



## AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

### Turno de acceso general

**Nombre:** VILLAGRÁ SERRANO, JORGE  
**Referencia:** RYC-2015-18039  
**Área Científica:** Ingeniería Eléctrica, Electrónica y Automática  
**Correo Electrónico:** jorjuel@gmail.com

#### Título:

Towards uncertainty management in autonomous and connected driving systems

#### Resumen de la Memoria:

Throughout his 14 years of research career, Dr. Jorge Villagra has worked without interruption around the uncertainty management for autonomous and connected driving systems, initially around control systems, thereafter spanning a large set of ICT research areas. Indeed, as current decision systems for autonomous driving require substantial human intervention when faced with novel and unanticipated situations, a true breakthrough is necessary to change car driver's feeling towards the autonomous vehicle so he/she perceives the new autonomous vehicle as predictable, reliable and comfortable as his/her private vehicle. The research of Dr. Villagra has attempted to find solutions handling the enormous uncertainty in the entire perception-cognition-action loop, seeking a safe human-like driving style.

Autonomous Vehicles have the potential to be a major disruption in society and in the automotive industry. These vehicles will transform the topology of urban and rural areas, whilst providing an enhanced service to society by enabling accessibility to different forms of transport and, at the same time. Autonomous Vehicles should lead to safety and efficiency improvements, provide accessibility to all sectors of society (e.g. the elderly, people living in rural areas), by releasing the humans from the routine tasks, and therefore improving their quality of life and autonomy. The different achievements of Dr. Villagra have significantly contributed to the progress beyond the state of the art in this (social) disruptive technology.

Dr. Villagra has had a leadership role in the international arena achieving several EU-funded projects and coordinating the subsequent research activities. The significant publication record derived from these projects has been complemented with an outstanding transfer of technology, mainly due to a very complete experience in all the agents of the innovation process value chain. His career can be succinctly summarized around three major research activities, which have been very rarely put together:

- ◆ Advanced mechatronic design for steering and suspension components through (i) the identification of new vehicle dynamic models, (ii) the development of a tool for global sensitivity analysis, (iii) the use of optimal non-linear control using differential flatness properties, (iv) the implementation of optimal co-design procedures for complex systems.
- ◆ Data-driven or model-free control: a change of paradigm that aims at unifying signal processing and control theories. Dr. Villagra has applied these novel techniques both to wheeled/biped robots and to autonomous driving systems, providing unprecedented results for unstable, uncertain and even networked complex systems. Several of his publications have permitted to show that these techniques can have a significant impact due to (i) its easiness of implementation and design, (ii) its reduced computational complexity, (iii) its intrinsic robustness to uncertainties, disturbances and measurement noises.
- ◆ New probabilistic approaches for embedded components in autonomous vehicles. Uncertainty management is handled through a unified framework ranging (i) enhanced perception and navigation through V2X communications (ii) integrity-based localization, (iii) smooth and optimal motion planning (iv) HW/SW co-design for last generation of hybrid embedded systems.

#### Resumen del Currículum Vitae:

Jorge Villagra graduated in Industrial Engineering at the Universidad Politécnica de Madrid in 2002. He received his PhD in Real-Time Computer Science, Robotics and Automatic Control at the École des Mines de Paris (France) in 2006. He was first granted with a 3 years CIFRE Program in PSA-Peugeot-Citroën and then with a post-doctoral fellowship at a Joint Research Unit INRIA-Mines ParisTech (France). The results of the PhD were granted with the Prize for the Best dissertation in Automatic Control in France in 2006. From 2007 to 2009 he held a position of Visiting Professor at the University Carlos III (Spain). He then received a 3 year JAEDoc fellowship at the AUTOPÍA Program in the Center for Automation and Robotics UPM-CSIC (Spain), where he spent one additional year funded by a research contract. Since September 2013 he is leading the ADAS and Highly Automated Driving Systems at Ixion Industry & Aerospace SL, where he also coordinates the activities for the EU R&D Programmes.

He has developed his research activity in 6 different entities with a very intense activity in project setup and management, through 25 projects ◆ 1 EU FP6, 2 EU FP7, 3 EU H2020, 4 private contracts in France with Large Enterprises, 12 national projects and 1 regional project. He is or has been IP of 10 of these projects (7 european, 3 national). He has participated in several international first-range demonstration events -the Grand Cooperative Driving Challenge, an international and unique challenge in the field of cooperative driving, and in a widely publicized demonstration where a vehicle of Autopia ran driverless 100 kilometers from Madrid roads.. He has participated in two licensed patents with two different research groups. He has been awarded with the best entrepreneurship project in Pasion IE



MINISTERIO  
DE ECONOMÍA  
Y COMPETITIVIDAD



DIVISIÓN DE PROGRAMACIÓN  
Y GESTIÓN ECONÓMICA Y  
ADMINISTRATIVA  
SUBDIVISIÓN DE  
PLANIFICACIÓN Y GESTIÓN  
ADMINISTRATIVA

## AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

### Turno de acceso general

contest -organized by Accenture and IE Business School. Organizer of three international and two national workshops. Speaker within the Spanish delegation of scientific excellence in the event **Networking Nations**, organized by The Royal Society in London (2012).

The candidate has published 36 peer reviewed journals articles or book chapters, 5 confidential technical reports and 39 international conference papers. These publications appear in 16 different journals, 59% of which are in first quartile, 45% of which are as first author and 73% without the PhD supervisor participation. The published papers are the result of a collaboration work with 37 different co-authors that belong to 12 different research groups, both in public institutions and in private organizations.

His research interests include nonlinear and optimal control using deterministic, data-driven and artificial intelligence approaches. He is particularly interested in applying these methodologies in Intelligent Transportation Systems and studying the interaction between networked agents of variable granularity.



## AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

### Turno de acceso general

**Nombre:** VIVAR GARCIA, MARTA  
**Referencia:** RYC-2015-17306  
**Área Científica:** Ingeniería Eléctrica, Electrónica y Automática  
**Correo Electrónico:** marta.vivar@gmail.com

#### Título:

Hybrid Solar Photovoltaic Systems

#### Resumen de la Memoria:

During her PhD at the Institute of Solar Energy - UPM (2004-2009), the candidate worked on a solar linear photovoltaic concentrator system within the framework of the EU IDEOCONTE project. She also worked in two other competitive projects, leading and managing the low concentration research activities (4 JCR papers, 1 technology transfer, 5 research projects ◆ 2 as PI).

As a postdoc at the Australian National University (2009-2012), she worked on hybrid solar photovoltaic-thermal systems, producing both electricity and heat. She directly managed a research project funded by the Australia-India Strategic Research Fund, which studied the technical and economic potential of solar photovoltaic linear concentrators in India; and was involved in other three projects related to new concepts for hybrid solar systems (micro-concentrator; spectrum-splitting CPV). But her best result was the development of a new concept for a hybrid system for the simultaneous production of drinking water and electricity, which was rapidly accepted for publication (13 JCR, 2 projects as PI, 12 student projects).

In 2012 she obtained Chinese funding as a PI and worked for a year at Tianjin University (China), leading and supervising closely all the project activities on hybrid photovoltaic/chemical systems (2 JCR papers). During this year she also obtained an MSc in the water field.

From mid-2013 she is working at IMDEA Water under a ◆Juan de la Cierva◆ contract, starting a new research line within the institute called ◆Water & Solar Photovoltaics◆, which explores the potential of integrating solar photovoltaic and water technologies to solve the problem of safe drinking water access and/or wastewater treatment, by developing clean and sustainable solutions for both industrial and rural applications, increasing the systems efficiencies, reducing costs and saving energy (7 JCR papers + 3 submitted, 1 EU patent filed, 1 software protection, 2 PhD thesis on-going, 14 students projects).

#### Resumen del Currículum Vitae:

Marta Vivar completed her Telecommunication Engineering degree at the Polytechnic University of Madrid (UPM) in 2002, working afterwards in a multinational company. In 2004 she was awarded a PhD fellowship ◆Formación de Personal Investigador◆ (FPI) from the Madrid regional government to conduct her PhD studies on ◆Photovoltaic Solar Energy◆ at the Institute of Solar Energy (IES-UPM), obtaining her PhD in 2009.

From 2009 to 2012, she joined the Australian National University (ANU), where she worked as an academic staff member, sharing both research and lecturing activities on hybrid photovoltaic-thermal systems. Early in 2012, she was awarded a one-year Chinese fellowship from the grant program ◆NSFC Research Fellowship for International Young Scientists◆ supported by the National Natural Science Foundation of China (NSFC), working at Tianjin University on photovoltaic-photochemical systems (2012-2013). During this period she also obtained a Master of Science in ◆Hydrology and Water Resources Management◆ at the University of Alcalá (2013) to obtain a more specialised training in this area due to the interdisciplinary character of her research. In July 2013 she joined the IMDEA Water Institute to initiate a new research line within the centre, ◆Water and Solar Photovoltaics◆. In November 2013 she obtained a ◆Juan de la Cierva◆ contract. Currently she is in the third and last year of this contract, working towards the creation and future consolidation of a new research group that is now composed by two researchers and two PhD students.

As a researcher in the different research centres where she has been working at, her main scientific production indicators includes: 26 articles in international SCI high impact journals (14 as first author, 19 in the top 25%, 21 on the last 5 years, h-index 9), 14 national scientific articles, 1 technology transfer, 6 seminars and 45 communications to international conferences (19 oral presentations, 2 invited talks). She has published with all the international research centres where she has been working (JCR articles from all research stays). She has also participated in 20 research projects, being PI in 6 of them, including an EU project and various international competitive projects with Australia, China, India and Mexico. She is supervising 2 PhD students and has supervised and/or co-supervised 28 honours and/or master students projects; and three of her students have obtained special awards related to the work developed under her supervision.

She also contributes to other research activities within the scientific community, especially at international level due to her career mobility: reviewer of EU H2020 projects (FET-OPEN call), reviewer of international high-impact journals, conferences organisation, and projects evaluation for scientific councils (Australian Research Council, National Natural Science Foundation of China).

She has completed several research stays, most of them supported by competitive funding, at ANU (Australia), ZSW (Germany), University of Ferrara (Italy), Anna University (India), Tianjin University (China) and UABJO (Mexico). As an indicator of her research activity, she obtained the national accreditation for ◆Non-civil servant tenured Associate Professor◆ (Profesora Contratada Doctora) in 2011.



## AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

### Turno de acceso general

**Nombre:** VALLEJOS VARGAS, STELLA  
**Referencia:** RYC-2015-18296  
**Área Científica:** Ingeniería Eléctrica, Electrónica y Automática  
**Correo Electrónico:** strellamedialuna@gmail.com

#### Título:

Sensing technologies and nanomaterials

#### Resumen de la Memoria:

My research line encompasses the sensing technologies and nanomaterials. Within this research line I have focused in the engineering and technological aspects for the fabrication of gas sensing Microsystems including the development of active sensing structures. As PhD student, I developed successfully two new regimes of sputtering for deposition of metal oxide thin films with nanometre grain size, which were employed for the fabrication of gas microsensors. The results derived from that research were directly connected to my PhD dissertation, resulting in the publication of 5 peer-reviewed papers in first quartile journals. Later as Post-doc, I pioneered the use of Aerosol Assisted Chemical Vapour Deposition (CVD) for the co-deposition of metal oxide nanostructures with metal nanoparticles, and developed advanced flexible transducing platforms on the base of polymers demonstrating the compatibility of the CVD method and the flexible platforms. These findings have resulted in 18 peer-reviewed papers, 10 from the first quartile 6 from the second quartile, and 2 from the third quartile. From these contributions 13 are directly related to gas sensing, including development of the sensing material and technological aspects of sensor fabrication, 3 exclusively dedicated to the development of the AACVD technique for nanostructured materials, 1 to the surface analysis of WO<sub>3</sub> nanostructures, and the last to synthesis of Pt-Bi<sub>2</sub>O<sub>3</sub> for photocatalytic hydrogen evolution. In particular, the paper published in Chemical Communications on Au-nanoparticle modified nanostructured WO<sub>3</sub> thin films deposited via AACVD received 85 cites, since its publication in 2011, and the paper published in Advanced Functional Material received 40 cites in only two years of publication. [WOS, 12/01/16]

I collaborate internationally, both within and across disciplines, with other scientists to broaden my research, and I still keep collaborative works with researchers and institutions in which I was affiliated previously. At present, I am participating actively in the elaboration of new proposals for the National Programme for Research (Spain), the Czech Science Foundation (Czech Republic) and the Horizon 2020.

I am interested in exploring further scalable synthesis methods to tailor and engineer the sensing properties of nanomaterials, as well as in developing new generation of gas sensor Microsystems able to fit in applications such as safety, security and air quality monitoring. The research in gas sensing technologies is orientated to an important market, which according to Global Industry Analysts, is forecasted to reach €2.5B by 2020, stimulated by the new legislation and public concerns regarding monitoring of gas leaks and emissions, and the increasing awareness on safety among end users. Thus, my research line is not only related to fundamental R&D but also has strong applicability to solve societal challenges and result in innovative products. Moreover, I believe my research is timely, as it adjusts well to the objectives of the latest EU work programmes on Nanosciences, Nanotechnologies, Materials and new production technologies (NMP) and to the priority Key Enable Technologies (KETs) considered in the Horizon 2020.

#### Resumen del Currículum Vitae:

I completed my Ph.D. in Electric Electronics and Automatic Engineering at the Universitat Rovira i Virgili (Spain) in 2008. Throughout my career, I have worked in various recognised research centres, both academic and industrial, in Spain (8 years), UK (18 months), France (4 months), and Czech Republic (19 months). I have participated in several funded projects (4 international and 5 national) and have been awarded with competitive fellowships (URV, Hands on Lab, Juan de la Cierva and Marie Curie). I have also mentored master/doctoral students, and supervised a doctoral thesis, on Aerosol Assisted Chemical Vapour Deposition (AACVD), that received an excellent Cum Laude qualification in 2011. While working at the European Technologic Centre for Lear Corporation I managed R&D&I projects, among them one carried out in collaboration with the Universitat Politècnica de Catalunya on design and control of reversible power DC-DC converters. Additionally, I have been evaluator for the Czech Science Foundation and La Fundación Carolina, and reviewer at doctoral dissertations in Spain. More recently I have been nominated by merits as part of the group of scientific advisors for developing the scientific and technological agenda (2025) in Bolivia.

Currently, I am Marie Curie SoMoPro fellow at Brno University of Technology (associated to the new European Centre, CEITEC, created with the support of the European Commission). I am also reviewer of numerous specialized journals and I am participating actively in the elaboration of new proposals related to my research line for the National Programme for Research (Spain), the Czech Science Foundation (Czech Republic) and the Horizon 2020.

My research activities have led to 23 peer-reviewed publications (2 more already submitted), 1 review, 30 presentations to national and international conferences (2 invited) and teaching workshops (4 invited, in Spain, Mexico, Bolivia and Czech Republic). During my career I have also done teaching assistance of different subjects at departments of electronic engineering (Bolivia, Czech Republic) and chemistry (UK). According to data published in the Web of Science, currently (12/01/2016) I have an H index of 10 with a total of 318 cites, being either first author or contact author of the 58 % of these publications and second author of the 30 %. Other achievements include my contribution in a patent and the realisation of white papers and roadmaps for power electronic components used in hybrid electric and



MINISTERIO  
DE ECONOMÍA  
Y COMPETITIVIDAD



DIVISIÓN DE PROGRAMACIÓN  
Y GESTIÓN ECONÓMICA Y  
ADMINISTRATIVA

SUBDIVISIÓN DE  
PLANIFICACIÓN Y GESTIÓN  
ADMINISTRATIVA

## AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

### Turno de acceso general

electric vehicles, while working at Lear Corporation.

My various research positions and fellowships have provided at each stage a more independent angle to my career, allowing me to strengthen my research in sensing technologies and nanomaterials, and motivating me to delineate and follow my own research ideas. The Ramón y Cajal fellowship would mean a significant and valuable increase in my competence, considering that a common bottleneck in my carrier has been the lack of long-term research contracts. In this sense, I believe, this fellow would definitely reinforce my potential to lead my research line in a national and international context, providing a certain stability to tackle more ambitious projects in the area of science and engineering.



## AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

### Turno de acceso general

**Nombre:** MORALES GONZALEZ, JUAN MIGUEL  
**Referencia:** RYC-2015-17182  
**Área Científica:** Ingeniería Eléctrica, Electrónica y Automática  
**Correo Electrónico:** juanmi82mg@gmail.com

#### Título:

Decision-making under uncertainty in energy systems

#### Resumen de la Memoria:

Juan M. Morales' scientific motif is to contribute to the **green** transformation of the energy sector with new methods and systems that involve the development of operations research, mathematical programming and optimization, energy analytics and economics, stochastic modeling and forecasting, among others.

With this aim in mind, his research has focused up to date on the use of advanced mathematical programming techniques, operations research and statistical methods for decision making in energy, placing particular emphasis on the challenges arising from the large-scale integration of intermittent and partly predictable renewable energy sources, such as wind and solar.

Within this general framework, his research work has followed three specific courses of action, namely:

1. Development of methods for probabilistic forecasting of market prices and renewable power production. These methods do not only provide a single-valued forecast (typically the conditional mean or the most likely value) of the targeted stochastic process (e.g., wind power, solar irradiance or electricity price), but also information on the uncertainty or potential error of the point prediction. These probabilistic forecasts are of utmost importance for all market agents to make the most out of their energy production and consumption and, in particular, for system operators and renewable power producers to mitigate the adverse effects associated with the stochastic nature of renewable energy sources. The candidate, together with his colleagues and research team, have developed novel techniques for probabilistic forecasting drawing from theory of time series analysis and stochastic differential equations.
2. Development of models for data-driven decision-making and simulation, primarily relying on techniques of optimization under uncertainty like stochastic programming, robust optimization, decision rules, and stochastic dynamic programming, and covering a wide variety of applications such as market-clearing procedures, the electricity procurement problem of retailers and consumers, smart grids and demand response, optimal charging of an electric vehicle, the offering problem of conventional and renewable power producers, the operation of combined heat and power systems, the probabilistic power flow problem, among others. The crucial aspect of these decision-making models is that they take full advantage of probabilistic forecasts.
3. Development of hierarchical optimization models to analyze the interaction of market agents in a smart-grid environment and the impact of stochastic renewable power production on the expansion planning of power systems, and to solve the offering problem of a price-maker wind power producer and propose novel electricity market designs with favorable economic properties.

Juan M. Morales is currently focusing on developing a novel mathematical framework that merges probabilistic forecasting and decision-making by the combined use of machine learning and mathematical programming. This new framework will facilitate taking advantage of big data to efficiently operate and plan the renewables-dominated power systems of the future.

#### Resumen del Currículum Vitae:

Since Juan M. Morales was awarded a PhD in Electrical Engineering from the University of Castilla - La Mancha in December 2010, his professional career as a researcher, and also as a teacher in a higher education institution, has primarily developed as an employee at the Technical University of Denmark (DTU): first, as a postdoctoral researcher under the framework of the "Hans Christian Ørsted Postdoctoral Fellowship" program for young talented investigators; second, as an assistant professor in the Department of Electrical Engineering of the same university; and finally, as a permanent associate professor in the Department of Applied Mathematics and Computer Science at DTU, which is the academic position that he currently holds since the first of April of 2013.

During his five years of postdoctoral research career, Juan M. Morales has become a mature, independent and creative researcher, capable of leading a research team and of generating high-impact and high-quality results. As an example, in 2015 alone, he published (or got accepted for publication) nine scientific articles in leading journals in their respective areas of knowledge. Furthermore, he has coauthored two books published by Springer, the most recent of which he has coordinated and led as the principal author. This book, which has the title "Integrating Renewables in Electricity Markets - Operational Problems," was published in the beginning of 2014 and since then, its content has been downloaded around ten thousands times according to Bookmetrix. Besides, he is currently involved in two large research



MINISTERIO  
DE ECONOMÍA  
Y COMPETITIVIDAD



DIVISIÓN DE PROGRAMACIÓN  
Y GESTIÓN ECONÓMICA Y  
ADMINISTRATIVA  
SUBDIVISIÓN DE  
PLANIFICACIÓN Y GESTIÓN  
ADMINISTRATIVA

## AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

### Turno de acceso general

and innovation projects of high international relevance (one funded by the European Commission and the other by the Danish Council of Strategic Research), to which he contributes as a work package leader. Lastly, he regularly participates, both as an invited speaker and as a session chair and organizer, in prestigious international conferences such as the "INFORMS Annual Meeting", "EURO conference", and the PES General Meeting.

Juan M. Morales' research profile is strongly multidisciplinary, with experience in mathematical programming, operations research, applied statistics and energy engineering and economics. His research has mainly focused on the development of mathematical methods, algorithms, and systems to facilitate the decarbonization of the energy sector. In this effort, he has had the opportunity to collaborate, involve and get support from the private sector, in particular, from companies such as DONG Energy, ENFOR, and Energinet.dk.

As a university teacher, he has developed his own course "Decision-making under uncertainty in electricity markets" within the MSc. program "Mathematical Modelling and Computation", which is presently in place in his department. A short version of this course was successfully conducted at Universidad Politécnica de Madrid, in a 18-h seminar that was held in March 2013, and that gathered more than 70 participants from different master programs and several important Spanish companies in the energy sector. Likewise, he actively contributes to training young practitioners and researchers and, in this vein, he has supervised and co-supervised a number of MSc. and PhD. students.

Further information on the candidate's research and teaching profile can be found in his personal webpage <https://sites.google.com/site/jnmmgo/home>.