

## Contact Details

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## Education

- 2011–Sept 2016 **PhD in Computer Vision (Cum Laude, International Doctor)**, *Computer Vision Center – Universitat Autònoma de Barcelona*, Spain.
- 2011–2012 **MSc in Computer Vision and Artificial Intelligence**, *Universitat Autònoma de Barcelona*, Spain.
- 2010–2011 **MSc in Computer Vision and Image Analysis**, *Kingston University of London*, UK, *1st class*.
- 2005–2010 **BSc in Computer Science (Hons.)**, *University of Murcia*, Spain, *1st class*.

## Patents

- 2017 **Holistic 3D object detection from multi-modal data for autonomous driving**, *Pending*, Toyota Research Institute.
- 2017 **System to perform 3D object detection using semi-supervised Domain Adaptation and light surrogate losses**, *Pending*, Toyota Research Institute.
- 2017 **Pipeline for 1000x speedup semantic video-queries using hierarchical neural networks**, *Pending*, Toyota Research Institute – University of Michigan.
- 2017 **Learning Perception models from Virtual Worlds using hierarchical instance-specific-GANs**, *Pending*, Toyota Research Institute, main intellectual author.
- 2017 **Learning Perception models from Virtual Worlds using Privileged-GANs for Unsupervised Domain Adaptation**, *Pending*, Toyota Research Institute.
- 2016 **Scene Recognition Apparatus for Autonomous Vehicles**, *Pending*, Toshiba Research Corporation, main intellectual author.

## Industrial Experience

- 2017 **TRINITY**, *Toyota Research Institute*, Distributed Simulation for Autonomous Driving, (Project manager).
- 2016-2017 **TRI-SUN**, *Toyota Research Institute*, Visual Scene Understanding System, (Main contributor).
- 2016 **CARLA Project**, *Intel–CVC*, Simulation for Autonomous Driving, (Project leader, 1st stage).
- 2016 **Simulation for Machine Learning and Driving**, *Huawei*, Simulation for Autonomous Driving, (Project leader).
- 2016 **Visual Change detection for 3D semantic mapping**, *Yandex–CVC*, Advance techniques for real-time mapping, (Project leader).
- 2016 **The SYNTHIA Virtual Environment**, *CVC*, A virtual world for training autonomous vehicles, (Project leader).
- 2015 **Do I Fit? (patent pending)**, *Volkswagen–SEAT–CVC*, Recognition systems for urban environments, (Project co-leader).
- 2013–2016 **Vision-only powered Autonomous Driving car**, *CVC*, An autonomous car project using only visual perception and leveraging simulation to improve model training and validation, individual contributor.

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## Research Interests

Autonomous Vehicles	Learning methods for Autonomous cars, Simulation for verification Semantic segmentation, self-localization
Machine Learning	Deep Learning, Generative methods, Virtual Worlds for automatic labelled data generation, Domain Adaptation, CNNs. LSTM and RNNs
Applied Mathematics	Robust decompositions (RPCA), Robust estimation, Continuous optimization, Riemannian optimization, Theory of embeddings, Non-linear dimensionality reduction
Computer Vision	Visual geometry, Semantic labelling, Obstacle detection
Robotics	Visual Odometry, Visual Simultaneous Localization and Mapping

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## Research Projects

- 2016–2017 **CARLA: CARs Learning to Act**, Intel, CVC, Creation of a distributed simulator for Autonomous Driving, Researcher, and simulation leader (2016).
- 2016 **ACDC: Automated and Cooperative Driving in the City**, CVC-MINECO, SPAIN, Learning Algorithms for Urban Scene Understanding, Researcher.
- 2012–2015 **eCo-DRIVERS: Ecological Cooperative Driver and Road Intelligent Visual Exploration for Route Safety**, CVC-MINECO, SPAIN, Advanced Automatic Systems for Visual Perception in Vehicles, Researcher.

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## Research Experience

- 2016–Ongoing **Research Scientist**, Toyota Research Institute, Machine Intelligence group, Los Altos, CA. *Simulation for Machine learning, Machine learning for Scene Understanding*
- 2016 **Research intern**, Toshiba Research & Development Center, Interactive and Media Laboratory, Automotive division, Kawasaki, Japan. *Novel Training methods for Deconvolutional Networks*; under the supervision of Dr. Watanabe-san
- 2015 **Research intern**, Toshiba Research Lab Cambridge, Cambridge, UK. *Deep Semantic Segmentation for Driverless cars*; under the supervision of Dr. Pablo Alcantarilla and Dr. Bjorn Stenger
- 2014–2016 **Research collaborator**, Applied Mathematics Group, University of Murcia, Spain. *Manifold Optimization techniques for Robust Decompositions*; Regular collaboration with Dr. Julio Guerrero
- 2014 **Research visitor**, Universite Catholique de Louvain (UCL), Louvain, Belgium. Short visit hosted by Dr. Laurent Jacques
- 2013–2014 **Research visitor**, NICTA, Canberra Research Lab, Canberra, Australia. *Robust Decompositions for Outlier Detection in Urban Visual Odometry*; under the supervision of Dr. Jose Alvarez
- 2013 **Research visitor**, Institute of Measurement and Control Technology (MRT), Karlsruhe Institute of Technology, Karlsruhe, Germany. *Robust Lie-Averaging for Fast pose Initialization*; under the supervision of Prof. Christoph Stiller
- 2010–2011 **Research visitor**, Robotic Vision Team, Kingston University, London, UK. *Visual SLAM for indoors Robots*; under the supervision of Prof. Paolo Remagnino
- 2010–2011 **Research visitor**, Human Body Motion Group, Kingston University, London, UK. *Fully Articulated Pose-hand Recovery*; under the supervision of Dr. Jesus Martinez-del-Rincon
- 2009–2010 **Research Assistant**, Applied Engineering Group, University of Murcia, Spain. Augmented reality methods based on natural features
- 2008–2009 **Research Assistant**, Applied Engineering Group, University of Murcia, Spain. Fish-tracker, fish visual tracking in controlled environments

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## Recent Talks

- March 2017 Computer Vision Center, Barcelona, Spain

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- Nov 2016 A2-Learn conference, Ann Arbor, MI, USA
- June 2016 Zoox, Palo Alto, USA
- June 2016 Int. Conf. CVPR, Las Vegas, USA
- June 2016 Industrial Robotics Institute, Barcelona, Spain.
- May 2016 Oxford University, Engineering Dept., Torr Group, Oxford, UK
- May 2016 NVIDIA Research, New Jersey, USA

## Skills & Tools

- Machine Learning** Convolutional Neural Networks, RNNs, Virtual worlds for automatic training, Transfer Learning, Network compression
- Optimization** Continuous optimization, Constrained optimization, Riemannian optimization
- Domain Adaptation** Applied to semantic labelling of urban scenes
- Visual Geometry** Robust motion estimation, multi-view geometry
- Programming & Prototyping** C/C++, Python, MATLAB, CUDA, Java
- Frameworks** Pytorch, TensorFlow, Caffe, MatConvNet, Chainer
- Engines** Unity3D, Unreal Engine 4, Blender
- Libraries** OpenCV, OpenSceneGraph, Point Cloud Library, SciPy, Qt

## Teaching Experience

- 2017 **Lecturer, MSc in Machine Learning**, *Universitat Autònoma de Barcelona*, Barcelona, Spain.
- 2012–2013 **T.A., Machine Learning**, *ETSE, Universitat Autònoma de Barcelona*, Barcelona, Spain.
- 2013–2014 **T.A., Machine Learning**, *ETSE, Universitat Autònoma de Barcelona*, Barcelona, Spain.
- 2014–2015 **T.A., Data Structures**, *ETSE, Universitat Autònoma de Barcelona*, Barcelona, Spain.
- 2014–2015 **T.A., Artificial Intelligence**, *ETSE, Universitat Autònoma de Barcelona*, Barcelona, Spain.
- 2015–2016 **Author, Online Course of Hands-on Deep Learning with MatConvNet**, Online.

## Student Supervision

- 2016 **MSc. dissertation**, *Jordi Frias*, *Universitat Autònoma de Barcelona*, Barcelona, Spain.  
*Urban Scene Understanding for Intelligent Vehicles*
- 2016 **MSc. dissertation**, *Albert Mosella Montoro*, *Universitat Autònoma de Barcelona*, Barcelona, Spain.  
*On Deconvolutional Nets for Semantic Segmentation*
- 2016 **MSc. dissertation**, *Akhil Gurram*, *Universitat Autònoma de Barcelona*, Barcelona, Spain.  
*Depth Estimation via Deconvolutional Nets*
- 2015 **BSc. dissertation**, *Joanna Materzynska*, *University of Vienna*, Vienna, Austria.  
*On Deep Semantic Segmentation*
- 2015 **BSc. dissertation**, *Sergi Canyameres*, *Universitat Autònoma de Barcelona*, Barcelona, Spain.  
*Deep learning to improve Pedestrian Detection*
- 2015 **BSc. dissertation**, *Jordi Frias*, *Universitat Autònoma de Barcelona*, Barcelona, Spain.  
*Real-time Representations for Urban Scene Understanding*
- 2014 **Research intern**, *Jordi Frias*, *Universitat Autònoma de Barcelona*, Barcelona, Spain.  
*Methods for Road Detection in 3D*
- 2014 **BSc dissertation**, *Gabriel Villalonga*, *Universitat Autònoma de Barcelona*, Barcelona, Spain.  
*3D Pedestrian Detection*

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- 2014 **BSc dissertation**, *Andrea Alvarez*, Universitat Autònoma de Barcelona, Barcelona, Spain.  
*Semantic Segmentation with 3D Features*
- 2013 **MSc dissertation**, *Manuel Granados*, Universitat Autònoma de Barcelona, Barcelona, Spain.  
*Semantic Scene Understanding for Urban Scenarios*

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## Languages

Spanish	Native
English	Proficient user
Catalan	Basic user
Japanese	Basic user

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## Awards & Honours

- 2016 **Honors, Cum Laude PhD Thesis**, *Barcelona, Spain*.
- 2016 **Finalist for Best System Paper Award at the Robotics Science and Systems (RSS) conference**, *Award given by the RSS consortium to outstanding systems papers presented at the RSS conference.*, Michigan, USA.
- 2011 **Best industrial IT project of the year**, *Award given by the IT consortium, TIMUR*, Murcia, Spain.
- 2010 **Top student of Computer Science**, *Promotion 2005–2010*, Murcia, Spain.
- 2010 **Honourable mention Computer Science, 1st class**, *Promotion 2005–2010*, Murcia, Spain.
- 2009 **Award of excellence in academic performance**, *Top 10 student of science and mathematics*, Murcia, Spain.

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## Publications

German Ros, Laura Sellart, Gabriel Villalonga, Elias Maidanik, Francisco Molero, Marc Garcia, Adriana Cedeno, Francisco Perez, Didier Ramirez, Eduardo Escobar, Jose Luis Gomez, David Vazquez, and Antonio M. Lopez. *Semantic Segmentation of Urban Scenes via Domain Adaptation of SYNTHIA*. Springer, 2017.

German Ros and Gines Garcia-Mateos. *Augmented Reality based on Natural Features*. AP LAMBERT Academic Publishing GmbH & Co, 1st edition edition, 2012.

Antonio M. Lopez, Jiaolong Xu, Jose L. Gomez, David Vazquez, and German Ros. *From Virtual to Real World Visual Perception using Domain Adaptation – The DPM as Example*. Springer, 2017.

Victor Vaquero, German Ros, Francesc Moreno-Noguer, Antonio M. Lopez, and Alberto Sanfeliu. Joint Coarse-and-Fine reasoning for deep optical flow. In *The IEEE International Conference on Image Processing (ICIP)*, Beijing, China, 2017.

Alexey Dosovitskiy, German Ros, Felipe Codevilla, Antonio Lopez, and Vladlen Koltun. CARLA: An open urban driving simulator. In *Conference on Robot Learning (CORL)*, Mountain View, CA, US, 2017.

Pablo F. Alcantarilla, Simon Stent, German Ros, Roberto Arroyo, and Riccardo Gherardi. Street-view change detection with deconvolutional networks. *Autonomous Robots (AURO)*, Springer, 2017.

German Ros, Simon Stent, Pablo F. Alcantarilla, and Tomoki Watanabe. Training constrained deconvolutional networks for road scene semantic segmentation. *arXiv preprint abs/1604.01545*, 2016.

German Ros, Laura Sellart, Joanna Materzynska, David Vazquez, and Antonio Lopez. The SYNTHIA dataset: A large collection of synthetic images for semantic segmentation of urban scenes. In *The IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Las Vegas, USA (short oral), 2016.

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German Ros, Julio Guerrero, and Jose Alvarez. Motion estimation via robust decomposition with constrained rank. *IEEE Transactions on Intelligent Vehicles*, 2016.

Pablo Alcantarilla, Simon Stent, German Ros, Roberto Arroyo, and Riccardo Gherardi. Street-view change detection with deconvolutional networks. In *Robotics: Science and Systems (RSS), Michigan, USA*, June 2016.

German Ros, Sebastian Ramos, Manuel Granados, Amir H. Bakhtiary, David Vazquez, and Antonio Lopez. Vision-based offline-online paradigm for autonomous driving. In *In Proc. IEEE Winter Conference on Applications of Computer Vision (WACV)*, Hawaii, USA, 2015.

German Ros, Julio Guerrero, Angel Sappa, Daniel Ponsa, and Antonio Lopez. Fast and robust fixed-rank matrix recovery. *arXiv preprint (submitted to T-PAMI), "http://arxiv.org/pdf/1503.03004v3.pdf"*, 2015.

German Ros and Jose Alvarez. Unsupervised image transformation for outdoor semantic labelling. In *In Proc. IEEE Intelligent Vehicles Symposium*, Seoul, Korea, 2015.

Alejandro Gonzalez, Gabriel Villalonga, German Ros, David Vazquez, and Antonio Lopez. 3D-guided multiscale sliding window for pedestrian detection. In *In Proc. Iberian Conference on Pattern Recognition and Image Analysis*, Santiago de Compostela, Spain, 2015.

German Ros, Julio Guerrero, Angel Sappa, Daniel Ponsa, and Antonio Lopez. VSLAM pose initialization via Lie-groups and Lie-algebras optimization. In *In Proc. IEEE International Conference on Robotics and Automation (ICRA)*, Karlsruhe, Germany, 2013.

German Ros, Julio Guerrero, Angel Sappa, Daniel Ponsa, and Antonio Lopez. Fast and robust l1-averaging-based pose estimation for driving scenarios. In *In Proc. British Machine Vision Conference (BMVC)*, Bristol, UK, 2013.

German Ros, Angel Sappa, Daniel Ponsa, and Antonio Lopez. Visual slam for driverless cars: A brief survey. In *In Proc. IEEE Workshop on Navigation, Perception, Accurate Positioning and Mapping for Intelligent Vehicles*, Alcala de Henares, Spain, 2012.

German Ros, Jesus Martinez del Rincon, and Gines Garcia-Mateos. Articulated particle filter for hand tracking. In *In Proc. International Conference on Pattern Recognition (ICPR)*, Tsukuba Science City, Japan, 2012.

Luisa M. Vera, German Ros, Gines Garcia-Mateos, and F. Javier Sanchez-Vazquez. MS-222 toxicity in juvenile seabream correlates with diurnal activity, as measured by a novel video-tracking method. *Journal of Aquaculture, Elsevier*, 2010.

German Ros, Gines Garcia-Mateos, Luisa M. Vera, and F. Javier Sanchez-Vazquez. A new taxonomy and graphical representation for visual fish analysis with a case study. In *In Proc. Workshop on Visual Observation and Analysis of Animal and Insect Behavior (VAIB), ICPR, Istanbul, Turkey*, 2010.