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AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2013

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Título:

Automatic Performance Optimisation and Design for Sustainable and High Throughput Software

Resumen de la Memoria:

Sustainability in IT has become a major concern nowadays. Many research groups and large companies (as Intel, Microsoft, or ARM, to name a few) are leading their R&D strategies towards computing sustainability. However, all the existing techniques are mostly focussed on either efficient resource management, the use of sustainable hardware, or manual software slimming. Optimising the resources used by a given software and reducing memory and I/O accesses and waiting times lead towards a more sustainable software, because the server requires less energy to execute it. However, this is a very complicated process to do by hand. I have been working during the last five years on novel sustainable solutions for high performance computing and before I worked for seven years on the design of novel efficient optimisation algorithms and their applications to solve complex problems. In this project, I propose working towards the automatic generation of sustainable software, at negligible cost (or even gain) in performance. This supposes a breakthrough in sustainable computing. The main aim is to provide important energy savings even at 100% resource utilisation, unlike other existing methods. This will be achieved not only by avoiding the waste of resources, but making a more efficient use of them too, which is also especially important for battery supported devices (tablets, smartphones, laptops, etc.). In addition, their synergy with the existing technologies and methods allows to further improving the energy-efficiency of computing systems. We will put strong focus on the optimisation of Cloud services, HPC applications, and software for mobile devices, for which we identify that our work is highly relevant. My strong background on optimisation allows me to successfully address this challenge, as it is suggested from my preliminary results. Next, I will briefly introduce the two approaches that will be followed during this project to achieve the identified goal.

The first approach deals with the automatic transformation of existing implementations. We propose the use of advanced smart optimisation techniques for source-to-source code optimisation. Our algorithms will find the right code transformations to minimise the energy demand of the algorithm, without impacting on its performance.

The second approach is the automatic generation of new parallel sustainable services to reproduce the behaviour of existing ones. It is based on our innovative technology that is able to learn and reproduce the results of a reference algorithm using parallel pattern recognition, called the virtual Savant. The technique will automatically generate parallel elastic programs to reproduce the behaviour of different services and applications.

Finally, the two described approaches can be used for optimising software components in the case of big/complex applications that cannot be handled as a whole with our techniques. These techniques are complementary to the current main existing trends. Therefore, it is possible to apply them on other sustainable platforms to further improve energy-efficiency.

Resumen del Currículum Vitae:

I got my PhD in 2007 at the University of Málaga, Spain. I got outstanding degree, European mention, received the predicate Cum Laude (= with distinction), and was awarded "Outstanding PhD Award" by my engineering school. Additionally, I was selected by the Spanish National Agency of Evaluation as one of the best Spanish PhD students, in any discipline, to participate in the National Campus de Excelencia, in 2005.

I worked as a post-doctoral researcher for 5 years at the University of Luxembourg and in 2012 I got a project (as principal investigator) to work as a senior researcher at the University of Lille 1 and INRIA, in France. I have participated as a researcher in 12 projects (some funded by the EUREKA framework), I was work package leader in several of them, and principal investigator of the ELCHID (108K€) and MES (8.5K€) projects, both dealing with resource management for sustainable large data-centres, and funded by the National Research Funds of Luxembourg. I am external expert for a USD 118K project on sustainable computing, from Uruguay. I collaborated with the teaching activities of my departments, and I am visiting professor at the University of Buenos Aires and invited keynote speaker at the Engineering Week 2014 of the University of Cádiz, Spain. Additionally, I have been invited to present my work in a number of talks, lectures, seminars, tutorials, and keynote speeches. I was visitor for 4.75 months at the universities of Luxembourg, Leipzig, and Colorado State as a PhD student, and for 2 months as post-doc at The University of Sydney.



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My published work, including 2 authored books (Springer and Wiley), 12 book chapters, and 20 journals (ISI-JCR indexed), is largely cited: around 1500 times, and it inspired many other researchers in their work. I have h-Index of 17, and several of my works have nearly 200 citations. I carried out works that were published in prestigious journals in the fields of metaheuristics, ad hoc networks, and sustainable and high performance computing (including three papers in the first journal out of 100 in category Computer Science, Theory & Methods). I was invited to present my work in the major conferences in these fields, for which I have a proven track record, and I am positioned as a reference researcher in the related literature, having collaborations with a number of the most important researchers in these topics worldwide. I am associate editor in an international journal, collaborated in the organisation of over 30 scientific events, served as reviewer for the most important conferences and journals in the field (over 75), and was management committee member of a COST action. I also served as research projects evaluator for a few national research agencies. I belong to some scientific associations, at national and European levels. I am advisor, supervisor, or reviewer of 10 PhD theses and 7 master theses. My team is currently composed of 4 PhD students and one postdoc.

I am board member of Imatrix Image Technologies SLNE, a spin-off company of the Spanish National Research Council (CSIC). Imatrix has carried out several technology transfer projects with international customers. I am the head of the software optimisation and quality control department. The company was selected as the second best project in two different entrepreneur national competitions.



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Título:

Synergies in the Design of Hardware for Real-Time and High-Performance Systems

Resumen de la Memoria:

Since I finished my PhD (2005), I have worked on exploiting cross-domain synergies including reliability, low power, testing, timing analysis, compiler techniques, certification against safety standards and performance analysis, always from a hardware design perspective. I have done this through my industrial experience at Intel Corporation (2005-2009) and my current work at the BSC (2009-present). Overall this has led to 65 papers conferences and journals, 15 patents issued at Intel and 1 patent licensed at BSC. Out of those, I am the principal investigator in 20 papers and 5 patents. See achievements 1, 2 and 3.

I developed fault-tolerant and easy-to-test hardware designs at Intel and became project leader. At BSC I have extended my research towards real-time systems, exploiting my background on reliability and low power, and gaining knowledge on timing analysis and certification. While I have a wide background, I have focused on improving the design and validation of real-time systems considering aspects related to my previous background. At BSC I participate in several international projects in the FP7 and ARTEMIS programmes (PROARTIS, parMERASA, VeTeSS, PROXIMA) and some projects with the European Space Agency (ESA). We pursue validating our findings and transfer them into real products.

I lead one large work package in PROXIMA (13 person/year) and BSC activities in VeTeSS. I was in charge of defining BSC work and getting the funds for VeTeSS (246.000€), and also participated in those tasks in other projects funded. See achievements 4 and 5.

I am (have been) also the supervisor of several PhD and master students, have given several invited talks in conferences, industry and academia, participate in several conference program committees, have received some awards and hold a degree in Humanities.

Achievement 1. Jaume Abella et al. ♦Penelope: the NBTI-Aware Processor♦. International Symposium on Microarchitecture (MICRO), 2007. MICRO is a top peer-reviewed conference. 109 citations (Google Scholar).

Achievement 2. Jaume Abella et al. ♦Memory Content Inverting to Minimize NBTI Effects♦, USPTO Patent No. 7,577,015.

Achievement 3. Jaume Abella et al. ♦Device for Controlling the Access to a Cache Structure♦, USPTO Application No. 61/700,990, EU Application No. 12184447.6. Not issued yet, but licensed to Aeroflex Gaisler (ESA chip vendor).

Achievement 4. Work package leader of the hardware infrastructure WP of PROXIMA (13 person/year in this WP).

Achievement 5. Got funds and lead BSC activities in ARTEMIS VeTeSS.

Resumen del Currículum Vitae:

I got my Degree in Computer Science (Ingeniero en Informática) in 2002, being first ranked at Universitat Politècnica de Catalunya (UPC), and my PhD in 2005 also at UPC being awarded as the best thesis in Information and Communication Technologies at the UPC in 2005. Later, I got my Degree in Humanities (Licenciado en Humanidades) at the Universitat Oberta de Catalunya.

As a researcher, I have worked on performance analysis, compiler optimizations and low power hardware designs during my research assistant stage at the UPC (1999-2005). Then I joined Intel (2005-2009), where I worked on reliability and testing at hardware level, spanning from microelectronics to microarchitectural levels, and becoming the leader of a research project. Finally, I joined the BSC-CNS in 2009 where I have extended my activities into timing analysis and certification against safety standards, exploiting a large number of synergies across the different topics I have worked in the past.

As a result of this research I have obtained the following quantitative results:

- 1) 65 papers published in top peer-reviewed conferences and journals, being the principal investigator in 20 of them.
- 2) 15 patents issued being the principal investigator in 5 of them.
- 3) 1 patent filed (as principal investigator) and already licensed to Aeroflex Gaisler, the chip vendor for space missions of the European Space Agency (ESA).

During my stage at the BSC, I have participated in obtaining more than 2.500.000€ through competitive funding calls, including 3 FP7, 1 ARTEMIS and 4 ESA-funded projects. In the case of the ARTEMIS project (called VeTeSS) I have been the only person involved



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in defining BSC activities, participating in the elaboration of the project proposal and getting the funds. I lead BSC activities in this project that runs until April-2015. I lead as well most activities related to hardware design in the other projects.

I am the PhD and master director or co-director of a number of students. Out of those, some of them have obtained already their degrees:

- 1) PhD: Marc Pons (2012), Bojan Maric (expected March/April 2014).
- 2) Master: Javier Carretero (2009), Leonidas Kosmidis (2011).

Some others are still conducting their PhD/master studies: Leonidas Kosmidis (PhD), Qixiao Liu (PhD), Milos Panic (PhD), Javier Jalle (PhD), Mladen Slijepcevic (PhD), Gabriel Fernández (Master), Suzana Milutinovic (Master).

I have participated in a number of other activities as the following:

- 1) Invited talks in conferences (IOLTS 2007, EUROPAR 2008, HIPEAC CSW 2011, HIPEAC MCS 2014), industry (ESA 2011, ARM Ltd. 2012) and academia (Univ. Carlos III 2012).
- 2) A number of program committees (IPDPS 2008, DATE 2011-2014, IOLTS 2011-2014, VALID 2011-2013, SELSE 2014).
- 3) Session chair in some of those conferences.
- 4) Reviewing papers for top conferences and journals including DATE, ISCA, MICRO, HPCA, ICS, PACT, DSN, IOLTS, IPDPS, ECRTS, RTAS, ASPLOS, ISPASS, CGO, ICCD, LCTES, EuroPAR, IEEE TC, IEEE CAL, IEEE TCAD, IEEE Micro, ACM TACO, IEEE TPDS, IEEE TVLSI.
- 5) Member of several dissertation/pre-dissertation committees.

Overall, my CV shows that I am highly-skilled independent researcher, leading important activities, influential in my research area, able to move research findings into industrial products and with high potential to further raise the productivity and success of BSC-CNS.



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Título:

3D Facial Dynamics for Behavioral Analysis

Resumen de la Memoria:

My research activity has been framed in the field of image analysis with statistical models of shape and appearance. I have worked on the development of new algorithms and extensions to existing methods to address technical limitations of the state of the art in the context of diverse applications, most of which in facial biometrics and, to a lesser extent, cardiac imaging.

The 3 main lines where I have focused my research are, in chronological order: facial biometrics (during my PhD thesis, 2003-2008), cardiac image analysis (first years as a post-doc, 2008-2010) and 3D craniofacial dysmorphology (the most recent line, between 2011 and 2013, in Dublin). In all 3 lines I have obtained relevant results that were published in highly ranked journals (14 articles, 11 in the first quartile) and peer-reviewed International Conferences (26 contributions). This is confirmed when analyzing the number of citations per article, which is about 2.45 times the international average for the field.

The specific topics of my research have been strongly determined by challenges derived from the application being addressed, so that the problems to solve were concrete and tangible. On the other hand, given my Engineering background, contributions were always focused on the computational aspects of the problem, translating application-specific issues into a different level of abstraction, preferably more general, to facilitate broader relevance of the research and avoid ad-hoc solutions risking over simplified and narrow scope solutions.

The application-driven approach described above also resulted in synergies with the industry, primarily through R+D+I projects. I have participated in several technology transfer and industrial projects as well as in national and European research projects.

Between 2007 and 2010 I led a small team of PhD students and scientific developers that was actively involved in research and technology transfer. The team was conceived from a methodological focus based on statistical shape models and addressed applications both from the biometrics and medical domains.

At the end of 2010 I moved to Dublin, where I worked for 3 years in 3D facial analysis for Craniofacial Dysmorphology in relation with neuropsychiatric disorders from developmental origin. In December 2011, I was awarded a Marie Curie Intra European Fellowship. This not only meant self funding in a very competitive call but it also released funding from the original project that we used to hire a junior post-doc that contributed to the project under my supervision. More recently, I obtained a research fellow position within the UPFellows program (also in a public and competitive international call) program to expand this research line into the analysis of 3D facial dynamics related to human behavior, which is emerging as one of the most popular areas in computer vision, with enormous potential due to its importance for disciplines such as robotics, psychology, linguistics or neuroscience. From a technical perspective, I see this research as a convergence of my most recent line on 3D geometry with my prior expertise in 2D facial analysis, which at the same time has common elements in the use of statistical models of shape and appearance and applications related to the medical domain.

Resumen del Currículum Vitae:

Federico Sukno obtained his degree in Electrical Engineering at La Plata National University (Argentina, 2000) and a PhD in Biomedical Engineering at Zaragoza University (Spain, 2008), with a grant awarded in a public competitive call from University of Zaragoza and Banco Santander.

He is author of 14 journal publications (11 in the first quartile, from which 6 in the first decile) and 26 international conference papers.

He has participated in 3 technology transfer projects from the Spanish Ministry of Industry and 2 consortiums with research and industrial partners from the CENIT program of the Spanish Centre for Technological Development (CDTI). He has also participated in projects with a stronger focus on fundamental research: 4 from the European Commission, 3 from the Spanish Ministry of Innovation and Science and 1 from the Wellcome Trust (UK). In December 2011 he was awarded a Marie Curie Intra-European Fellowship from FP7, in a highly competitive call (success rate of Marie Curie-IEF proposals has been estimated in 18%).

Between 2007 and 2010 he led a team of 6 members (the section on Statistical Image Analysis, within the CISTIB research group at Pompeu Fabra University), which involved considerable work in co-supervision of team members and writing of proposal and project deliverables.

Between November 2010 and December 2013 he worked as a post-doctoral researcher with a joint appointment at Dublin City University and the Royal College of Surgeons in Ireland. In this post, his research focused on the analysis of three-dimensional facial



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dysmorphology with applications into neuropsychiatric disorders from developmental origin and reconstructive surgery. In October 2013 he was awarded a research fellow position at Pompeu Fabra University (UPFellow program) in a competitive and public international call.

He has participated as invited lecturer in the IEEE SPS Summer school on biomedical image processing and analysis (Dubrovnik, 2013) and in EClmag school and workshop on image science (Buenos Aires, 2009).

Between 2005 and 2010, and in parallel with his research activities, he was also an assistant professor at Pompeu Fabra University (Spain), where he taught courses on Analog electronics and Information theory for 5 years. He has led a teaching innovation project (2010-2011) and has attended an intensive specialization course for University teaching (2007-2008, 500 hours). He has also co-supervised one PhD student (2007-2010), three internship students (2008, 2011) a final career project (2012), one MSc student (2013) and a junior post-doc (2013).

Dr. Sukno is a member of the Face3D Research Consortium and adjunct member of the Centre for Image Processing and Analysis (Dublin City University). He obtained the research accreditation (for lecturer) in 2010 and the advanced research accreditation (for associate prof) in 2012, from the Catalan agency for quality of the university system (AQU).



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Título:

Computational geometry applied to geographic information science

Resumen de la Memoria:

Computational geometry is an area of Computer Science that studies geometric algorithms: algorithms that deal with geometric objects. Geometric objects are ubiquitous in our daily digital life. The position of a car in the screen of a GPS navigator, the shape of an obstacle that a robot needs to avoid when moving from one place to another, or the triangular mesh that models the surface of a 3D character in an animation film. These are all geometric objects that require geometric algorithms in one way or another: to find the shortest path to take the car to its destination, to find a wide-enough corridor so that the robot does not get too close to the obstacles, or perhaps to decide in what order the triangles of the mesh should be rendered. Computational geometry has applications in many areas. In essence, in almost any area that needs algorithms to handle geometric objects and where efficiency is important, computational geometry can be useful.

Geographic information science (GIS) is a field that brings together researchers from various backgrounds like geography, mathematics, computer science, and engineering. GIS deals with geographic or geo-referenced data: information that has coordinates in space (positions of objects, boundaries of regions, the different slopes over a terrain surface, etc.). Therefore their basic objects are naturally geometric. Moreover, with the explosion of geographic data acquisition technologies (like 3D laser scanners or RFID tags), GIS software has had to cope with huge amounts of data, which requires efficient algorithms to process them.

In his research career the candidate has worked on different subfields related to geometric algorithms. He has done research on mainstream computational geometry problems, as well as on more combinatorial ones, closer to discrete mathematics. He has also worked on problems related to information visualization and graph drawing, and to bioinformatics. However, his main research line is related to the many applications of computational geometry to geographic information science.

Within this reserach line, he has made several contributions in topics like terrain modeling, where he studied the optimization of a family of triangulations known as Higher Order Delaunay Triangulations (HODTs). The applicant showed that even though some criteria are hard to optimize over HODTs, many other useful criteria (e.g. measures of triangle quality or 3D angles between adjacent triangles) can be incorporated into these triangulations efficiently, allowing to generate terrain models that have better properties and, at the same time, well-shaped triangles.

The contributions related to the application of geometric algorithms to GIS have not been limited to HODTs and terrain modeling. They have spanned a wide range of problems where the common denominator is that the study of the geometric properties of the problem and the application of existing and new computational geometry techniques allow obtaining efficient and provably good solutions to GIS problems. Examples of this are locating clusters in aggregated health data (to detect the origin of disease outbreaks), the computationa of a "median" trajectory, which represents a target set of similar trajectories, and the embedding of a river network in triangulated terrain.

Resumen del Currículum Vitae:

After studying Computer Science at Universidad de Buenos Aires, the applicant moved to Utrecht University to start a PhD in one of the leading computational geometry groups in Europe. His dissertation studied algorithms for optimizing terrain models represented by triangulations (a subdivision of the plane into triangles, where the vertices of the triangles are sampled points with an elevation). The thesis presented methods to compute triangulations that are optimal with respect to a variety of criteria (for example, that guarantee that the terrain surface is as smooth as possible), while maintaining other important properties of the triangulation, like the shape of the triangles, which should be as close as possible to equilateral.

During the four years of PhD work and in the ones that followed, the candidate has worked on several different subfields related to geometric algorithms. He has done research on mainstream computational geometry problems, as well as on some more combinatorial problems, closer to discrete mathematics. He has also worked on problems related to information visualization and graph drawing, and to bioinformatics. His main research line focuses on the application of computational geometry to geographic information science; he has studied a wide range of problems motivated from geographic information science for which the study of



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the geometric properties of the problem and the application of existing and new computational geometry techniques allow obtaining efficient and provably good solutions.

Despite his young research career, the candidate has a strong record obtaining research funding. In fact, almost all his postdoctoral research has been carried out in projects written and presented by the applicant himself, awarded in competitive calls from funding agencies from the European Union (Marie Curie Fellowship) and two other European countries (The Netherlands and Portugal).

The candidate track record shows a vast international activity, demonstrated in the large number of publications with collaborators from other universities, the participation in the scientific committees of several international conferences, and the attendance to a large number of invitation-only workshops and other research events from his field.



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Título:

Learning Algorithms for Latent Variable Structured Prediction

Resumen de la Memoria:

Dr. Quattoni has received her doctorate from MIT in 2009 under the advise of professors Michael Collins and Trevor Darrell. As evidenced by a strong international presence in all mayor machine learning and computer vision conferences her main contributions lie at the intersection between statistical machine learning and applications. During her PhD her work has focused on two main research areas: 1) latent variable models for structured prediction and 2) multitask and transfer learning with applications to image classification. She has

made significant contributions on both subject areas and she is regarded as one of the leading experts in conditional latent variable models. The models and algorithms resulting from her pre-doctoral work have found applications in a wide set of tasks ranging from sentiment analysis in the NLP community to protein-folding prediction in bio-informatics. To give an objective metric, the open source library that implements some of the methods developed during her PhD has been downloaded close to two-thousand times this year alone.

After graduation Dr. Quattoni joined the LARCA machine learning team at UPC with a Juan de la Cierva Grant. Since then she has returned to her research on latent variable models, but from a different perspective, and has been leading a new research line on algebraic learning methods for latent variable structured prediction. Working on close collaboration with LARCA automata learning experts and UPC's natural language processing group, the UPC team has become one of the recognized world experts in this new exciting research area. Dr. Quattoni has received multiple distinctions for this work such as a google research award and a best paper award at a leading european natural language processing conference.

Overall the broad research topic of Dr. Quattoni is the development of latent variable models and learning algorithms for structured data. The main advantage of these models is that the latent variables provide more freedom in explaining the structured data, and can often identify the relevant patterns in a given structured domain. These general class of methods have wide applicability, from modelling gramatical patterns of natural language sentences to identifying an effective representation for human gestures. The increased expressivity of these models, comes at a cost, the learning problem usually involves a non-convex optimization. In the last years we have witnessed significant progres in this area, in part because of the introduction of spectral techniques to the field of structured prediction. Dr. Quattoni has been an active researcher in these developments.

Resumen del Currículum Vitae:

Education:

- 2003: Bachelor of Arts in Computer Science (summa cum laude), Mount Holyoke, USA
- 2005: Master of Science in Computer Science, Massachusetts Institute of Technology, USA
- 2009: PhD in Computer Science, Massachusetts Institute of Technology, USA

Grants:

- 2009-2012: Juan de la Cierva postdoctoral fellowship, at Universitat Politecnica de Catalunya (UPC).
- 2010 : Google Research Award (40.000 USD)
- 2013-2014: EraNet Chist-Era collaborative project, in conjunction with UPC and CSIC/IRI, and other European Partners (1.5 M total, 250K for UPC-CSIC/IRI)

Awards:

- 2010: Google Research Awards
- 2012: Best Paper Award at the European Chapter of the Association for Computational Linguistics (EACL)

Publication Records:

- More than 25 publications in top conferences and journals in the areas of machine learning, computer vision and natural language



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processing, including NIPS, ICML, ECML, CVPR, EACL, EMNLP, Machine Learning, PAMI

- According to Google Scholar, 1 publication with more than 300 citations, 5 publications with more than 200 citations, and 8 with more than 50 citations.
- High international recognition in the field.

Professional Services:

- Been part of program committees of most important conferences in machine learning, computer vision and natural language processing: NIPS, ICML, ECML, CVPR, ACL, EMNLP, EACL.
- Co-founder of and consultant for a US-based natural language processing startup that has been awarded several NSF grants.



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Título:

Problemas de optimización de alto coste computacional en diferentes áreas de conocimiento

Resumen de la Memoria:

Tres son las líneas de investigación que la solicitante ha desarrollado, fundamentalmente, a lo largo de su carrera investigadora: computación de alto rendimiento (High Performance Computing o HPC en inglés), optimización global (Global Optimization o GO en inglés) y aplicaciones, e.g. problemas de optimización de alto coste computacional en diferentes áreas de conocimiento.

La computación de altas prestaciones, y más concretamente el paralelismo, se aplica a multitud de campos para el desarrollo de aplicaciones y el estudio de problemas que, bien exigen grandes recursos computacionales (tiempo de proceso, espacio de almacenamiento), bien requieren trabajar en tiempo real.

La optimización global incluye teoría, métodos y aplicaciones de las técnicas cuyo objetivo es encontrar el óptimo global en problemas de optimización donde existen (muchos) óptimos locales (son óptimos en un entorno) que no son óptimos globales (los mejores de todas las posibles alternativas).

La línea principal sobre la que se ha desarrollado la actividad investigadora de la solicitante es la del diseño de algoritmos eficientes y eficaces de optimización global. En particular, ha trabajado en algoritmos metaheurísticos que podrían enmarcarse dentro de la computación evolutiva. El diseño de estos nuevos algoritmos se ha basado en la obtención eficaz y eficiente de soluciones en problemas de optimización con y sin restricciones definidos tanto sobre dominios continuos como discretos. Los problemas reales de optimización con los que ha trabajado la solicitante son NP completos, y consecuentemente requieren un alto coste computacional para ser resueltos, y son un gran desafío para la computación de altas prestaciones. La solicitante ha aplicado para cada uno de los problemas y algoritmos propuestos los diferentes paradigmas de la programación paralela.

La investigación realizada por la solicitante, presenta un claro carácter multidisciplinar, lo cual se refleja en las características propias de la investigación llevada a cabo y en los campos en los que los resultados de su investigación pueden aplicarse. De hecho, a lo largo de su carrera, el espectro de problemas donde la solicitante ha aplicado técnicas de optimización global y paradigmas de programación paralela ha sido muy amplio, abarcando problemas de muy diversa índole:

1. Localización de Servicios.
2. Tomografía electrónica.
3. Escalado multidimensional.
4. Plegamiento de proteínas
5. Optimización del confort térmico
6. Neurobiología computacional.

Resumen del Currículum Vitae:

La solicitante finalizó sus estudios de Ingeniería Informática en el año 2003. Desde entonces hasta el día de hoy, ha trabajado ininterrumpidamente como investigadora, siempre financiada por becas o contratos obtenidos en convocatorias públicas competitivas. Obtuvo el título de doctora en Técnicas Informáticas Avanzadas en 2008 con mención Cum Laude y con acreditación de Doctorado Europeo. En el año 2012 obtuvo la acreditación de Profesor Titular de Universidad, a través de la Agencia Nacional de Evaluación de la Calidad y Acreditación.

Como resultado de su investigación, la solicitante ha publicado 19 trabajos en revistas científicas de reconocida calidad (todas con impacto SCI, 7 de ellas en el primer cuartil de su categoría). En 13 de ellas, la solicitante es la primera autora. Además, ha publicado 4 capítulos de libro, un libro con los resultados de su tesis y 51 contribuciones a congresos. Tiene 59 citas en WOS, 62 en Scopus y 156 en Google Scholar, a pesar de que sus publicaciones son recientes. Estos trabajos se han desarrollado en el marco de 11 proyectos de investigación (4 autonómicos, 4 nacionales y 3 europeos). Además, también ha sido la Investigadora Principal de un proyecto conseguido en convocatoria competitiva en el ámbito de la Universidad de Granada. A lo largo de su carrera, ha establecido colaboración con distintos grupos de investigación de diferentes disciplinas y áreas temáticas, y ha realizado estancias en centros de



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investigación de prestigio (nacionales e internacionales), acumulando más de 34 meses (12,5 meses en estancias internacionales). En relación a la transferencia de la investigación, ha participado activamente en un contrato de investigación con la EBT (Empresa de Base Tecnológica) Seven Solutions, S.L. de la Universidad de Granada, así como en un contrato firmado a través de la Red Española de e-Ciencia y en otro para la evaluación de infraestructuras de computación de altas prestaciones firmado con Bull España S.A.

La investigadora ha dirigido una tesis doctoral, tres proyectos fin de máster y un proyecto final de carrera. Además, ha sido miembro del comité organizador de dos congresos, uno nacional y otro internacional. Finalmente destacar que la solicitante ha pertenecido o pertenece a 7 redes de ámbito científico y es revisora habitual de artículos científicos en revistas de prestigio incluidas en el JCR.