
CONTACT INFORMATION	Amazon Development Center Germany GmbH Krausenstr. 38 10117 Berlin, Germany <i>Phone:</i> +49 (0)-170-3252451 <i>E-mail:</i> anton.a.milan@gmail.com <i>Web:</i> www.milanton.de
RESEARCH INTERESTS	Computer Vision, Machine Learning, Computer Graphics , multi-target tracking, object recognition, action classification, pose estimation, Deep Learning, discrete and continuous optimization, visual SLAM, modeling, physically-based rendering, image-based rendering
PROFESSIONAL APPOINTMENTS	Applied Scientist 08/2017 – present Amazon Development Center Germany, Berlin <ul style="list-style-type: none">• Robotic perception and manipulation• Project lead, research and production delivery Senior Research Fellow 01/2014 – 07/2017 Australian Centre for Visual Technologies (ACVT), University of Adelaide, Australia <ul style="list-style-type: none">• Supervisor: Prof. Ian Reid• Multi-target tracking, semantic SLAM, Recurrent Neural Networks• Affiliation<ul style="list-style-type: none">• Australian Centre for Robotic Vision (Centre Director: Peter Corke) Visiting Researcher 05/2016 – 09/2016 Autonomous Intelligent Systems, University of Bonn, Germany <ul style="list-style-type: none">• Supervisor: Prof. Sven Behnke• Scene understanding and tracking for robotics, APC, Centauro• Student supervision Visiting Researcher 06/2015 – 09/2013 Photogrammetry and Remote Sensing Group, ETH Zürich, Switzerland <ul style="list-style-type: none">• Supervisor: Prof. Konrad Schindler• Multi-target tracking using RNNs Visiting Researcher 07/2013 – 12/2013 Pattern Recognition and Machine Learning, Hokkaido University, Sapporo, Japan <ul style="list-style-type: none">• Supervisor: Prof. Mineichi Kudo• Multi-target tracking using infrared sensors. Research Assistant 11/2009 – 10/2013 Visual Inference, TU Darmstadt, Germany (2010 – 2013) Image Understanding, TU Darmstadt, Germany (2009 – 2010) <ul style="list-style-type: none">• Supervisors: Prof. Stefan Roth, Prof. Konrad Schindler• Multi-target tracking• Affiliation<ul style="list-style-type: none">• Research Training Group: Cooperative, Adaptive and Responsive Monitoring in Mixed Mode Environments (Speaker: Prof. Oskar von Stryk) Student Assistant 05/2006 – 12/2007 Multimedia, Simulation and Virtual Reality Group, University of Bonn, Germany <ul style="list-style-type: none">• Supervisors: Dr. Arno Zinke
EDUCATION	TU Darmstadt , Darmstadt, Germany Ph.D. (Dr. Ing), Computer Science 05/2013 <ul style="list-style-type: none">• <i>Summa cum Laude</i>, With Distinction• Thesis Topic: <i>Energy Minimization for Multiple Object Tracking</i>

- Adviser: Prof. Stefan Roth, PhD
- Examiner: Prof. Dr. Konrad Schindler
- Co-Examiner: Dr. Ivan Laptev
- Area of Study: Computer Science

University of Bonn, Bonn, Germany

Diplom (~ M.Sc.), Computer Science

05/2008

- *Cum Laude*
- Thesis Topic: *Ein Ansatz zur bildbasierten Rekonstruktion der Bidirektionalen Kurvenstreuungsfunktion (BCSDF) aus Haarclustern*, Grade: 1.0/1.0
- Adviser: Dr. Arno Zinke, Prof. Andreas Weber
- Minor in Philosophy

Polytechnical University of Valencia, Valencia, Spain

Visiting student

06/2007 – 03/2008

REFEREED
JOURNAL
PUBLICATIONS

- [1] G. Lin, F. Liu, **A. Milan**, C. Shen, and I. Reid. RefineNet: Multi-Path Refinement Networks for Dense Prediction *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)* 41(1), 2019. doi:10.1109/TPAMI.2019.2893630
- [2] M. Schwarz, **A. Milan**, A. Periyasamy, and S. Behnke. Multi-class RGB-D Object Detection and Semantic Segmentation for Autonomous Manipulation in Clutter. *International Journal of Robotics Research (IJRR)* 37(4-5):437-451, June 2017.
- [3] **A. Milan**, K. Schindler, and S. Roth. Multi-target Tracking by Discrete-Continuous Energy Minimization. *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)* 38(10), 2016. doi:10.1109/TPAMI.2015.2505309
- [4] **A. Milan**, S. Roth, and K. Schindler. Continuous Energy Minimization for Multi-target Tracking. *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)* 36(1), 2014. doi:10.1109/TPAMI.2013.103
- [5] A. Zinke, T. Lay Herrrera, **A. Andriyenko**, M. Rump, A. Weber, and R. Klein. A Practical Approach for Photometric Acquisition of Hair Color. *SIGGRAPH Asia 2009*. Dec. 2009, 28:5(165). doi:10.1145/1618452.1618511

PEER-REVIEWED
CONFERENCE AND
WORKSHOP
PUBLICATIONS

- [6] U. Iqbal, **A. Milan**, M. Andriluka, E. Ensafutdniov, L. Pishchulin, J. Gall, B. Schiele. PoseTrack: A Benchmark for Human Pose Estimation and Tracking. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Salt Lake City, Utah, June 2018.
- [7] S. H. Rezatofghi, V. Kumar B G, **A. Milan**, E. Abbasnejad, A. Dick, I. Reid. DeepSet-Net: Predicting Sets with Deep Neural Networks. In *Proceedings of the Sixteenth IEEE International Conference on Computer Vision (ICCV)*, Venice, Italy, October 2017.
- [8] U. Iqbal, **A. Milan**, J. Gall. Pose-Track: Joint Multi-Person Pose Estimation and Tracking. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Honolulu, Hawaii, July 2017.
- [9] G. Lin, **A. Milan**, C. Shen, and I. Reid. RefineNet: Multi-Path Refinement Networks for Semantic Segmentation. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Honolulu, Hawaii, July 2017.
- [10] **A. Milan**, H. Rezatofghi, R. Garg, A. Dick, and I. Reid. Data-Driven Approximations to NP-Hard Problems. In *Proceedings of the Thirty-First AAAI Conference on Artificial Intelligence (2017)*, San Francisco, California, 2017. **Oral presentation.**
- [11] **A. Milan**, H. Rezatofghi, A. Dick, K. Schindler and I. Reid. Online Multi-Target Tracking using Recurrent Neural Networks. In *Proceedings of the Thirty-First AAAI Conference on Artificial Intelligence (2017)*, San Francisco, California, 2017.

- [12] M. Schwarz, **A. Milan**, C. Lenz, A. Muñoz, A. Periyasamy, M. Schreiber, S. Schüller, and S. Behnke. NimbRo Picking: Versatile Part Handling for Warehouse Automation. In *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, Singapore, 2017. **Finalist of Best Automation Paper Award**
- [13] H. Rezatofighi, **A. Milan**, Z. Zhang, A. Dick, Q. Shi and I. Reid. Joint Probabilistic Matching Using m-Best Solutions. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Las Vegas, Nevada, June 2016. **Oral presentation, 3.9% acceptance rate.**
- [14] H. Rezatofighi, **A. Milan**, Z. Zhang, A. Dick, Q. Shi and I. Reid. Joint Probabilistic Data Association Revisited. In *Proceedings of the Fifteenth IEEE International Conference on Computer Vision (ICCV)*, Santiago, Chile, 2015.
- [15] **A. Milan**, L. Leal-Taixé, K. Schindler, and I. Reid. Joint Tracking and Segmentation of Multiple Targets. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR)*, Boston, Massachusetts, June 2015.
- [16] **A. Milan**, S. Roth, K. Schindler, M. Kudo. [Privacy Preserving Multi-target Tracking](#). In *ACCV Workshops: Workshop on Human Identification for Surveillance (HIS)*, Singapore, 2014.
- [17] **A. Milan**, R. Gade, A. Dick, T. B. Moeslund, I. Reid. Improving Global Multi-target Tracking with Local Updates. In *ECCV Workshops: Workshop on Visual Surveillance and Re-Identification*, Zurich, Switzerland, 2014.
- [18] S. Tang, M. Andriluka, **A. Milan**, K. Schindler, S. Roth and B. Schiele. Learning People Detectors for Tracking in Crowded Scenes. In *Proceedings of the Fourteenth IEEE International Conference on Computer Vision (ICCV)*, Sydney, Australia, 2013.
- [19] **A. Milan**, K. Schindler, and S. Roth. Detection- and trajectory-level exclusion in multiple object tracking. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR)*, Portland, Oregon, June 2013. **Fraunhofer IGD Best Paper Award (Honorable Mention).**
- [20] **A. Milan**, K. Schindler, and S. Roth. Challenges of ground truth evaluation of multi-target tracking. In *Proceedings of the CVPR 2013 Workshop on Ground Truth - What is a good dataset?*, Portland, Oregon, June 2013.
- [21] **A. Andriyenko**, K. Schindler, and S. Roth. Discrete-continuous optimization for multi-target tracking. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR)*, Providence, Rhode Island, June 2012. **Fraunhofer IGD Best Paper Award.**
- [22] **A. Andriyenko** and K. Schindler. Multi-target tracking by continuous energy minimization. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR)*, Colorado Springs, Colorado, June 2011.
- [23] **A. Andriyenko**, S. Roth, and K. Schindler. An analytical formulation of global occlusion reasoning for multi-target tracking. In *ICCV Workshops: 11th International IEEE Workshop on Visual Surveillance*, Barcelona, Spain, November 2011.
- [24] **A. Andriyenko** and K. Schindler. Globally optimal multi-target tracking on a hexagonal lattice. In K. Daniilidis, P. Maragos, and N. Paragios, editors, *Proceedings of the 11th European Conference on Computer Vision (ECCV)*, volume 6311, pages 466–479, Lecture Notes in Computer Science, 2010. Springer.

OTHER PUBLICATIONS	<p>[25] A. Milan, L. Leal-Taixé, I. Reid, S. Roth, and K. Schindler MOT16: A Benchmark for Multi-Object Tracking. <i>arXiv:1603.00831</i></p> <p>[26] L. Leal-Taixé, A. Milan, I. Reid, S. Roth, and K. Schindler MOTChallenge 2015: Towards a Benchmark for Multi-Target Tracking. <i>arXiv:1504.01942</i></p> <p>[27] Anton Milan. <i>Energy Minimization for Multiple Object Tracking</i>. PhD thesis, TU Darmstadt, Darmstadt, Germany, 2014.</p> <p>[28] Anton Andriyenko. <i>Ein Ansatz zur bildbasierten Rekonstruktion der Bidirektionalen Kurvenstreuungsfunktion (BCSDF) aus Haarclustern (An Approach to Image-Based Reconstruction of the Bidirectional Curve Scattering Distribution Function (BCSDF) From Hair Clusters)</i>. Diplom thesis, University of Bonn, Germany, 2008.</p>	
INVITED TALKS	<p>Technische Universität München, Mößbauer Symposium May 10, 2017</p> <p>Queensland University of Technology (QUT), Brisbane, ACRV January 20, 2017</p> <p>CASE 2016, Fort Worth, Texas, AWL Workshop August 21, 2016</p> <p>MPI Tübingen, Perceiving Systems July 22, 2016</p> <p>Universität Bonn, Institute of Computer Science January 13, 2016</p> <p>Universität Würzburg, Institute for Molecular Infection Biology July 14, 2015</p> <p>ICCV Workshops, Sydney, RMRC Challenge December 2, 2013</p> <p>University of Hokkaido, Pattern Recognition and Machine Learning August 1, 2013</p> <p>MPI Saarbrücken, Computer Vision and Multimodal Computing September 14, 2012</p> <p>RWTH Aachen, Computer Graphics and Multimedia August 27, 2009</p> <p>University of Bonn, Computer Vision Group August 20, 2009</p> <p>TU Darmstadt, Image Understanding August 13, 2009</p>	
SELECTED PROJECTS	<p>PoseTrack Challenge 02/2017 – present</p> <ul style="list-style-type: none"> • Dataset and benchmark for human pose tracking <p>Amazon Robotics Challenge 2017 12/2016 – present</p> <ul style="list-style-type: none"> • Leading perception development for automated picking and stowing. • Won 1st prize in the final round task. <p>SMR Technologies 02/2016 – 12/2016</p> <ul style="list-style-type: none"> • Visual quality control for car part manufacturing <p>Centauro (Horizon 2020) 05/2016 – 09/2016</p> <ul style="list-style-type: none"> • Developed perception for a centaur-like robot <p>Amazon Picking Challenge 2016 05/2016 – 07/2016</p> <ul style="list-style-type: none"> • Manipulating a robot arm for picking and stowing objects • Achieved 2nd and 3rd place (out of 16 participants) <p>MOTChallenge 06/2014 – present</p> <ul style="list-style-type: none"> • Multi-Object Tracking Benchmark 	
TEACHING EXPERIENCE	<p>University of Adelaide (Singapore Campus), Singapore 02/2017 – 03/2017</p> <p><i>Lecturer (with Prof. D. Suter), Artificial Intelligence</i></p> <ul style="list-style-type: none"> • Block lecture (17 hours). • Preparing and marking tutorials, assignments and exams • Moderating student forum and course web page. 	

TU Darmstadt, Darmstadt, Germany

10/2012 – 05/2013

Teaching Assistant, Computer Vision II

- Winter 2011/2012
- Instructor for tutorials.
- Responsible for designing, distributing and grading assignments.
- Moderating student forum and course web page.

Seminar Assistant, Advanced Topics in Computer Vision

- Spring 2012, Spring 2013
- Supervising undergraduate students

Grader for HCS, Computer Graphics, Computer Vision.

PROFESSIONAL
SERVICE

Area Chair

- ICCV: 2019,

Workshop Chair

- Multi-Object Tracking: How crowded can it get?, CVPR 2019
- PoseTrack Challenge: Human Pose Estimation and Tracking in the Wild, ICCV 2017
- First Joint BMTT-PETS Workshop on Tracking and Surveillance, CVPR 2017
- 2nd Workshop on Benchmarking Multi-target Tracking: MOTChallenge, ECCV 2016
- 1st Workshop on Benchmarking Multi-target Tracking (BMTT), WACV 2015

Program Committee

- 1st Workshop on Understanding Human Activities: Context and Interactions (HACI 2013), in conjunction with ICCV 2013.

Reviewer

Conferences

- CVPR: 2019, 2018, 2017, 2016, 2015, 2013, 2012
- ICCV: 2017, 2015, 2013
- ECCV: 2016, 2014, 2012
- IEEE International Conference on Robotics and Automation (ICRA) 2017
- Applications of Computer Vision (WACV) 2017
- Annual Conference on Neural Information Processing Systems (NIPS) 2016
- Asian Conference on Computer Vision (ACCV) 2016
- Robotics: Science and Systems Conference (RSS) 2016
- Photogrammetric Computer Vision (PCV) 2014

Journals

- IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)
- International Journal of Computer Vision (IJCV)
- The International Journal of Robotics Research (IJRR)
- Autonomous Robots (AURO)
- Centauro EU-Project (internal)
- Machine Vision and Applications (MVAP)
- IEEE Signal Processing Letters
- Journal of photogrammetry, remote sensing and geoinformation processing (PFG)

Examiner

- PhD Thesis, Alex Bewely. QUT, Brisbane. 2017

PROFESSIONAL
EXPERIENCE

TU Darmstadt, Darmstadt, Germany

Research Assistant and PhD Student

11/2009 – 10/2013

- Assistance in research and teaching.
- Developed new models and algorithms for multi-object tracking.
- Supervised undergraduate students in engineering and computer science.

Luminova, Melbourne, Australia

3D Shader Developer

10/2008 – 05/2009

- Developed new shaders for architectural visualization.
- Maintained scripts and extended existing shaders for rendering.
- Advising on rendering techniques.

Cocoon by HGC International, Düsseldorf, Germany

Industrial Visualizer

04/2008 – 10/2009

- Modeled and rendered furniture, interiors and exteriors of various hotels, lobbies, restaurants and clubs.

University of Bonn, Bonn, Germany

Student Assistant

05/2006 – 12/2007

- Programmed in C++ and XML
- Developed shaders and implemented a scene parser.
- Modeled hair and other objects with 3D Max.
- Co-authored a research paper.

Primavera Gallery, New York, NY

System Administrator

10/2000 – 01/2001

- Web design and maintenance.
- Photographed objects and edited images.
- System administration.

EXTRACURRICULAR COURSES	• First Aid Course: HLT AID003, First Aid Officer	2014
	• Language Course: <i>Polish</i> , Certificate Unicert I, TU Darmstadt, Germany	2010 to 2013
	• CUDA and openACC hands-on tutorial, TU Darmstadt, Germany	2012
	• Language Course: <i>Spanish</i> , Level B1, Valencia, Spain	2007
	• Java Course, VHS, Cologne, Germany	2002

PARTICIPATION	• Doctoral Consortium at CVPR 2013, Portland, OR, USA
	• GKmM Summer School, Robots and Sensor Networks 2012, Eberburg, Germany
	• INRIA VRML Summer School (VRML) 2012, Grenoble, France
	• International Computer Vision Summer School (ICVSS) 2011, Sicily, Italy
	• International Computer Vision Summer School (ICVSS) 2010, Sicily, Italy

SERVICE	<i>Student Volunteer</i>
	• DAGM 2010 (German Association for Pattern Recognition) conference
	• CASC 2007, International Workshop on Computer Algebra in Scientific Computing
	<i>Contributer</i>
	• Multiple Object Tracking Benchmark
	• OpenGM
	• BPF: Fully Automatic Multi-target Tracking System
	• CAVIAR Dataset

HARDWARE AND SOFTWARE SKILLS	Computer Programming:
	• Python, MxNet, MATLAB, C, C++, Lua, ROS, Torch, Java, JavaScript, PHP, Perl, OpenGL, MySQL, MaxScript, Mel Script, MetaSL, HTML, Octave, Assembler, Visual Basic, Unix shell scripting, GNU make
	Computer-Aided Design Tools:
	• 3D Max, Maya, vRay, mentalray, Blender, AutoCAD, ArchiCAD, SketchUp, mentalmill, Poser, SolidWorks

Video Editing

- Adobe Premiere, After Effects, VirtualDub

Version Control and Software Configuration Management:

- Mercurial, Git, CVS, SVN

Desktop Editing and Productivity Software:

- Microsoft Office, LibreOffice, Photoshop, Vim, Eclipse, T_EX (L^AT_EX, B_IB_TE_X, PSTricks), GIMP, InkScape

Operating Systems:

- Microsoft Windows, Linux, OS X, Android, iOS

Hardware:

- Desktop computer assembly, soldering

EXPERTISE

Computer Science:

- *Computer Vision*: Multi-target Tracking, Visual SLAM, Object Detection, Graphical Models, Face Detection, Action Recognition, Deep Learning for Computer Vision
- *Computer Graphics*: Physically-based Rendering, Shading, Simulation

Mathematics:

- Optimization Methods, Continuous Optimization, Discrete Inference, Graphical Models, Combinatorics, Analysis, Applied Mathematics

GRANTS AND AWARDS

- SMR Technologies. Project on visual quality inspection (with I. Reid), AUD 42K
- Swiss National Science Foundation (SNF) International Short Visit Grant 2015, CHF 11K.
- Fraunhofer IGD Best Paper Award, 2014 (Honorable Mention)
- IEEE CVPR 2013 Doctoral Consortium Travel Grant.
- INRIA VRML Summer School, Best Poster Award, 2012
- Fraunhofer IGD Best Paper Award, 2012

REFERENCES

Prof. Ian Reid

(e-mail: ian.reid@adelaide.edu.au; phone: +61-8-8313-2135)

- Prof., School of Computer Science, The University of Adelaide
- ◊ University of Adelaide, Ingkarni Wardli, N. Terrace Campus, Adelaide, SA, Australia
- ★ *Prof. Reid is my current supervisor.*

Prof. Sven Behnke

(e-mail: behnke@cs.uni-bonn.de; phone: +49 (0) 338 73-4116)

- Prof., Computer Science Department, University of Bonn
- ◊ University of Bonn, Computer Science Institute VI, Friedrich-Ebert-Allee 144, 53113 Bonn, Germany
- ★ *Prof. Behnke was my supervisor during my research visit in 2016.*

Prof. Dr. Konrad Schindler

(e-mail: konrad.schindler@geod.baug.ethz.ch; phone: +41-44-633-3004)

- Prof., Photogrammetry and Remote Sensing, ETH Zurich
- ◊ HIL D 42.3, Wolfgang-Pauli-Str. 15, 8093 Zürich, Switzerland
- ★ *Prof. Schindler was my graduate adviser.*

Prof. Stefan Roth, PhD

(e-mail: sroth@cs.tu-darmstadt.de; phone: +49-6151-16-21425)

- Prof., Department of Computer Science, TU Darmstadt
- ◊ TU Darmstadt, Hochschulstr. 10, 64289 Darmstadt, Germany
- ★ *Prof. Roth was my graduate adviser.*