D. Dissertation, Department of Communications Engineering, University of Cantabria.

## Selected publications

### International journals

- Y. Song, P. J. Schreier, D. Ramírez, and T. Hasija. Canonical correlation analysis of high-dimensional data with very small sample support. *Signal Process.*, 128:449–458, November 2016.
- D. Ramírez, P. J. Schreier, J. Vía, I. Santamaría, and L. L. Scharf. Detection of multivariate cyclostationarity. *IEEE Trans. Signal Process.*, 63(20):5395–5408, October 2015.
- S. Ali, D. Ramírez, M. Jansson, G. Seco-Granados, and J. A. López-Salcedo. Multi-antenna spectrum sensing by exploiting spatio-temporal correlation. *Eurasip J. Applied Signal Process.*, 160, 2014.
- S. C. Olhede, D. Ramírez, and P. J. Schreier. Detecting directionality in random fields using the monogenic signal. *IEEE Trans. Inform. Theory*, 60(10):6491–6510, October 2014.
- S. Dähne, V. V. Nikulin, D. Ramírez, P. J. Schreier, K.-R. Müller, and S. Haufe. Finding brain oscillations with power dependencies in neuroimaging data. *NeuroImage*, 96:334–348, 2014.
- J. Manco-Vásquez, M. Lázaro-Gredilla, D. Ramírez, J. Vía, and I. Santamaría. A Bayesian approach for adaptive multiantenna sensing in cognitive radio networks. *Signal Process.*, 96, Part B:228–240, March 2014.
- D. Ramírez, P. J. Schreier, J. Vía, and I. Santamaría. Testing blind separability of complex Gaussian mixtures. *Signal Process.*, 95:49–57, February 2014.
- D. Ramírez, J. Vía, I. Santamaría, and L. L. Scharf. Locally most powerful invariant tests for correlation and sphericity of Gaussian vectors. *IEEE Trans. Inform. Theory*, 59(4):2128–2141, April 2013.
- V. Pichler, M. Homolák, W. Skierucha, M. Pichlerová, D. Ramírez, J. Gregor, and P. Jaloviar. Variability of moisture in coarse woody debris from several ecologically important tree species of the temperate zone of Europe. *Ecohydrology*, 5(4):424–434, July 2012.
- D. Ramírez, G. Vazquez-Vilar, R. López-Valcarce, J. Vía, and I. Santamaría. Detection of rank- $P$  signals in cognitive radio networks with uncalibrated multiple antennas. *IEEE Trans. Signal Process.*, 59(8):3764–3774, August 2011.

- J. Gutiérrez, Ó. González, J. Pérez, D. Ramírez, L. Vielva, J. Ibáñez, and I. Santamaría. Frequency-domain methodology for measuring MIMO channels using a generic test bed. *IEEE Trans. Instrum. Meas.*, 60(3):827–838, April 2011.
- D. Ramírez, J. Vía, I. Santamaría, and L. L. Scharf. Detection of spatially correlated Gaussian time series. *IEEE Trans. Signal Process.*, 58(10):5006–5015, October 2010.
- J. Vía, D. Ramírez, and I. Santamaría. Properness and widely linear processing of quaternion random vectors. *IEEE Trans. Inform. Theory*, 56(7):3502–3515, July 2010.
- D. Ramírez, I. Santamaría, J. Pérez, J. Vía, J. A. García-Naya, T. M. Fernández-Caramés, H. Pérez-Iglesias, M. González-López, L. Castedo, and J. M. Torres-Royo. A comparative study of STBC transmissions at 2.4 GHz over indoor channels using a  $2 \times 2$  MIMO testbed. *Wireless Comm. and Mobile Computing*, 8(9):1149–1164, November 2008.
- D. Ramírez and I. Santamaría. Regularised approach to detection of constant modulus signals in MIMO channels. *Electr. Lett.*, 42(3):184–186, February 2006.

### International conferences

- D. Ramírez, A. G. Marques, and S. Segarra. Graph-signal reconstruction and blind deconvolution for diffused sparse inputs. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, New Orleans, USA, March 2017.
- T. Hasija, Y. Song, P. J. Schreier, and D. Ramírez. Bootstrap-based detection of the number of signals correlated across multiple data sets. In *Proc. Asilomar Conf. Signals Syst. Computers*, Pacific Grove, USA, November 2016.
- Y. Song, T. Hasija, P. J. Schreier, and D. Ramírez. Determining the number of signals correlated across multiple data sets for small sample support. In *Proc. Eur. Signal Process. Conf.*, Budapest, Hungary, August 2016.
- T. Hasija, Y. Song, P. J. Schreier, and D. Ramírez. Detecting the dimension of the subspace correlated across multiple data sets in the sample poor regime. In *Proc. IEEE Work. Stat. Signal Process.*, Majorca, Spain, June 2016.
- A. Pries, D. Ramírez, and P. J. Schreier. Detection of cyclostationarity in the presence of temporal or spatial structure with applications to cognitive radio. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Shanghai, China, March 2016.
- D. Ramírez, P. J. Schreier, J. Vía, I. Santamaría, and L. L. Scharf. An asymptotic LMPI test for cyclostationarity detection with application to cognitive radio (invited paper). In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Brisbane, Australia, April 2015.
- D. Ramírez, P. J. Schreier, J. Vía, I. Santamaría, and L. L. Scharf. A regularized maximum likelihood estimator for the period of a cyclostationary process. In *Proc. Asilomar Conf. Signals Syst. Computers*, Pacific Grove, USA, November 2014.
- S. Dähne, V. V. Nikulin, D. Ramírez, P. J. Schreier, K.-R. Müller, and S. Haufe. Optimizing spatial filters for the extraction of envelope-coupled neural oscillations. In *Proc. Int. Work. Pattern Recognition In Neuroimaging*, Tübingen, Germany, June 2014.
- D. Ramírez, L. L. Scharf, J. Vía, I. Santamaría, and P. J. Schreier. An asymptotic GLRT for the detection of cyclostationary signals. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Florence, Italy, May 2014.

- D. Ramírez, P. J. Schreier, J. Vía, and V. V. Nikulin. Power-CCA: Maximizing the correlation coefficient between the power of projections. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Vancouver, Canada, May 2013.
- D. Ramírez, P. J. Schreier, J. Vía, and I. Santamaría. GLRT for testing separability of a complex-valued mixture based on the strong uncorrelating transform. In *Proc. IEEE Int. Work. Machine Learning for Signal Process.*, Santander, Spain, September 2012.
- S. C. Olhede, D. Ramírez, and P. J. Schreier. The random monogenic signal. In *Proc. IEEE Int. Conf. Image Process.*, Orlando, Florida, USA, September 2012.
- D. Ramírez, J. Iscar, J. Vía, I. Santamaría, and L. L. Scharf. The locally most powerful invariant test for detecting a rank- $P$  Gaussian signal in white noise. In *Proc. IEEE Sensor Array and Multichannel Signal Process. Work.*, Hoboken, NJ, USA, June 2012.
- J. Manco-Vásquez, M. Lazaro-Gredilla, D. Ramírez, J. Vía, and I. Santamaría. Bayesian multiantenna sensing for cognitive radio. In *Proc. IEEE Sensor Array and Multichannel Signal Process. Work.*, Hoboken, NJ, USA, June 2012.
- D. Ramírez, J. Vía, and I. Santamaría. The locally most powerful test for multiantenna spectrum sensing with uncalibrated receivers. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Kyoto, Japan, March 2012.
- G. Vazquez-Vilar, D. Ramírez, R. López-Valcarce, J. Vía, and I. Santamaría. Spatial rank estimation in cognitive radio networks with uncalibrated multiple antennas (invited paper). In *Proc. Int. Conf. on Cognitive Radio and Advanced Spectrum Management*, Barcelona, Spain, October 2011.
- G. Vazquez-Vilar, D. Romero, R. López-Valcarce, D. Ramírez, J. Vía, I. Santamaría, and J. Sala. Recent advances in multiantenna spectrum sensing: complexity, noise uncertainty, and signal rank issues. In *Int. Work. COST Action IC0902*, Barcelona, Spain, October 2011. Extended abstract.
- J. A. García-Naya, L. Castedo, Ó. González, D. Ramírez, and I. Santamaría. Experimental evaluation of Interference Alignment under imperfect channel state information. In *Proc. Eur. Signal Process. Conf.*, Barcelona, Spain, September 2011.
- D. Ramírez, J. Vía, I. Santamaría, and L. L. Scharf. Multi-sensor beamsteering based on the asymptotic likelihood for colored signals. In *Proc. IEEE Work. Stat. Signal Process.*, Nice, France, June 2011.
- D. Ramírez, G. Vazquez-Vilar, R. López-Valcarce, J. Vía, and I. Santamaría. Multiantenna detection under noise uncertainty and primary user's spatial structure. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Prague, Czech Republic, May 2011.
- D. Ramírez, J. Vía, I. Santamaría, and L. L. Scharf. Multiple-channel detection of a Gaussian time series over frequency-flat channels. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Prague, Czech Republic, May 2011.
- Ó. González, D. Ramírez, I. Santamaría, J. A. García-Naya, and L. Castedo. Experimental validation of Interference Alignment techniques using a multiuser MIMO testbed. In *Proc. Int. ITG Work. on Smart Antennas*, Aachen, Germany, February 2011.



- D. Ramírez, J. Vía, and I. Santamaría. Multiantenna spectrum sensing: The case of wideband rank-one primary signals. In *Proc. IEEE Sensor Array and Multichannel Signal Process. Work.*, Israel, October 2010.
- J. Vía, D. Ramírez, I. Santamaría, and L. Vielva. Improperness measures for quaternion random vectors. In *Proc. IEEE Int. Work. Machine Learning for Signal Process.*, Finland, August 2010.
- D. Ramírez, J. Vía, I. Santamaría, R. López-Valcarce, and L. L. Scharf. Multiantenna spectrum sensing: Detection of spatial correlation among time-series with unknown spectra. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Dallas, USA, March 2010.
- J. Vía, D. Ramírez, I. Santamaría, and L. Vielva. Widely and semi-widely linear processing of quaternion vectors. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Dallas, USA, March 2010.
- D. Ramírez, J. Vía, and I. Santamaría. Coherent fusion of information for optimal detection in sensor networks. In *Proc. IEEE Work. Stat. Signal Process.*, Cardiff, UK, September 2009.
- D. Ramírez, J. Vía, I. Santamaría, and P. Crespo. Entropy and Kullback-Leibler divergence estimation based on Szegő's theorem. In *Proc. Eur. Signal Process. Conf.*, Glasgow, Scotland, August 2009.
- I. Santamaría, V. Elvira, J. Vía, D. Ramírez, J. Pérez, J. Ibáñez, R. Eickhoff, and F. Ellinger. Optimal MIMO transmission schemes with adaptive antenna combining in the RF path. In *Proc. Eur. Signal Process. Conf.*, Lausanne, Switzerland, August 2008.
- D. Ramírez, J. Vía, and I. Santamaría. Multiple-channel signal detection using the generalized coherence spectrum. In *Proc. IAPR Work. Cognitive Information Process.*, Santorini, Greece, June 2008.
- D. Ramírez, J. Vía, and I. Santamaría. A generalization of the magnitude squared coherence spectrum for more than two signals: Definition, properties and estimation. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Las Vegas, USA, April 2008.
- J. A. García-Naya, T. M. Fernández-Caramés, H. J. Pérez-Iglesias, M. González-López, L. Castedo, D. Ramírez, I. Santamaría, J. Pérez, J. Vía, and J. M. Torres-Royo. Performance of STBC transmissions with real data. In *Proc. IST Mobile & Wireless Comms. Summit*, Budapest, Hungary, July 2007.
- D. Ramírez, I. Santamaría, J. Pérez, J. Vía, A. Tazón, J. A. Garcia-Naya, T. M. Fernandez-Carames, M. Gonzalez Lopez, H. J. Pérez Iglesias, and L. Castedo. A flexible testbed for the rapid prototyping of MIMO baseband modules. In *Proc. Int. Symp. on Wireless Comm. Systems*, Valencia, Spain, September 2006.
- J. Vía, I. Santamaría, J. Pérez, and D. Ramírez. Blind decoding of MISO-OSTBC systems based on principal component analysis. In *Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process.*, Toulouse, France, May 2006.