



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

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Título:

Research in Security and Privacy in Distributed Systems

Resumen de la Memoria:

In November 2007 I started my doctoral studies, and in the subsequent years I conducted a couple of research-oriented internships, of 6 months each (and both supported by specific competitive grants), at NEC Laboratories Europe in Heidelberg, Germany. On June 21, 2010 I defended my PhD Thesis, receiving the European Doctorate mention and being awarded with the Best PhD Award by the University of Murcia in January 2011. All this period was supported by a competitive grant awarded by the Seneca Foundation of the Region of Murcia, Spain.

Since November 15, 2010 I am working as a Senior Researcher at NEC Laboratories Europe.

My PhD Thesis was entitled **Trust and Reputation Management in Distributed and Heterogeneous Systems**, and that was my main research line during my doctoral studies. Once finished my PhD, I started applying my knowledge on trust and reputation management to several other environments (such as identity management and access control systems, intrusion detection systems, social networks, etc.), as well as exploring new research fields (smart grids, homomorphic encryption, searchable encryption, cybersecurity, IoT, cloud computing, etc.).

So far I have co-advised two PhD Theses, both receiving the European Doctorate mention, both having the Quality mention and one of them having received the Best PhD Award by the University of Murcia.

With the first one, entitled **Enhancing User-Centric Identity Management Systems with Reputation Models in Distributed Environments**, we started exploring the application of trust and reputation management into user-centric identity management systems, whereas with the second PhD Thesis, entitled **Managing Access Control Systems in Distributed Environments with Dynamic Asset Protection**, we investigated on advanced access control mechanisms to achieve a dynamic assets protection.

Finally, while working at NEC Laboratories, I have addressed a variety of research fields, such as IoT, Smart Grids, Homomorphic encryption, Searchable encryption, Cybersecurity, etc.

Resumen del Currículum Vitae:

In November 2007 I started my doctoral studies, and in the subsequent years I conducted a couple of research-oriented internships, of 6 months each (and both supported by specific competitive grants), at NEC Laboratories Europe in Heidelberg, Germany. On June 21, 2010 I defended my PhD Thesis, receiving the European Doctorate mention and being awarded with the Best PhD Award by the University of Murcia in January 2011. All this period was supported by a competitive grant awarded by the Seneca Foundation of the Region of Murcia, Spain.

Since November 15, 2010 I am working as a Senior Researcher at NEC Laboratories Europe.

Today, around 8 years later and being 32 years old, I own the following research quality indicators, according to Google Scholar (<https://goo.gl/wVLysl>):

- Total citations: 841
- h-Index: 13
- i10 Index: 15

So far, I have published 27 articles in journals indexed in the JCR (5 in 1st Quartile; 12 in 2nd Quartile; 7 in 3rd Quartile; 3 in 4th Quartile), 11 in international conferences and 2 book chapters, making a total of 40 publications.

I have co-advised 2 PhD Theses, both receiving the European Doctorate mention, both having the Quality mention and one of them having received the Best PhD Award by the University of Murcia. Furthermore, I have supervised 7 research interns while performing their respective stays at NEC Laboratories Europe.

In this time as a researcher I have accrued 5 international patents exploited by NEC Corporation, as well as 2 open source projects, having



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

3460 and 1313 downloads, respectively.

I have participated in 2 standardization bodies of OASIS, contributing to 5 international standardization reports.

Besides belonging to the Editorial Board of 5 international journals, I have also collaborated as a Guest Editor in 8 Special Issues in journals indexed in the JCR. I have acted as a reviewer for 22 international journals, as TPC member in 50 international conferences and as General co-chair, Program co-chair, Publicity co-chair or Industry co-chair in 15 international conferences.

I have contributed to 2 national research and development contracts (with an accumulated funding of 902,515 €), 5 national R&D projects (942,118 € of total funding) and 9 European research projects (47,145,980 € of accumulated funding), being the main investigator from NEC side, as well as Work Package leader, in 3 of them (with an overall funding of 8,211,979 €).

I have also provided my support in the preparation of several European project proposals, leading and coordinating one of them, and with a high acceptance ratio.

All the aforementioned merits (research projects, publications, TPC, Special Issues, etc.) has helped me to build across these years a wide network of contacts at a international level, both in Academia and industry, including researchers, Professors, CEOs, developers, editors and many more.

More information and details about my research and academic career can be found in my website:

<http://ants.inf.um.es/~felixgm/en>



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

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Título:

Ensuring the Reliability of Multicore and Cloud Software

Resumen de la Memoria:

In the past decade computing has undergone a radical shift: with the advent of multicore processors and cloud computing, concurrent and distributed programming have gone mainstream. Unfortunately, programmers find it particularly hard to write correct software using these paradigms, because reasoning about the behaviour of concurrent and distributed software is inherently difficult. Reasoning about concurrency requires a programmer to keep track of multiple threads of computation and interactions between them; distribution additionally requires considering computations located in different places and inevitable failures. This complexity makes it easy for programmers to make mistakes, leading to unreliable software. The goal of my research is to provide programmers with programming models, methods and tools that help them build correct multicore and cloud software. To this end, I combine techniques from the areas of programming languages and verification on one hand, and distributed computing, on the other. Most of my research is done within the framework of the EU project ADVENT that I am coordinating. I have worked in several application domains, with the following key results:

* I have proposed the first formal and declarative specifications of modern consistency models for cloud databases, methods for proving the correctness of key components in cloud database implementations and methods for reasoning about applications using cloud databases.

* I have pioneered the use of programming language theory techniques to determine consistency guarantees that software transactional memory systems have to provide to allow safe application programming.

* The criteria commonly used to define the correctness of non-blocking concurrent algorithms, such as linearisability, are inappropriate for the settings of real-world programming languages, such as C/C++ and Java. I have proposed the first criteria that lift this limitation and, in particular, handle data structure manipulation, weak memory models and higher-order algorithms. I have also established results that allow using the criteria to modularise the verification of complex multicore software. My work in this strand has highlighted a serious problem in the memory model of the C/C++ 2011 standard.

* I have proposed the first program logics that allow verifying operating systems code with features that aim to make the maximal use of multicore parallelism, present in kernels such as Linux and Windows. This includes preemptive scheduling and read-copy-update synchronisation.

* In my Ph.D. thesis, I proposed the first static analyses for scalably verifying safety and liveness properties of shared-memory concurrent programs manipulating data structures. These analyses have been implemented in the SLayer tool at Microsoft Research for proving memory safety of device drivers. During this practical development, I also solved an open theoretical problem of showing the soundness of non-standard variants of separation logics that the static analyses were based on.

Resumen del Currículum Vitae:

I am a tenure-track Assistant Research Professor at the IMDEA Software Institute in Madrid, which I joined in 2010. I obtained my PhD in 2010 from the University of Cambridge, UK. My thesis has been awarded a Best Dissertation Award of the European Association for Programming Languages and Systems (EAPL). From 2010 until 2013 I held a Marie Curie fellowship at IMDEA.

I maintain international collaborations with researchers in both industry and academia. I am the Coordinator of an EU FP7 project "ADVENT: Architecture-driven verification of systems software" (2013-2016) in the FET Young Explorers track and I have also been involved in 5 other collaborative projects. I participate in activities of international mobility: in addition to my postdoctoral stay at Cambridge, I have been a Visiting Researcher at Microsoft Research 4 times, in Redmond (USA) and Cambridge (UK), as well as a Research Intern at Cadence Berkeley Labs (USA) and University of Trento (Italy). I coordinate a Joint Microsoft Research - IMDEA Research Centre, and I have led several on-going joint projects with Microsoft. At IMDEA I am leading a group comprising two postdoctoral researchers, one PhD student and one MSc intern.

I have published 24 papers, out of which 8 papers in conferences with CORE rank A* (flagship), 11 papers in conferences with CORE rank A (excellent) and 2 papers in highly regarded journals. This includes papers in top conferences on both programming languages (POPL, PLDI)



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AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

and distributed computing (PODC, DISC). I have an h-index of 13, and my papers have attracted 653 citations (excluding self-citations). I have served on the programme committees 15 international conferences and workshops, including the most important venues in programming languages: POPL, ESOP, CONCUR, ICALP. I have also given invited talks and tutorials at POPL and several other workshops and conferences, as well numerous universities and industrial research organisations.



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

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Título:

Computer-based personalized medicine

Resumen de la Memoria:

OVERVIEW: After a Juan de la Cierva fellowship in Spain, a PhD from Imperial College London, UK, I have now been awarded a Marie-Curie grant, with a one-year stay at Stanford University (USA). Throughout these experiences, my research interests have revolved around computer-based personalized medicine, i.e. to develop the computational frameworks and tools that will enable the delivery of the right treatment to the right patient at the right time.

i) Medical image computing for automated diagnosis: I started my research at Imperial College London on medical image computing for functional quantification and patient diagnosis, working with images with severe pathologies or high levels of noise.

ii) Computational modeling for treatment planning: In Spain, I participated in several regional, national, and European projects on computational modeling of organs, to simulate their response to various treatments, ultimately to select computationally the best treatment for each patient.

iii) Big data analytics for disease understanding: More recently, I have been working on the processing of large-scale biomedical data for the extraction of novel clinical knowledge on diseases. I have just been awarded a project for the development of a computational decision support system for arterial stenting from a large-scale database (DECARTS).

RESEARCH RECORD: My output consists of 52 peer-reviewed international publications, including 23 journal papers and a total of 22 papers as a first-author. Thanks to my Juan de la Cierva project and the multiple international collaborations, my record has more than tripled in the last three years alone (from 15 papers before 2013 to a current total of 52). Also, during this time, I supervised three PhD students who have all successfully published in high impact-factor Q1 journals.

The quality of my work can be illustrated through several results: (i) best paper award (STACOM 2015), (ii) first place in international competition (statistical shape model challenge), (iii) student best paper as co-author (EIT 2015), (iv) commercial software (CMRtools), (v) open-source platform (CardioSuite), and (vi) keynote speaker invitations (e.g. SIPAIM 2013).

Furthermore, I have participated in the writing, execution, or management of 13 research projects funded in the UK, Spain, by the European Commission, or regionally. I have occupied various roles in these projects, from (i) associated researcher (MySpine) and (ii) software developer (CMRtools) to (iii) WP leader (cvREMOD) and (iv) PI (DECARTS). Besides, I have significant experience in technology transfer projects (CMRtools, CardioSuite, DECARTS).

I have a highly developed international research profile thanks to (i) my education and training in several countries (France, Germany, UK, Spain), (ii) joint international publications with a total of 14 research institutions from 9 different countries (Netherlands, New Zealand, Switzerland, Canada, etc), and (iii) my participation in many international meetings as an organizer (ISBI 2012), program committees (ICML-MI 2015, PMI 2015), or in reviewing committees (MICCAI, IEEE-TMI).

Last but not least, I have been awarded an applied research project which will allow me to spend one year at Stanford University (USA) to further enhance my research profile in one of the most prestigious universities in technology innovation.

Resumen del Currículum Vitae:

CURRENT POSITIONS

- 2016: Visiting researcher at Stanford University, USA
- 2016 ♦ 2017: Marie-Curie / Tecnio fellowship at the Computer Vision Center, Barcelona

PAST POSITIONS

- 2012 ♦ 2015: Juan de la Cierva fellowship at the Department of ICT, Universitat Pompeu Fabra, Barcelona
- 2011: Postdoctoral researcher at the Center for Computational Imaging and Simulation Technologies in Biomedicine, Barcelona
- 2009 ♦ 2010: Research Associate, Department of Computing, Imperial College London, UK



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

- 2003 ♦ 2004: Software developer, CMRtools, London, UK
- 2000 ♦ 2001: Database programmer, EvoBus, Daimler AG, Mannheim, Germany

EDUCATION

- 2009: PhD in Medical Image Computing, Imperial College London, UK
- 2002: Advanced Msc in Computer Science, Université de Montpellier II, France
- 2001: Engineering degree, CESTI Paris, France, and RWTH Aachen, Germany
- 1998: Undergraduate in Mathematics, Université de Bourgogne, France

OTHER SCHOLARSHIPS

- 2005: Royal Society/Wolfson MIC Laboratory PhD scholarship, UK
- 2001: Erasmus exchange studentship (based on student ranking), carried out at RWTH Aachen, Germany
- 1999: Leonardo de Vinci industrial mobility grant by the EC, carried out at EvoBus, Daimler AG, Germany

RESEARCH PROJECTS

- UK: CMRtools, PLATFORM, RT-ISIS
- Spain: STIMATH, cvREMOD, INDIMUSICA
- Europe: euHeart, MySpine, VPH-Share
- Regional (Catalonia): CardioSuite, VERTEX, DECARTS

MISCELLANEOUS ACTIVITIES

- Program committees: SIPAIM 2013, ICML-MI 2015, PMI 2015
- Conference organization: ISBI 2012 (publication chair), MICCAI 2009 (local organizing committee)
- Invited talks: SIPAIM 2013, Faculty of Telemedicine, National University of Colombia (2013)
- Grant reviewer: Medical Research Council (MRC), UK (since 2015)
- Paper reviewer in 12 international journals (e.g. IEEE Transactions on Medical Imaging)
- Teaching: Imperial College London: computer vision, computational techniques. Universitat Pompeu Fabra: theory classes of probability and random processes
- Invited lecturer for biomedical engineering school (Bogota, 2013)

RESEARCH RECORD

- 52 scientific publications as of January 2016, including 23 journals
- 22 publications as a first-author, including 10 in high-impact factor Q1 journals
- 9 journals in the top ranked journal in medical imaging according to JCR/SJR (i.e. IEEE-TMI)
- 1 best paper award and 1st place in international challenge
- 1 student paper award (as co-author)
- 3 research projects in the UK, 3 in Europe, 4 in Spain, 3 regional projects (including 3 technology transfers)
- 1 commercial software, 1 open-source platform
- 1 book chapter on computational modeling
- Supervision of 3 PhD students and 5 Msc/Mphil/Bsc students
- Joint papers with 14 research institutions in 9 different countries (Netherlands, New Zealand, Switzerland, Canada, etc)

10 SELECTED PAPERS as FIRST-AUTHOR

- Lekadir et al., Elsevier MedIA 2016
- Lekadir et al., Med. Phys. 2016
- Lekadir et al., ABME 2016
- Lekadir et al., IEEE-TMI 2015
- Lekadir et al., Elsevier J. Biomech. 2015
- Lekadir et al., IEEE-TMI 2014
- Lekadir et al., IEEE-TBME 2014
- Lekadir et al., IEEE-TMI 2011
- Lekadir et al., J. CMR 2008
- Lekadir et al., IEEE-TMI 2007

5 SELECTED PAPERS with STUDENTS

- Alba et al., IEEE-TMI 2016
- Pereanez et al., IEEE-TMI 2015
- Pereanez et al., Elsevier MedIA 2014
- Alba et al., MRM 2014
- Hoogendoorn et al., IEEE-TMI 2013



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

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Título:

Algoritmos SIG (Sistemas de Información Geográfica) novedosos para Modelos Digitales de Elevaciones (DEMs) de muy alta resolución y nubes de puntos LIDAR (Laser Imaging Detection and Ranging).

Resumen de la Memoria:

1. Trayectoria: En la Universidad de Almería, inicié mi trayectoria investigadora en la línea de **Estrategias de optimización para aplicaciones científicas basadas en PDEs sobre sistemas de alto rendimiento**. Los resultados de mi tesis doctoral fueron publicados en 8 artículos indexados. En 2007, tras mi incorporación al Dpto. de Arquitectura de Computadores de la Universidad de Málaga, realicé un estudio y una propuesta para un proyecto de investigación titulado **High Performance Irradiation and Horizon Computation Models for Very Large High Resolution Terrains** que fue financiado mediante el Subprograma Juan de la Cierva (2008-2011), y que sirvió de lanzamiento para esta nueva línea de investigación. En primer lugar, desarrollé el modelo solar para el cálculo de la radiación a partir de Modelos Digitales de Elevaciones (MDEs) enormemente grandes y, posteriormente, para aumentar su exactitud numérica incorporé al modelo solar un modelo de horizontes. Los resultados de estos dos modelos han sido publicados en 3 artículos de alto impacto, galardonados con 3 premios, y han dado lugar a la obtención de 1 proyecto I+D de excelencia autonómico (de la cual fui promotora y redactora, aunque no pude ser investigadora principal porque mi figura contractual lo impedía), 1 contrato R+D y la creación de una empresa Spin-Off, que también fue premiada por la Cámara de Comercio de Málaga. Los frutos de mi trabajo en esta línea han sido tan alentadores que se incluyó como línea estable de investigación en el Dpto. de Arquitectura de Computadores. Paralelamente, he iniciado y mantenido colaboraciones en otras dos líneas de investigación con resultados exitosos: 1) Estrategias de optimización para aplicaciones científicas sobre sistemas de alto rendimiento y 3) Modelos de rendimiento.

2. Línea principal de investigación: El principal objetivo de esta línea es extraer información sintética y útil para diferentes aplicaciones a partir de MDEs y nubes de puntos LIDAR. Durante la última década, se vienen generando un número creciente de datos con cada vez mayor resolución espacial para caracterizar la heterogeneidad del relieve. A su vez, no para de crecer la demanda pública y privada de contar con MDEs y nubes de puntos LIDAR de resolución espacial de 1 m² o incluso del orden de cm² para grandes superficies, que acaban ocupando un enorme volumen de datos. Esta proliferación de MDEs ha despertado un gran interés en la comunidad científica para desarrollar nuevos algoritmos que caractericen computacionalmente muchas de las propiedades físicas que están determinadas por la forma del terreno. El software actual no está preparado para abordar estos MDEs y LIDAR porque se diseñaron inicialmente para un solo punto de observación y para grids de pequeño tamaño. Esto supone una enorme limitación para la escalabilidad. En esta línea he desarrollado varios algoritmos computacionales muy novedosos y eficientes: de horizontes, radiación solar, visibilidad total y visibilidad volumétrica. Actualmente, estoy trabajando en una metodología SIG novedosa para resolver el problema conocido como multi-observer siting para encontrar la ubicación óptima del mínimo número de observadores que da una máxima cobertura en un territorio. Esta metodología puede servir en numerosas problemas de la vida real.

Resumen del Currículum Vitae:

Completé la Licenciatura en Física en 1998 (homologado en España en 2006) y el DEA en Energía y Medio Ambiente en 2001, ambos en la Universidad Mohammed V (Rabat, Marruecos). En 2002, inicié mi carrera investigadora, siempre financiada por becas o contratos de convocatorias públicas competitivas. En 2006, obtuve el doctorado en Técnicas Informáticas Avanzadas en la Universidad de Almería, Cum Laude con acreditación de Doctorado Europeo.

He publicado 15 artículos en revistas indexadas en ISI (1 del primer decil, 6 del primer cuartil y 7 del segundo cuartil), 18 artículos en congresos internacionales de prestigio con revisión por pares (10 clasificados como CORE A y 8 patrocinados por IEEE y/o ACM). Además, he publicado 1 IBM research paper, 2 capítulos de libro, 1 libro con mi tesis, y 9 contribuciones a congresos nacionales.

Mi investigación tiene vocación de servir a la sociedad. Creé una empresa spin-off, premiada por la Cámara de Comercio de Málaga y he desarrollado 1 plataforma web, 2 aplicaciones Android, y 1 Atlas online que proporciona el cálculo de la radiación solar disponible en cualquier punto del terreno.

He participado en 14 proyectos de investigación (1 americano, 2 europeos, 7 nacionales, 4 autonómicos) y 2 contratos I+D. He redactado propuestas de investigación que han sido financiadas con 8 ayudas de programas competitivos para realizar estancias de investigación en 7 centros extranjeros de prestigio internacional (2 de ellas competitivas a nivel internacional y 3 a nivel Europeo), acumulando un total de 26 meses (20 meses post-doctorales y 6 pre-doctorales). 5 de estas ayudas estuvieron financiadas por



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

programas de movilidad de prestigio internacional y nacional (Tinsley Oden, HiPEAC, HPC Europa, y José Castillejo).

Pertenezco a 4 redes de ámbito científico (1 internacional y 3 nacionales).

He impartido un total de 479.2 horas de docencia de grado y posgrado en asignaturas relacionadas con arquitectura de computadores, programación paralela y sistemas operativos y dispongo de la acreditación de Profesor Titular (ANECA) desde 2015.

Mis trabajos abrieron una nueva línea en la Universidad de Málaga y dieron lugar a la concesión de 1 proyecto y 1 contrato I+D y a que me otorgaran 2 premios internacionales, ambos basados en mi investigación como Juan de la Cierva. Soy investigadora principal de 1 contrato de investigación. He dirigido 1 tesis doctoral y 2 tesis de master. He sido investigadora principal y primera autora en 22 de mis 31 publicaciones indexadas, y segunda autora en 5.

He sido miembro del comité organizador de 2 congresos (1 internacional y 1 nacional). He sido revisora de proyectos de investigación internacionales, de varias revistas SCI-ISI y congresos CORE A.



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

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Título:

Elastic Networks for Image Sequence Analysis

Resumen de la Memoria:

Visual sensing plays a fundamental role to understand most environments designed by humans who heavily rely on visual signals. My research interests are focused on semantically understanding through image sequences to provide high level reasoning of events occurring in the environment of a mobile platform (robot or a handheld device). For example, early detection of pedestrian's intention to cross the street. Reliable understanding of actions through image sequences is a challenging and unsolved problem in computer vision and is essential to develop realistic portable robots assisting with many daily tasks.

In this era of big data, deep networks have achieved impressive results in image classification tasks by leveraging large datasets of visual data. However, reliable solutions for the semantic understanding of actions are still lacking in practical applications such predicting and anticipating pedestrian movements. Moreover, current methods are fixed to regular data structures and rely on large high quality annotated datasets and very large computational resources. My research line aims at closing the gap between computer vision and pure learning methods with focus on two main aspects: introducing flexible structures to represent data; and explicitly integrating theoretical models and different sources of input data into the process of leveraging visual datasets to yield reliable semantic action understanding models that require less training data and are less computationally intensive and therefore, suitable to be embedded in portable platforms.

To achieve this ambitious goal, my research agenda is based on a framework where input data comes from a stream of data -e.g. visual, inertial and GPS; and additional external sensors (e.g. a laser rangefinder). In addition, the system has access to large visual datasets with general descriptions-e.g. social-network images with tags, captions or a category label for each object in the scene. The scientific goal consists of leveraging all these sources of information to yield models for high level semantic understanding of actions relying only on data coming from the internal sensors (e.g. visual data stream).

The scientific goal of this agenda will advance knowledge and involve significant contributions in the following fields: 1) Elastic data representation introducing novel data structures to enable the use of non-squared image representations. 2) Multimodal Feature representation learning leveraging all possible sources of labeled and unlabeled data available at train time. 4) Real-time robotics building upon the novel idea of sparse classification for real-time operation.

The expected outcome of this research agenda is to yield high level semantic models for understanding actions through image sequences that require less annotated training data and are less computational intensive; this outcome aligns with the on-going traction of mobile and embedded computing. As a consequence, these models will not only enable the next generation of mobile robotics but will also open new avenues of research to the regular-sized research groups.

I am confident that my diverse background with a proved track record of academic, research and industry experience, will lead to a unique positioning and competence to undertake and complete this ambitious research agenda with high quality.

Resumen del Currículum Vitae:

Dr. Alvarez received his PhD degree with Honors from the Autonomous Univ. of Barcelona in Oct. 2010 under the supervision of Prof. T. Gevers (Univ. of Amsterdam) and Prof. A. Lopez. Subsequently, he worked in the US as a postdoctoral researcher under the supervision of Prof. Yann LeCun in New York Univ. and Prof. H. Jiang in Boston College. Since 2013 he is a research scientist at NICTA, Australia. His research interests are in the fields of computer vision and machine learning and are focused on efficient data-driven methods for leveraging large collections of multimodal (partially annotated) data to enable the next generation of smart portable robots

Dr. Alvarez's first publication was in 2007. To this date he is co-inventor of 3 patents and he has published more than 40 scientific papers in top-tier international conferences and journals most of them as first author. His current h-Index is 12 (i10-index 16) and his total of number of citations is 480 according to his Google scholar profile (accessed 17/01/2016) available at: https://scholar.google.com.au/citations?user=Oyx_UIAAAA&hl=en. Dr. Alvarez has been invited to present his research during invited talks at several national and international conferences including Oxford Brooks, NEC Labs, Australian Research Summer School or the Australian Conference on Robotics.

Dr. Alvarez's experience extends beyond academia. He has held engineer and project leader positions at E2S S.L (2000-2005) including a research internship at Carnegie Mellon University in 2003, the Computer Vision Center (2006-2010) and freelance contracts with SEAT S.A. and Galimplant S.A. He is co-inventor of three patents. He is also an active member of the research community: He serves as Associate



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AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

Editor of IEEE Trans. on Intelligent Transportation (T-ITS [Q1 IF:2.9]); as Area Chair of IEEE-ICRA15, and Area Chair of IEEE-WACV 2016; Dr. Alvarez also serves as reviewer for major conferences and top-tier journals including IEEE T-PAMI, IJCV, IEEE T-IP, IEEE T-ITS, IEEE-T-NNLS, IEEE CVPR, ICCV, ECCV.

Dr. Alvarez has also co-organized several workshops collocated with the computer vision flagship conferences: CPCV, CRSUAD and the workshop on benchmarking road detection. He is also the lead organizer of the annual deep learning in computer vision workshop and the Computer Vision in Vehicle Technology workshop held with IEEE-CVPR.

Dr. Alvarez won 7 awards: 1) Extraordinary Doctorate Award 2010-2011; 2) Doctor Europeus Certificate (2011); 3) best paper award at ICCV 2013w; 4) best poster award at IbPria 07; 5) mobility award from UAB in 2008 and 2009; and 6) 12-month mobility award from ERCIM in 2012. Dr. Alvarez also won four (4) professional accreditations: 1) Research and 2) Assistant Prof. Certificate by the AQU Spain in 2014 and 2012 respectively; 3) Associate and 4) Assistant Professor Certificates by ANECA, Spain in 2014 and 2012 respectively.

Dr. Alvarez has supervised 1 PhD Student (now at Microsoft) and 2 MSc students; He is currently co-supervising 4 Ph.D. students, 1 M.Sc. student and 2 visiting researchers. In addition, Dr. Alvarez, at ANU, is a panel member of two other PhD students with Prof. S. Gould and Prof. H. Li.

During his career, Dr. Alvarez has had more than 1000 hours of teaching experience and he supervised the final project of twelve 12 undergraduate students in Spain and 4 in Australia.



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

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Título:

Part-based alignment through discriminative regression

Resumen de la Memoria:

My research lays within the Computer Vision and Pattern Recognition fields, focusing in particular on the problems of face alignment, facial expression recognition and object tracking.

My research trajectory started as a PhD student at the Autonomous University of Barcelona in 2010, where I tackled the problem of part-based object tracking and facial point detection. During this time, I worked on a pioneering approach to facial point detection based on discriminative regression. This work, published at the prestigious CVPR, proposed an approach that has revolutionised facial point detection performance and is nowadays the standard approach.

I then move to the Imperial College London, where my work focused on improving the complete pipeline for facial expression recognition, with special interest on the performance on increasingly unconstrained scenarios. Such a pipeline includes face detection, facial landmark detection and tracking, and the facial expression recognition module itself. I proposed a novel sampling-based algorithm within the discriminative regression framework, published at TPAMI, and worked on how to represent facial expressions as spatio-temporal events.

In May 2014 I moved to the University of Nottingham as a Research Fellow, which is my current position. I am devising algorithms capable of automatically analysing large repositories of visual data like Youtube in terms of their facial expression content. Much of the research is focusing on how to build methods specific to the characteristics of the test instances rather than using general-purpose algorithms, using techniques such as Incremental Learning and Multi-Task Learning. I am also conducting research on general-purpose object tracking, to which I am adapting some of the ideas of my facial point tracking algorithms.

During this time, I have published 10 journal articles (9 of them Q1 and 1 Q2), 4 of them being as first author. This includes a TPAMI as first author, which is the most prestigious journal in my field. I have also published in the top conferences within my field, such as CVPR and ICCV (twice). I also have published a book chapter, and a number of publications in other prestigious conferences and workshops such as BMVC, ICPR, ICIP and CVPR and ICCV workshops. These works have been cited around 400 times to date, 140 times in 2015 alone.

While my work has focused on producing innovative research outputs, the interest generated by the algorithms proposed in the private sector has led to knowledge transfer agreements on each of the research lines followed. For example, Anthropic donated 25000 GBP to my group at Imperial College in exchange of my source code for facial point detection, CrowdEmotion donates IP royalties in exchange of their use of the facial expression recognition software developed at my group, and more recently, SciSports has shown interest on the general-purpose tracking algorithms developed. I also have a Patent application to my name for work together with Unilever.

As a result of this research, I have a position as a established researcher within my field. I am organising a workshop at CVPR 2016, I have organised a one-day BMVA technical meeting. I am also a reviewer for most journals within my field (TPAMI, Trans. Cybernetics, TIP, PR, TAC, etc), and conferences (CVPR, ICCV, BMVC, FG, etc).

Resumen del Currículum Vitae:

After finishing my PhD at the UAB in 2010, I have spent almost 5 years and a half as a researcher in the UK, spending 3.5 years at the Imperial College and the rest at the University of Nottingham, where I am currently a Research Fellow.

My research has been on the fields of Computer Vision and Pattern Recognition and, in particular, on face alignment, facial expression recognition and object tracking.

Within these lines of research, I have published 10 journals (9 of them Q1, 1 Q2, 4 as first author), including a first authored TPAMI paper (the top journal in my field). I have also published in the top conferences in my field, including CVPR and ICCV twice, and also in conferences such as BMVC, ICPR, ICIP, as well as in CVPR, ICCV and FG workshops. I have also published a book chapter, and I currently have two journals and a CVPR 2016 under review.



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

Among my most important contributions are the proposal of the discriminative regression-based alignment framework, which has been instrumental in recent developments on face alignment. I have also shown that this framework can equally be applied successfully to general-purpose object tracking.

I have further contributions in the field of facial expression recognition, most notably regarding the use of spatio-temporal models for expression recognition, and regarding the design of person-specific models through Multi-Task Learning techniques.

I currently have ~400 citations, with 140 of them coming in 2015 alone. Furthermore, this last year I got 5 journals (4 Q1, 2 as first author), a book chapter (as first author), 2 ICCVs and 2 workshops accepted for publication. Out of my 6 most cited papers, 2 are from 2010, 2 from 2013, and the other two from 2014 and 2015. This highlights the steady growth of my research impact.

I have been involved in several multi-party research projects, including European Union-funded projects (within the ERC starting grant, FP7 and Horizon 2020 programs), UK and Spanish national funding, as well as private funding.

I have co-supervised one PhD and 3 final year projects, and I'm currently co-supervising 4 more PhD students.

I am organising a workshop on face analysis at the upcoming CVPR conference, and I have organised a one-day BMVA technical meeting. I serve as reviewer/PC for most journals and conferences, including TPAMI, TIP, TCyb, PR, TAC, CVPR, ICCV, FG or BMVA.

My research has also attracted interest from the private section, which has resulted in knowledge transfer agreements. In particular, Anthropic paid 25000 pounds (~33000 euro) for the source code of my TPAMI work on facial point detection. My group in Nottingham also has an agreement with CrowdEmotion in exchange for our algorithms on facial expression recognition. I am involved in a framework agreement project between the University of Nottingham and Unilever. As a result of this work, I am part of a patent application. Finally, SciSports, a Dutch company, has also recently shown interest in my work on object tracking, resulting a 3 month joint research collaboration.

Other merits:

I have visited the Oregon State University during 3 months as a "visiting scholar"

I am an IEEE member

I have a proficiency level in English



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

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Título:

Novel And Innovative Machine Learning Methods For The Analysis And/Or Control Of Complex Systems

Resumen de la Memoria:

The research of Vicenç Gómez focuses primarily on the development of machine learning methods for the analysis and/or control of complex systems. He takes a multi-disciplinary approach from both theoretic and applied perspectives. From a theoretical point of view, his research lies at the interface between computer science, control theory and statistical physics. His application domains include social networks, robotics, brain-computer interfaces and the smart grid.

One of his key theoretical contributions was to show the general equivalence between probabilistic inference in graphical models and optimal control computation for a general class of non-linear stochastic optimal control problems. This contribution had an important impact for diverse fields such as robotics, computational neuroscience and cognitive science. He also developed efficient approximate inference algorithms in graphical models based on a theoretical tool (loop calculus) originated in statistical physics, thus filling a gap between the theoretical physics and the machine learning community. Inspired by these results, he derived novel reinforcement learning algorithms which enforce smooth policy updates during the optimization of the control policy. For such algorithms, he established for the first time important asymptotic performance properties not existing in other state-of-the-art reinforcement learning algorithms.

In his applied research line, Vicenç Gómez was among the first researchers to analyze large-scale social data from online communication and to use simple mathematical models to explain the observed complex activity patterns. One of his key contributions in this area comprised the analysis of billions of comments crawled from a popular tech-news website and became a seminal paper in the field with more than 217 citations in Google Scholar. He applied his theoretical results on optimal control in different real-world scenarios, such as learning robotic motor skills or coordinating teams of unmanned aerial vehicles. Together with a PhD student whom he supervised, he introduced a control paradigm based on neural feedback for adaptive classification of Brain Computer Interfaces (BCI). This paradigm was implemented in several BCI applications such as mental typewriters.

Resumen del Currículum Vitae:

Vicenç Gómez is a post-doctoral fellow at the AI group at the Universitat Pompeu Fabra (UPF) under a fellowship for transnational academic career (FP7 Marie Curie Actions). Before, he worked as a research fellow in the machine learning (ML) group at the Radboud University Nijmegen (The Netherlands) for more than 6 years, where he developed his main line of research in optimal control and approximate inference.

He has a rich network of international collaborations established during his work in different national (Dutch) and European-funded projects in the Netherlands. He collaborates with M. Chertkov at the CNLS at Los Alamos National Laboratory (USA) developing efficient ML algorithms inspired by tools derived by the theoretical physics community. During his involvement in an FP7-funded project (ComPLACS), he visited and performed coordination tasks between two prestigious research groups resulting in two impact publications: the IAS group at Technische Universitaet Darmstadt (Germany) and the CCSML at University College London (UK). He extended the reinforcement learning and optimal control methods developed in Nijmegen into real robotic platforms, such as helicopter drones and robotic arms, provided by these labs.

Recently, he initiated a collaboration with prof. Dr. Chao Chu at the College of Control Science and Engineering at the Zhejiang University (ranked second top university in China), where was invited to teach lectures in ML and stochastic optimal control. Other important collaborations, all of them resulting in published articles include the Nara Institute of Science and Technology (Japan), the Stochastic Operations Research group at University of Twente (the Netherlands) and the Computational Cognitive Neuroscience Lab at the Donders Center for Cognition (the Netherlands).

He published 11 articles in JCR journals (10 of them belonging to the 1st quartile, including three JMLR papers as main author) and 10 papers in top conferences (with peer-review process comparable to a JCR journal publication) such as NIPS, UAI, AISTATS and WWW. He has more than 573 citations according to Google Scholar (H-index=10) and more than 59 citations according to Web of Science (H-index=5).

He is program committee member of IJCAI, UAI and ICWSM and reviewer of NIPS, AAAI and ICML. He reviewed in Neural Computation, Neurocomputing, IEEE Intelligent Systems, and Journal of Statistical Mechanics. He recently organized a workshop in the last NIPS on "Learning, Inference and Control of Multi-Agent Systems" that brought key people from the multi-agent systems community to the NIPS



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AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2015

Turno de acceso general

community and was attended by more than 100 researchers.

He has competences as group leader, currently supervising a PhD student at the UPF on the topic of social behavior influence in large-scale networks and co-supervising two more: one with the Radboud University, on control and inference in complex networks and another one with Zhejiang university, on coordination of drones for solving complex tasks. In the past, he co-supervised one PhD student in the Netherlands and several master students. These results had a strong impact in the BCI community, since they introduced a control paradigm based on neural feedback for adaptive classification that was implemented in several BCI applications.

He has teaching experience for undergraduate and master studies. He is currently teaching in the Master of Intelligent Autonomous Systems at UPF.