

Sergio Orts Escolano

CONTACT INFORMATION

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RESEARCH INTERESTS

My research interests span topics in 3D Computer Vision, High Performance Computing on GPUs, Virtual/Augmented Reality and Deep Learning, with specific interest in depth sensing, real-time 3D reconstruction, 3D object recognition, 3D hand pose estimation and 3D tele-immersive communications.

WORK/RESEARCH EXPERIENCE

- October 2016 - Present: **Full-time Assistant Professor, University of Alicante.**

Full-time assistant professor in the Computer Science & Artificial Intelligence department at the University of Alicante. I am an active member of the Robotics & Vision research group RoViT.

- July 2016 - September 2016: **Research scientist, PerceptiveIO.**
- August 2015 - June 2016: **Visiting Researcher, Microsoft Research** (Interactive 3D technologies group) under the direction of Dr. Shahram Izadi. During my stay, I participated as a researcher in the following projects:
 - Holoportation: a new type of 3D capture technology that allows high-quality 3D models of people to be reconstructed, compressed and transmitted anywhere in the world in real time.
 - HyperDepth: a machine learning based approach for solving stereo correspondence problem efficiently, without compromising depth accuracy.
 - Fusion4D: a real-time non-rigid 3D surface reconstruction algorithm for motion capture.
- February 2014 - July 2015: **Postdoc researcher, University of Alicante. Computer technology Department.**
- June 2014 - August 2014: **Research internship at Microsoft Research** (Multimedia, Interaction, and Communication group) under the direction of Dr. Charles Loop.
- June 2012 - November 2012: **Visiting researcher, Computer Vision Group at the University of Edinburgh** under the direction of Prof. Robert B. Fisher.
- January 2011- January 2014: **PhD fellowship at the Computer Technology Department, University of Alicante.** Supervisors: Dr. Jose Garcia Rodriguez and Dr. Miguel Cazorla

EDUCATION

PhD in Computer Science

January 2011 - January 2014. Computer Technology Department. University of Alicante.

- Thesis Topic: “A Three-Dimensional Representation method for Noisy Point Clouds based on Growing Self-Organizing Maps accelerated on GPUs”
- Supervisors: Jose Garcia-Rodriguez and Miguel Cazorla-Quevedo.
- This thesis obtained the highest mark (10) and was approved by external reviewers for international mention.
- <https://bitbucket.org/sorts/thesis>

MSc in Computer Science, University of Alicante, 2010 - 2011

- Dissertation Topic: “Accelerated Reconstruction of 3D Scenes using Self-Organizing Maps”

- Supervisor: Jose. Garcia-Rodriguez and Miguel Cazorla-Quevedo
- Graduated with honours (9/10)

MSc in Java Enterprise applications and web services, University of Alicante, 2011 - 2012

- Graduated with honours (10/10)

BSc in Computer Science, University of Alicante, 2005 - 2010

- Average grade (8.1/10) 2nd in the promotion (out of 150)

FELLOWSHIPS,
RESEARCH GRANTS
& AWARDS

- **2014:** PhD Defense graded Cum Laude, Highest Honors at the University of Alicante (UA). Examiners: Prof. A. Psarrou (University of Westminster), Prof. M. Graña (University of the Basque Country) and Prof. J.M. Garcia-Chamizo (University of Alicante).
- **2012:** Predoctoral grant to fund studies abroad during the PhD, funded by the Spanish Government.
- **2012:** Research collaboration grant for a 5-month research stay at the Computer Vision Group at the University of Edinburgh (Prof. Robert B. Fisher). This research stay was funded by the European Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC) June 2012 - December 2012. Favourable results were obtained in the use of the GPU to accelerate the computation of a 3D shape descriptor based on the calculation of 3D semi-local surface patches of partial 3D views.
- **2011:** The CUDA Research Center at the Barcelona Supercomputing Center (BSC) presented an Honorable mention to Sergio Orts-Escalano for his presentation at the poster Session during the Barcelona Computing Week 2011, Programming and Tuning Massively Parallel Systems: GPU Accelerated Growing Neural Gas Network.
- **2011:** Spanish Government grant for Doctoral studies. (2011-2015)

RESEARCH

Projects participation

- “Development of a 3D object recognition system for social robotics: 3D Convolutional Neural Networks.” University of Alicante project (GRE-16-19) (2017-2019).
- **“Holoportation”** Virtual 3D Teleportation in Real-time. Microsoft Research project (2015-2016).
- **“HyperDepth”** Learning Depth from Structured Light Without Matching. Microsoft Research project (2015-2016).
- “System for enhancing autonomy of people with acquired brain injury on their integration into society (TIN2016-76515-R).” Spanish national project (COMBAHO) (2015-2019).
- “Development of a comprehensive robotic system for monitoring and interaction for people with acquired brain damage and disabilities.” Spanish national project (SIRMAVED) (2014-2017).
- “Discovery of novel blood anticoagulants using hybrid artificial intelligence techniques in HPC environments” European project jointly coordinated by the University of Iceland, University of Alicante, and Catholic University of San Antonio in Murcia (2014-2016).
- “Cooperative Simultaneous Localization and Mapping (SLAM) in large scale environments.” Spanish national project (DPI2009-07144) (2010-2012)
- “Visual surveillance systems for the identification and characterization of anomalous behavior”

Reviewer

- Journal of Real-time Image Processing
- Associate Editor of the International Journal of Computer Vision and Image Processing (IJCVIP)
- Parallel computing Journal
- PeopleCap - ICCV 2017 Workshop
- PeopleCap - ECCV 2018 Workshop
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2018)
- Neurocomputing Journal
- Applied Soft Computing Journal
- International Joint Conference on Neural Networks (IJCNN) 2012-2018
- International Work Conference on Artificial Neural Networks (IWANN) 2011-2015

Scientific Talks & Research Presentations

- Research talk at Microsoft Research: “High Performance Computer Vision”. May 2018.
- Research talk at the University of Ljubljana: “High Performance Computer Vision”. January 2018.
- Seminar at the University of Iceland (High Performance Computing group): Representation of 3D molecules structure using computer vision and neural methods. Graph-based matching methods. June 2015.
- Talks at IJCNN 2015, The International Joint Conference on Neural Networks: Using GNG on 3D Object Recognition in Noisy RGB-D data and Processing Point Cloud Sequences with Growing Neural Gas.
- Talk at IWANN 2013, International Work-Conference on Artificial Neural Networks: Point cloud data filtering and downsampling using growing neural gas.
- Talk at IJCNN 2012, International Joint Conference on Neural Networks: Multi-GPU based camera network system keeps privacy using growing neural gas.
- Talk at IWANN 2011, International Work-Conference on Artificial Neural Networks: Fast Image Representation with GPU-Based Growing Neural Gas.

Supervision of PhD students

- Outdoor depth estimation from monocular RGB images. PhD (2017-2020)
- Deep Learning algorithms for autonomous cars: from urban object detection to driver assistance systems. PhD (2015-2018)
- Predictive learning for computer vision problems. PhD (2017-2020)
- Natural Interaction Interfaces for Virtual Reality scenarios using 3D gestures. PhD (2012-2015)

SOCIETIES/MEMBERSHIPS

- Member of the European Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC)
- Member of the European Network for the Advancement of Artificial Cognitive Systems, Interaction and Robotics (EUCog)
- Member of the International Neural Network Society (INNS)
- Machine Intelligence Research: Scientific network for innovation and research excellence (MIR-Labs)

IN THE NEWS/MEDIA

- Microsoft Holoportation. One of the projects in which I have actively participated as a key member has been massively covered by the press. Press Coverage: ZDNet, TechRadar, Gizmodo, VentureBeat, Mashable, The Verge, Engadget, PC Magazine, Mirror, PC World, Gamasutra, Digital Trends, CNET and more than 50 different technological blogs around all the world. <http://research.microsoft.com/en-us/projects/holoportation/>
- HiPEAC: Compilation and Computer Architecture Magazine: Column about the research carried out during my PhD. <https://www.hipeac.net/>

PUBLICATIONS

Google Scholar; Citations: 646, H-index: 12

Congresses and Conferences

1. **The RobotriX: An eXtremely Photorealistic and Very-Large-Scale Indoor Dataset of Sequences with Robot Trajectories and Interactions.** Garcia-Garcia, A., Martinez-Gonzalez, P., Oprea, S., Orts-Escolano, S. & Garcia-Rodriguez, J.; In Proc. of The International Conference on Intelligent Robots and Systems (IROS), 2018.
2. **LonchaNet: A Sliced-based CNN Architecture for Real-time 3D Object Recognition.** Gomez-Donoso, F., Garcia-Garcia, A., Garcia-Rodriguez, J., Orts-Escolano, S. & Cazorla, M.; In 2017 International Joint Conference on Neural Networks (IJCNN), 2017.
3. **Closed-form Bayesian Fusion Equation using Occupancy Probabilities.** Loop, C., Cai, Q., Chou, P. & Orts-Escolano, S.; In 2016 International Conference on 3D Vision (3DV), 2016.
4. **Holoportation: Virtual 3D Teleportation in Real-time.** Orts-Escolano, S., Rhemann, C., Fanello, S., Kim, D., Kowdle, A., Chang, W., Degtyarev, Y., Davidson, P.L., Khamis, S., Dou, M., Tankovich, V., Loop, C., Cai, Q., Chou, P.A., Mennicken, S., Valentin, J., Pradeep, V., Wang, S., Kang, S.B., Kohli, P., Lutchyn, Y., Keskin, C. & Izadi, S.; In 29th ACM User Interface Software and Technology Symposium (UIST), 2016.
5. **PointNet: A 3D Convolutional Neural Network for real-time object class recognition.** Garcia-Garcia, A., Gomez-Donoso, F., Garcia-Rodriguez, J., Orts-Escolano, S., Cazorla, M. & Lopez, J.A.; In 2016 International Joint Conference on Neural Networks (IJCNN), 2016.
6. **Fusion4D: Real-time Performance Capture of Challenging Scenes.** Dou, M., Khamis, S., Degtyarev, Y., Davidson, P., Fanello, S., Kowdle, A., Escolano, S.O., Rhemann, C., Kim, D., Taylor, J., Kohli, P., Tankovich, V. & Izadi, S.; In SIGGRAPH, 2016.
7. **HyperDepth: Learning Depth from Structured Light Without Matching.** Fanello, S., Rhemann, C., Tankovich, V., Kowdle, A., Orts-Escolano, S., Kim, D. & Izadi, S.; In Computer Vision and Pattern Recognition (CVPR), 2016.

8. **Registration methods for RGB-D cameras accelerated on GPUs.** Montoyo, J., Morell, V., Cazorla, M., Garcia-Rodriguez, J. & Escolano, S.O.; In ISR/Robotik, 2014.
9. **Support Vector Machines Prediction of drug solubility on GPUs.** Cano, G., Garcia-Rodriguez, J., Orts-Escolano, S. & Perez Garrison, A.; In International Work-Conference on Bioinformatics and Biomedical Engineering (IWBBIO), 2015.
10. **Using GNG on 3D Object Recognition in Noisy RGB-D data.** Rangel, J.C., Morell, V., Cazorla, M., Orts-Escolano, S. & Rodriguez, J.G.; In 2015 International Joint Conference on Neural Networks (IJCNN), 2015.
11. **Non-rigid point set registration using color and data downsampling.** Saval-Calvo, M., Orts-Escolano, S., Lopez, A.J., Rodríguez, G.J., Guillo, F.A., Morell-Gimenez, V. & Cazorla, M.; In 2015 International Joint Conference on Neural Networks (IJCNN), 2015.
12. **3D colour object reconstruction based on Growing Neural Gas.** Orts-Escolano, S., Garcia-Rodriguez, J., Morell, V., Cazorla, M. & Garcia-Chamizo, J.M.; In 2014 International Joint Conference on Neural Networks (IJCNN), 2014.
13. **Registration methods for RGB-D cameras accelerated on GPUs.** Montoyo, J., Morell, V., Cazorla, M., Garcia-Rodriguez, J., Orts-Escolano, S. In ISR/Robotik 2014.
14. **Point Light Source Estimation based on Scenes Recorded by a RGB-D camera.** Boom, B., Orts-Escolano, S., Ning, X., McDonagh, S., Sandilands, P. & Fisher, R.B.; In the British Machine Vision Conference (BMVC), 2013.
15. **Natural User Interfaces in Volume Visualisation Using Microsoft Kinect.** Angelopoulou, A., Reddy, B., Garcia-Rodriguez, J., Mentzelopoulos, M. & Orts-Escolano, S., In the IEEE ICIAP-International Congress on Image Analysis and Processing (ICIAP), 2013.
16. **Improving Drug Discovery using a neural networks based parallel scoring functions.** Perez-Sanchez, H., Guerrero, G., Garcia, J.M., Pena, J., Cecilia, J.M., Orts-Escolano, S. & and Garcia-Rodriguez, J.; In International Joint Conference on Neural Networks (IJCNN), 2013.
17. **Improving 3D Keypoint Detection from Noisy Data Using Growing Neural Gas.** Garcia-Rodriguez J., Cazorla, M., Orts-Escolano, S. & and Morell, V.; In the International Work Conference on Artificial Neural Networks (IWANN), 2013.
18. **A study of registration techniques for 6DoF SLAM.** Morell, V., Cazorla, M., Viejo, D., Orts, S. & Garcia-Rodriguez, J.; In the Catalan Artificial Intelligence Association conference (CCIA), 2012.
19. **Multi-GPU Based Camera Network System Keeps Privacy using Growing Neural Gas.** Orts-Escolano, S., Garcia-Rodriguez, S., Morell-Gimenez, V., Azorin-Lopez, J. & Garcia-Chamizo, J.M.; In 2012 International Joint Conference on Neural Networks (IJCNN), 2012.
20. **Fast Autonomous Growing Neural Gas.** Garcia-Rodriguez, J., Angelopoulou, A., Garcia-Chamizo, J.M., Psarrou, A., Orts-Escolano, S. & Morell-Gimenez, V.; In 2011 International Joint Conference on Neural Networks (IJCNN), 2011.
21. **Fast Image Representation with GPU-Based Growing Neural Gas.** Garcia Rodriguez, J., Angelopoulou, A., Morell, V., Orts, S., Psarrou, A. & Garcia Chamizo, J.M.; In 2011 International Work Conference on Artificial Neural Networks (IWANN), 2011.

Journals

1. **A survey on deep learning techniques for image and video semantic segmentation.** Garcia-Garcia, A., Orts-Escolano, S., Oprea, S., Villena-Martinez, V. & Garcia-Rodriguez, J.; Applied Soft Computing, 2018.

2. **An augmented reality application for improving shopping experience in large retail stores.** Cruz, E., Orts-Escolano, S., Gomez-Donoso, F., Rizo, C., Rangel, J.C., Mora, H. & Cazorla, M.; Virtual Reality, 2018.
3. **A study of the effect of noise and occlusion on the accuracy of convolutional neural networks applied to 3D object recognition.** Garcia-Garcia, A., Garcia-Rodríguez, J., Orts-Escolano, S., Oprea, S., Gomez-Donoso, F. & Cazorla, M.; Computer Vision and Image Understanding, 2017.
4. **A robotic platform for customized and interactive rehabilitation of persons with disabilities.** Gomez-Donoso, F., Orts-Escolano, S., Garcia-Garcia, A., Garcia-Rodríguez, J., Castro-Vargas, J.A., Ovidiu-Oprea, S. & Cazorla, M.; Pattern Recognition Letters, 2017.
5. **Pedestrian Movement Direction Recognition Using Convolutional Neural Networks.** Dominguez-Sanchez, A., Cazorla, M. & Orts-Escolano, S.; IEEE Trans. Intelligent Transportation Systems, 2017.
6. **Interactive light source position estimation for augmented reality with an RGB-D camera.** Boom, B., Orts-Escolano, S., Ning, X., McDonagh, S., Sandilands, P. & Fisher, R.B.; Computer Animation and Virtual Worlds, 2017.
7. **Multi-sensor 3D object dataset for object recognition with full pose estimation.** Garcia-Garcia, A., Orts-Escolano, S., Oprea, S., Garcia-Rodríguez, J., Azorin-Lopez, J., Saval-Calvo, M. & Cazorla, M.; Neural Computing and Applications, 2016.
8. **GNG-based foot reconstruction for custom footwear manufacturing.** Jimeno-Morenilla, A., Rodríguez, G.J., Orts, S. & Davia-Aracil, M.; Computers in Industry, 2016.
9. **3DCOMET: 3D compression methods test dataset.** Navarrete, J., Morell, V., Cazorla, M., Viejo, D., Rodríguez, G.J. & Orts-Escolano, S.; Robotics and Autonomous Systems, 2016.
10. **Object recognition in noisy RGB-D data using GNG.** Rangel, J.C., Morell, V., Cazorla, M., Orts-Escolano, S. & Rodriguez, J.G.; Formal Pattern Analysis & Applications, 2016.
11. **Evaluation of sampling method effects in 3D non-rigid registration.** Saval-Calvo, M., Azorin-Lopez, J., Fuster-Guillo, A., Garcia-Rodríguez, J., Orts-Escolano, S. & Garcia-Garcia, A.; Neural Computing and Applications, 2016.
12. **3D surface reconstruction of noisy point clouds using Growing Neural Gas: Object/Scene reconstruction.** Orts-Escolano, S., García-Rodríguez, J., Morell-Gimenez, V., Cazorla, M. & Serra Perez, J.A.; Neural Processing Letters, 2015.
13. **3D Model Reconstruction using Neural Gas Accelerated on GPU.** Orts-Escolano, S., Garcia-Rodríguez, J., Serra-Perez, J.A., Jimeno-Morenilla, A. & Morell-Gimenez, V.; Applied Soft Computing, 2015.
14. **Geometric 3D Point Cloud Compression.** Morell, V., Orts-Escolano, S., Cazorla, M. & Garcia-Rodríguez, J.; Pattern Recognition Letters, 2014;
15. **3D maps representation using GNG.** Morell, V., Cazorla, M., Orts-Escolano, S. & Garcia-Rodríguez, J.; Mathematical Problems in Engineering, 2014.
16. **A Comparative Study of Registration Methods for RGB-D Video of Static Scenes.** Morell-Gimenez, V., Saval-Calvo, M., Azorin-Lopez, J., Garcia-Rodríguez, J., Orts-Escolano, S. & Cazorla M.; Sensors, 2014.
17. **Real Time Motion Estimation using a Neural Architecture Implemented on GPUs.** Garcia-Rodríguez, J., Orts-Escolano, S., Angelopoulou, A., Psarrou, A., Azorin-Lopez, J. & Garcia-Chamizo, J.M.; Journal of Real-Time Image Processing, 2014.
18. **3D Reconstruction of Medical Images from Slices Automatically Landmarked with Growing Neural Models.** Garcia-Rodríguez, J., Orts-Escolano, S., Angelopoulou, A. & Psarrou, A.; Neurocomputing, 2014.

19. **Parallel Computational Intelligence-Based Multi-Camera Surveillance System.** Orts-Escolano, S., Garcia-Rodriguez, J., Morell, V., Cazorla, M., Azorin, J. & Garcia-Chamizo, J.M.; Journal of Sensors and Actuator Networks, 2014.
20. **3D-based reconstruction using growing neural gas landmark: application to rapid prototyping in shoe last manufacturing.** Jimeno-Morenilla, A., Garcia-Rodriguez, J., Orts-Escolano, S. & Davia-Aracil, M.; The International Journal of Advanced Manufacturing Technology, 2013.
21. **Real-time 3D semi-local surface patch extraction using GPGPU.** Orts-Escolano, S., Morell, V., Garcia-Rodriguez, J., Cazorla, M. & Fisher, R.B.; Journal of Real-Time Image Processing, 2013.
22. **GPGPU implementation of growing neural gas: Application to 3D scene reconstruction.** Orts, S., Garcia-Rodríguez, J., Viejo, D., Cazorla, M. & Morell, V.; Journal of Parallel & Distributed Computing, 2012.
23. **Autonomous Growing Neural Gas for applications with time constraint: Optimal parameters estimation.** Garcia-Rodríguez, J., Angelopoulou, A., Garcia-Chamizo, J.M., Psarrou, A., Orts Escolano, S. & Morell Gimenez, V.; Journal Neural Networks, 2012.

Book Chapters

1. **Review of Registration Methods on Mobile Robots.** Morell-Gimenez, V., Orts-Escolano, S., Garcia-Rodríguez, J. & Cazorla, M.; Robotic Vision: Technologies for Machine Learning and Vision Applications. IGI GLOBAL, 2012.
2. **Computer Vision Applications of Self-Organizing Neural Networks.** Garcia-Rodriguez, J., Garcia-Chamizo, J., Orts-Escolano, S., Morell-Gimenez, V., Angelolopoulou, A. & Cazorla, M.; Robotic Vision: Technologies for Machine Learning and Vision Applications. IGI GLOBAL, 2012.

TEACHING
EXPERIENCE

Programming I, subject in Computer Science degree (4-year programme) at the University of Alicante. 2016-2019

Computer Graphics and Multimedia, subject in University Master's Degree in Development of Software for Mobile Devices at the University of Alicante, 2016-2018

Interfaces for Intelligent Environments, subject in University master's degree in Computing Technologies at the University of Alicante. 2013-2015

Appliances and infrastructures for multimedia systems, subject in Multimedia Engineering degree (4-year programme) at the University of Alicante. 2012-2014

Operating Systems, subject in Multimedia Engineering degree (4-year programme) at the University of Alicante. 2012-2014

Several Seminars & Workshops on CUDA programming, at the University of Alicante May 10, 2011-2018

OTHER EXPERIENCE

- Contributor of the Point Cloud Library (PCL). It is a standalone, large scale, open project for 2D/3D image and point cloud processing.
- Experience building low-cost 3D printers (Prusa models) and creating 3D parts using Blender and other CAD tools.

LANGUAGES

Spanish: Native.
English: Fluent, C1
Catalan: Fluent.