Alberto García-García

PhD in Machine Learning and Computer Vision

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Interests and Objectives

My main area of interest lies on the intersection of 3D Computer Vision, Machine Learning, and GPU Programming. My other related passions are Physics, scientific simulations, and 3D computer graphics.

Work/Research Experience

2019 - Now (7 months)	**Postdoctoral Researcher** **Institute of Space Sciences, Spanish National Research Council (CSIC)** Code optimization, GPU acceleration, astrophysics simulation, and artificial intelligence for the MAGNESIA ERC Consolidator project supervised by Nanda Rea.
2019 (3 months)	**Oculus Core Tech Intern** **Facebook Oculus Core Tech, Zürich** Mixed Reality core technology with deep learning managed by Gian Diego Tipaldi.
2017 (3 months)	**Research Intern** **Facebook Reality Labs, Redmond** Deep learning for camera pose and 6DoF transformation estimation supervised by Surreal's team manager Richard Newcombe.
2016 (4 months)	**Machine Learning Software Intern** **NVIDIA Corporation, Santa Clara Headquarters** Efficient background removal with deep learning at NVIDIA Research advised by Shalini de Mello and the Camera/Algorithms team managed by Howard Waterfall.
2015-2016 (8 months)	**Research Engineer** **Department of Computer Technology, University of Alicante** C++/Qt rehabilitation application for people with acquired brain damage using multiple sensors: Kinect V2, Leap Motion, and Tobii Eye X.
2015 (2 months)	**PRACE Summer Of High Performance Computing Student** **Jülich Supercomputing Centre, Forschungszentrum Jülich** GPU acceleration of the Fast Multipole Method under the supervision of Ivo Kabadshow.
2014–2015 (8 months)	**Research Intern** **Department of Computer Technology, University of Alicante** 3D object recognition in real time (Kinect/Jetson TK1 and CUDA).
2013–2014 (4 months)	**Research Intern** **Department of Computer Technology, University of Alicante** Development of an accelerated variant of the Iterative Closest Point.

Educational Background

2016–2020	**Doctor of Philosophy in Machine Learning and Computer Vision** **University of Alicante** PhD Thesis: Deep Learning for 3D Perception: Computer Vision and Tactile Sensing Grade: 10 (Cum Laude) Advisors: José García-Rodríguez and Sergio Orts-Escolano
2015–2016	**Master's Degree in Automation and Robotics** **University of Alicante** Grade: 9.86/10 Master's Thesis: *3D Object Recognition with Convolutional Neural Networks* Advisors: José García-Rodríguez and Jorge Pomares-Baeza
2018–Ongoing	**Bachelor's Degree in Physics** **University of Alicante**
2011–2015	**Bachelor's Degree in Computer Engineering** **University of Alicante** High Academic Performance Group – Grade : 9.75/10 Bachelor's Thesis (with Honors): *Towards a real-time 3D object recognition pipeline on mobile GPGPU computing platforms using low-cost RGB-D sensors.* Advisors: José García-Rodríguez and Sergio Orts-Escolano
2014	**Erasmus Intensive Programme: Big Data** **The University of Salford**

Publications

Journals

- *[j20]* **A Review on Deep Learning Techniques for Video Prediction**. Sergiu Oprea, Pablo Martinez-Gonzalez, Alberto Garcia-Garcia, John Alejandro Castro-Vargas, Sergio Orts-Escolano, Jose Garcia-Rodriguez, Antonis Argyros. Under review in TPAMI (2020).

- *[j19]* **A very young radio-loud magnetar**. P Esposito, N Rea, A Borghese, F Coti Zelati, D Viganò, GL Israel, A Tiengo, A Ridolfi, A Possenti, M Burgay, D Götz, F Pintore, L Stella, C Dehman, M Ronchi, S Campana, A Garcia-Garcia, V Graber, S Mereghetti, R Perna, R Turolla, S Zane. Astrophysical Journal Letters (2020).

- *[j18]* **A visually realistic grasping system for object manipulation and interaction in virtual reality environments**. Sergiu Oprea, Pablo Martinez-Gonzalez, Alberto Garcia-Garcia, John A Castro-Vargas, Sergio Orts-Escolano, Jose Garcia-Rodriguez. Computers and Graphics (2019).

- *[j17]* **UnrealROX: An eXtremely Photorealistic Virtual Reality Environment for Robotics Simulations and Synthetic Data Generation**. Pablo Martinez-Gonzalez, Sergiu Oprea, Alberto Garcia-Garcia, Alvaro Jover-Alvarez, Sergio Orts-Escolano, Jose Garcia-Rodriguez. Under Review Virtual Reality (2018). Pre-print version available at arXiv.

- *[j16]* **COMBAHO: A Deep Learning System for Integrating Brain Injury Patients in Society.** Jose Garcia-Rodriguez, Francisco Gomez-Donoso, Sergiu Oprea, Alberto Garcia-Garcia, Miguel Cazorla, Sergio Orts-Escolano, Zuria Bauer, John Castro-Vargas, Felix Escalona, David Ivorra-Piqueres, Pablo Martinez-Gonzalez, Eugenio Aguirre, Miguel Garcia-Silviente, Marcelo Garcia-Perez, Jose M Cañas, Francisco Martin-Rico, Jonathan Gines, Francisco Rivas-Montero. Pattern Recognition Letters (2017).

- *[j15]* **A Survey On Deep Learning Techniques for Image and Video Segmentation**. Alberto Garcia-Garcia, Sergio Orts-Escolano, Sergiu Oprea, Victor Villena-Martinez, Pablo Martinez-Gonzalez, Jose Garcia-Rodriguez. Applied Soft Computing (2018). Pre-print version available at arXiv.

- *[j14]* **Classifying Behaviours in Videos with Recurrent Neural Networks**. Javier Abellan-Abenza, Alberto Garcia-Garcia, Sergiu Oprea, David Ivorra-Piqueres, Jose Garcia-Rodriguez. International Journal of Computer Vision and Image Processing (2017).

- *[j13]* **A Robotic Platform for Customized and Interactive Rehabilitation of Persons with Disabilities.** Francisco Gomez-Donoso, Sergio Orts-Escolano, Alberto Garcia-Garcia, Jose Garcia-Rodriguez, John Alejandro Castro-Vargas, Sergiu Ovidiu-Oprea, Miguel Cazorla. Pattern Recognition Letters (2017).

- *[j12]* **A Study of the Effect of Noise and Occlusion on the Accuracy of Convolutional Neural Networks applied to 3D Object Recognition**. Alberto Garcia-Garcia, Jose Garcia-Rodriguez, Francisco Gomez-Donoso, Miguel Cazorla. Computer Vision and Image Understanding (2017).

- *[j11]* **Automatic Selection of Molecular Descriptors using Random Forest: Application to Drug Discovery**. Gaspar Cano, Jose Garcia-Rodriguez, Alberto Garcia-Garcia, Horacio Perez-Sanchez, Jón Atli Benediktsson, Anil Thapa, Alastair Barr. Expert Systems (2017).

- *[j10]* **A Quantitative Comparison of Calibration Methods for RGB-D Sensors Using Different Technologies**. Víctor Villena-Martínez, Andrés Fuster-Guilló, Jorge Azorín-López, Marcelo Saval-Calvo, Jeronimo Mora-Pascual, Jose Garcia-Rodriguez, Alberto Garcia-Garcia. Sensors (2017).

- *[j9]* **Computational Analysis of Distance Operators for the Iterative Closest Point Algorithm**. Higinio Mora-Mora, Jeronimo Mora-Pascual, Alberto Garcia-Garcia, Pablo Martinez-Gonzalez. PLOSOne (2016).

- *[j8]* **Automatic Schaeffer's Gestures Recognition System**. Francisco Gomez-Donoso, Miguel Cazorla, Alberto Garcia-Garcia, Jose Garcia-Rodriguez. Expert Systems (2016).

- *[j7]* **Evaluation of Sampling Method Effects in 3D Non-rigid Registration**. Marcelo Saval-Calvo, Jorge Azorin-Lopez, Andres Fuster-Guillo, Jose Garcia-Rodriguez, Sergio Orts-Escolano, Alberto Garcia-Garcia. Neural Computing and Applications (2016).

- *[j6]* **Multi-sensor 3D Object Dataset for Object Recognition with Full Pose Estimation**. Alberto Garcia-Garcia, Sergio Orts-Escolano, Sergiu Oprea, Jose Garcia-Rodriguez, Jorge Azorin-Lopez, Marcelo Saval-Calvo, Miguel Cazorla. Neural Computing and Applications (2016).

- *[j5]* **Bioinspired Point Cloud Representation: 3D Object Tracking**. Jose Garcia-Rodriguez, Sergio Orts-Escolano, Miguel Cazorla, Vicente Morell, Jorge Azorin, Marcelo Saval, Alberto Garcia-Garcia. Neural Computing and Applications (2016).

- *[j4]* **Drug Solubility Prediction with Support Vector Machines on Graphic Processor Units**. Gaspar Cano, Jose Garcia-Rodriguez, Sergio Orts-Escolano, Alberto Garcia-Garcia, Jorge Peña-Garcia, Alfonso Perez-Garrido, Horacio Perez-Sanchez. Revista Internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería (2016).

- *[j3]* **Interactive 3D Object Recognition Pipeline on Mobile GPGPU Computing Platforms using Low-cost RGB-D Sensors**. Alberto Garcia-Garcia, Sergio Orts-Escolano, Jose Garcia-Rodriguez, Miguel Cazorla. Journal of Real-Time Image Processing (2016).

- *[j2]* **3D Model Reconstruction using Neural Gas Accelerated on GPUs**. Sergio Orts-Escolano, Jose Garcia-Rodriguez, Jose Antonio Serra-Perez, Antonio Jimeno, Vicente Morell-Gimenez, Miguel Cazorla, Alberto Garcia-Garcia. Applied Soft Computing (2015).

- *[j1]* **3D Surface Reconstruction of noisy Point Clouds using Growing Neural Gas: Object/Scene Reconstruction**. Sergio Orts-Escolano, Jose Garcia-Rodriguez, Vicente Morell-Gimenez, Miguel Cazorla, Jose Antonio Serra-Perez, Alberto Garcia-Garcia. Neural Processing Letters (2015).

Conferences and Workshops

- *[w3]* **The RobotriX: A Large-scale Dataset of Embodied Robots in Virtual Reality.** Albert Garcia-Garcia, Sergiu Oprea, Pablo Martinez-Gonzalez, Sergio Orts-Escolano, Jose Garcia-Rodriguez. CVPR Workshop on 3D Scene Generation (CVPR 2019). To Appear.

- *[w2]* **Tactile Graphs for Grasp Stability Prediction**. Brayan S. Zapata-Impata, Alberto Garcia-Garcia, Sergio Orts-Escolano, Jose Garcia, Pablo Gil. ICLR Workshop on Representation Learning on Graphs and Manifolds (ICLR 2019).

- *[w1]* **UA at SemEval-2019 Task 5:Setting a Strong Linear Baseline for Hate Speech Detection**. Carlos Perello, David Tomas, Alberto Garcia-Garcia, Jose Garcia-Rodriguez, Jose Camacho-Collados. NAACL HLT International Workshop on Semantic Evaluation (NAACL 2019).

- *[c12]* **A Visually Plausible Grasping System for Object Manipulation and Interaction in Virtual Reality Environments.** Sergiu Oprea, Pablo Martinez-Gonzalez, Alberto Garcia-Garcia, John Alejandro Castro-Vargas, Sergio Orts-Escolano, Jose Garcia-Rodriguez. Spanish Conference on Computer Graphics (CEIG 2019). To Appear.

- *[c11]* **TactileGCN: A Graph Convolutional Network for Predicting Grasp Stability with Tactile Sensors.** Alberto Garcia-Garcia, Brayan Stiven Zapata-Impata, Sergio Orts-Escolano, Pablo Gil, Jose Garcia-Rodriguez. International Joint Conference on Neural Networks (IJCNN 2019) To Appear.

- *[c10]* **The RobotriX: An eXtremely Photorealistic and Very-Large-Scale Indoor Dataset of Sequences with Robot Trajectories and Interactions.** Albert Garcia-Garcia, Sergiu Oprea, Pablo Martinez-Gonzalez, Sergio Orts-Escolano, Jose Garcia-Rodriguez. International Conference on Intelligent Robots (IROS 2018).

- *[c9]* **Detecting and Manipulating Objects with a Social Robot: An Ambient Assisted Living Approach.** John Alejandro Castro-Vargas, Alberto Garcia-Garcia, Sergiu Oprea, Sergio Orts-Escolano, Jose Garcia-Rodriguez. Iberian Robotics Conference (ROBOT 2017).

- *[c8]* **LONCHANet: A Slice-based CNN Architecture for Real-time 3D Object Recognition.** Francisco Gomez-Donoso, Alberto Garcia-Garcia, Jose Garcia-Rodriguez, Sergio Orts-Escolano, Miguel Cazorla. International Joint Conference on Neural Networks (IJCNN 2017).

- *[c7]* **A Recurrent Neural Network Based Schaeffer Gesture Recognition System.** Sergiu Oprea, Alberto Garcia-Garcia, Jose Garcia-Rodriguez, Sergio Orts-Escolano, Miguel Cazorla. International Joint Conference on Neural Networks (IJCNN 2017).

- *[c6]* **Towards a Unified CPU/GPU Codebase for Linear Scaling FMM Coulomb Solver.** Alberto Garcia-Garcia, Ivo Kabadshow, Andreas Beckmann. GPU Technology Conference (GTC 2016).

- *[c5]* **PointNet: A 3D Convolutional Neural Network for Real-Time Object Class Recognition.** Alberto Garcia-Garcia, Francisco Gomez-Donoso, Jose Garcia-Rodriguez, Sergio Orts-Escolano, Miguel Cazorla, Jorge Azorin-Lopez. International Joint Conference on Neural Networks (IJCNN 2016).

- *[c4]* **Accelerating an FMM-based Coulomb Solver with GPUs.** Alberto Garcia-Garcia, Ivo Kabadshow, Andreas Beckmann. SPPEXA Symposium proceedings, Lecture Notes in Computational Science and Engineering (LNCSE 2016).

- *[c3]* **Optimized Representation of 3D Sequences using Neural Networks**. Sergio Orts-Escolano, Jose Garcia-Rodriguez, Vicente Morell, Miguel Cazorla, Alberto Garcia-Garcia, Sergiu Ovidiu-Oprea. International Work-conference on the Interplay between Natural and Artificial Computation (IWINAC 2015).

- *[c2]* **Efficient Matching for the Iterative Closest Point Algorithm by using Low Cost Distance Metrics.** Higinio Mora-Mora, Jeronimo Mora-Pascual, Pablo Martinez-Gonzalez, Alberto Garcia-Garcia. International Conference on Applied Mathematics and Computational Methods in Engineering (AMCME 2015).

- *[c1]* **Convergence Analysis and Validation of low Cost Distance Metrics for Computational Cost Reduction of the Iterative Closest Point algorithm**. Higinio Mora-Mora, Jerónimo Mora-Pascual, Pablo Martínez-González, Alberto García-García. Mathematical Modelling in Engineering & Human Behaviour (MMEHB 2014).

Poster Presentations

- *[p2]* **LonchaNet: A Slice-based CNN Architecture for Real-time 3D Object Recognition.** Alberto Garcia-Garcia, Francisco Gomez-Donoso, Miguel Cazorla, Sergio Orts-Escolano, Jose Garcia-Rodriguez. GPU Technology Conference (GTC 2017).

- [p1] **One Kernel To Rule Them All. Performance-Portable FMM for CPUs and GPUs.** Ivo Kabadshow, Andreas Beckmann, Alberto Garcia-Garcia. GPU Technology Conference (GTC 2016).

Project Participation

2019 – Today	**MAGNESIA** (ERC Consolidator) *"Magnetar Census: The Impact of Highly Magnetic Neutron Stars in the Explosive and Transient Universe."*
2018 – Today	**GV/2018/022** (Valencian Regional Project) *"Development of convolutional neural network unsupervised 3D object recognition techniques for assistive robotics."*
2016 – 2019	**COMBAHO** (Spanish National Project TIN2016-76515-R) *"System for enhancing autonomy of people with acquired brain injury and dependent on their integration into society."*
2015	**SPPEXA/GROMEX** (German Priority Programme 1648) *"Priority Programme Software for Exascale Computing."/"Unified Long-range Electrostatics and Dynamic Protonation for Realistic Biomolecular Simulations on the Exascale"*
2014 – 2015	**SIRMAVED** (Spanish National Project DPI2013-40534-R) *"Development of a comprehensive robotic system for monitoring and interaction for people with acquired brain damage and dependent people."*

Reviewer Service

- IEEE International Conference on Computer Vision and Pattern Recognition (CVPR 2019/2020)
  - **Outstanding Reviewer (2019)**
- IEEE European Conference on Computer Vision (ECCV2020)
- IEEE International Conference on Computer Vision (ICCV 2019)
- IEEE International Conference on Intelligent Robots (IROS 2018/2020)
- International Joint Conference on Neural Networks (IJCNN 2017/2018/2019/2020)
- Pattern Recognition Letters (PRL)
- Applied Soft Computing (ASOC)
- IEEE Transactions on Instrumentation and Measurement (TIM)
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
- Autonomous Robots (AURO)

Societies/Memberships

- **IV&L Net**: Member of the European Network on Integrating Vision and Language, ICT COST Action IC1307.

- **HiPEAC**: Member of the European Network of Excellence on High Performance and Embedded Architecture and Compilation.

- **AERFAI**: Member of the Spanish Association on Pattern Recognition and Image Analysis.

- **DTIC**: (2014-2019) Member of the Council of the Department of Computer Technology, University of Alicante (Student representative).

Honors and Awards

2018	**National Bachelor's Degree Extraordinary Award** Awarded by the Spanish Ministerio de Educación, Cultura y Deporte (MECD).
2016	**Master's Degree in Automation and Robotics Extraordinary Award** Awarded for achieving the best academic record of the Master in Automation and Robotics (University of Alicante, 2015-2016) with an average grade of 9.86 out of 10 points.
2015	**Best Academic Record in Technology Degrees Award** Awarded for achieving the best academic record among the students of all technology-related degrees (University of Alicante, 2011-2015).
2015	**Bachelor's Degree in Computer Engineering Extraordinary Award** Awarded for achieving the best academic record of the Degree in Computer Engineering (University of Alicante, 2011-2015) with an average grade of 9.75 out of 10 points.
2015	**Summer of HPC Ambassador Award** Awarded with the Best HPC Ambassador Award of the Summer of High Performance Computing programme by PRACE for the outreach achieved communicating the results of the programme.
2014	**CUDA Programming Contest Winner** Winner of the CUDA Programming Contest organized by the University of Alicante, for the work entitled *CUDA Implementation of Kohonen maps*.

Grants

2016	**FPU Grant for PhD Studies** Granted by the Spanish Ministerio de Economía y Competitividad de España (MINECO). Considered to be the most competitive grant funded by the Spanish government with only 37 grants awarded for the Computer Science area (nationwide).
2015	**Research Initiation Grant** Research collaboration grant to foster the initiation in research tasks to gain knowledge about current scientific and technical problems and possible solution methods during a six month stay (January, 2016 – June, 2016) at the Department of Computer Technology at the University of Alicante co-funded by the *Industrial Informatics and Computer Networks (I2RC)* research group and the *Vicerrectorado de Investigación, Desarrollo e Innovación* of the *University of Alicante*.
2014	**Research Collaboration Grant** Research collaboration grant for initiation in research tasks during an eight month stay (November, 2014 – June, 2015) at the Department of Computer Technology at the University of Alicante funded by the *Ministerio de Educación, Cultura y Deporte* (MECD) from Spain.

Courses and training

- **Intro to Deep Learning with PyTorch**
  Online at Udacity (Ongoing).

- **Programming and Tuning Massively Parallel Systems + AI (PUMPS) Summer School**
  Barcelona Supercomputing Center, 2018.

- **Self-Driving Car Nanodegree - Term 2**
  Online at Udacity, 2018.

- **Self-Driving Car Nanodegree - Term 1: Deep Learning**
  Online at Udacity, 2017.

- **iV&L Net Training School 2016: 2nd Summer School on Integrating Vision and Language**
  University of Malta, 2016.

- **Deep Learning**
  Online at Udacity, 2016.

- **Machine Learning**
  Online at Coursera, 2016.

- **Summer Course on Scientific Applications and Computer Vision on Graphics Processors**
  University of Alicante, 2013.

- **Workshop on Scientific Applications and Computer Vision on Graphics Processors**
  University of Alicante, 2013.

- **Interactive 3D Graphics (Highest Distinction)**
  Online at Udacity, 2013.

- **Functional Programming Principles in Scala (Highest Distinction)**
  Online at Coursera, 2013.

Teaching

- Invited talk for the Master's in Computer Vision at the Computer Vision Center of Barcelona (2019).
- CUDA/C++ workshop at the University of Alicante (2016/2017/2018/2019).
- CUDA/C++ the Bachelor's Degree in Multimedia Engineering at the University of Alicante (2016-2019).

Skills

- C/C++
- CUDA C++ / Visual Profiler / NVProf
- Python / MATLAB
- Fortran77/90/95
- PyTorch / TensorFlow / MATLAB
- Unreal Engine / Unity
- Linux / Bash / GDB / CMake
- Windows / Visual Studio
- Git
- GoogleTest
- LaTeX

Languages

English	Fluent (C1+)
Spanish	Native

Reference List (by amount of time working together)

- **Jose Garcia-Rodriguez** (jgarcia@dtic.ua.es)
  University of Alicante
  Department of Computer Technology and Computation
  Alicante, Spain

- **Sergio Orts-Escolano** (sorts@ua.es)
  Google Research
  San Francisco, California, USA

- **Nanda Rea** (rea@ice.csic.es)
  Spanish National Research Council (CSIC)
  Institute of Space Sciences (IEEC-ICE)
  Barcelona, Spain

- **Gian Diego Tipaldi** (diego.tipaldi@oculus.com)
  Facebook Oculus Core Tech
  Mixed Reality
  Zürich, Switzerland

- **Richard Newcombe** (richard.newcombe@oculus.com)
  Facebook Reality Labs
  Surreal team
  Redmond, Washington, USA

- **Howard Waterfall** (hwaterfall@nvidia.com)
  NVIDIA Corporation
  Camera/Algorithms
  Santa Clara, California, USA

- **Shalini De Mello** (shalinig@nvidia.com)
  NVIDIA Corporation
  Mobile Visual Computing (NVIDIA Research)
  Santa Clara, California, USA

- **Ivo Kabadshow** (i.kabadshow@fz-juelich.de)
  Forschungszentrum Jülich
  Institute for Advanced Simulation
  Jülich Supercomputing Centre
  Jülich, Germany