



# Daniel Gehrig | M.Sc.

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## 👤 Personal Information

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Nationality: *Switzerland and United States of America*

Research Interests: *Deep Learning, Computer Vision, Event Cameras, Robotics*

## 🎓 Education

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- 2018 – 2023    **PhD Student at Robotics and Perception Group**    @**University of Zurich**, Switzerland
- **Research Topic:** Event Cameras for Computer Vision and Robotics
  - **Advisor:** Prof. Davide Scaramuzza  
(Thesis Grade: 6.0/6.0)
- 2016 – 2018    **M.Sc. in Mechanical and Process Engineering**    @**ETH Zurich**, Switzerland
- **GPA:** 6.0/6.0, passed with distinction
  - **Focus:** *Robotics, Artificial Intelligence, Computer Vision*
  - **Thesis:** *Asynchronous Photometric Feature Tracking with Event- and Frame-based Cameras*
  - **Advisor:** Prof. Davide Scaramuzza  
(Thesis Grade: 6.0/6.0)
- 2012 – 2015    **B.Eng. in Mechanical and Process Engineering**    @**ETH Zurich**, Switzerland
- **GPA:** 5.6/6.0
  - **Focus:** *Nanotechnology*
  - **Thesis:** *Humidity Filters for Breath Analysis*
  - **Advisor:** Prof. Sotiris Pratsinis  
(Thesis Grade: 6.0/6.0)

## 📖 Journal Publications

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- **Daniel Gehrig** and Davide Scaramuzza. “Low Latency Automotive Vision with Event Cameras”. In: *Nature* 629 (2024), pp. 1034–1040  
[Open Access PDF](#), [Video](#), [Code](#), [Dataset](#)
- **Daniel Gehrig**, Henri Rebecq, Guillermo Gallego, and Davide Scaramuzza. “EKLT: Asynchronous Photometric Feature Tracking using Events and Frames”. In: *International Journal of Computer Vision* 128 (2020), pp. 601–618  
[PDF](#), [Video](#), [Code](#), [Evaluation Code](#)
- **Daniel Gehrig\***, Michelle Rüegg\*, Mathias Gehrig, Javier Hidalgo-Carrió, and Davide Scaramuzza. “Combining Events and Frames using Recurrent Asynchronous Multimodal Networks for Monocular Depth Prediction”. In: *IEEE Robotics and Automation Letters (RA-L)* 6 (2021), pp. 2822–2829.  
[PDF](#), [Video](#), [Code](#), [Dataset](#)
- **Daniel Gehrig**, and Davide Scaramuzza, “Low-latency Inter-frame Object Detection with Event Cameras”. Under review in: *IEEE Transactions on Pattern Analysis and Machine Intelligence* (2023).  
[Video](#), [Dataset](#)

- Mathias Gehrig, Willem Aarents, **Daniel Gehrig**, and Davide Scaramuzza “DSEC: A Stereo Event Camera Dataset for Driving Scenarios”. In: *IEEE Robotics and Automation Letters (RA-L)* 6 (2021), pp. 4947–4954.  
[PDF](#), [Video](#), [Code](#), [Dataset](#),
- Nico Messikommer, **Daniel Gehrig**, Mathias Gehrig, and Davide Scaramuzza “Bridging the Gap between Events and Frames through Unsupervised Domain Adaptation”. In: *IEEE Robotics and Automation Letters (RA-L)* 7 (2022), pp. 3515–3522  
[PDF](#), [Video](#), [Code](#)
- Florian Mahlknecht, **Daniel Gehrig**, Jeremy Nash, Friedrich M. Rockenbauer, Benjamin Morrell, Jeff Delaune, and Davide Scaramuzza “Exploring Event Camera-based Odometry for Planetary Robots”. In: *IEEE Robotics and Automation Letters (RA-L)* 7 (2022), pp. 8651–8658  
[PDF](#), [Video](#), [Code](#), [Dataset](#)

## Peer-Reviewed Conference Papers

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- Ling Gao\*, **Daniel Gehrig**\*, Hang Su, Davide Scaramuzza, and Laurent Kneip “An N-Point Linear Solver for Line and Motion Estimation with Event Cameras”. In: *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)* (2024) [Paper Project Page](#)
- **Daniel Gehrig**, Henri Rebecq, Guillermo Gallego, and Davide Scaramuzza. “Asynchronous, Photometric Feature Tracking using Events and Frames”. In: *Springer: European Conference on Computer Vision (ECCV)* (2018) pp. 750–765. **Oral Presentation. Oral Acceptance Rate: 2.4%**  
[PDF](#), [Video](#), [Code](#), [Evaluation Code](#), [Oral Presentation Video](#)
- **Daniel Gehrig**, Antonio Loquercio, Konstantinos G. Derpanis, and Davide Scaramuzza. “End-to-End Learning of Representations for Asynchronous Event-Based Data”. In: *IEEE/CVF International Conference on Computer Vision (ICCV)* (2019), pp. 5632–5642.  
[PDF](#), [Video](#), [Code](#)
- **Daniel Gehrig**\*, Mathias Gehrig\*, Javier Hidalgo-Carrió, and Davide Scaramuzza. “Video to Events: Recycling Video Dataset for Event Cameras”. In: *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)* (2020), pp. 3583–3592.  
[PDF](#), [Video](#), [Code](#)
- **Daniel Gehrig**\*, Michelle Rüegg\*, Mathias Gehrig, Javier Hidalgo-Carrió, and Davide Scaramuzza. “Combining Events and Frames using Recurrent Asynchronous Multimodal Networks for Monocular Depth Prediction”. In: *IEEE International Conference on Robotics and Automation (ICRA)* 6 (2021), pp. 2822–2829.  
[PDF](#), [Video](#), [Code](#), [Dataset](#)
- Nikola Zubić\*, **Daniel Gehrig**\*, Mathias Gehrig, and Davide Scaramuzza “From Chaos Comes Order: Ordering Event Representations for Object Detection”. In: *IEEE/CVF International Conference on Computer Vision (ICCV)* (2023) Links: [PDF](#)
- Ling Gao, Hang Su, **Daniel Gehrig**, Marco Cannici, Davide Scaramuzza, and Laurent Kneip “A 5-Point Minimal Solver for Event Camera Relative Motion Estimation”, In: *IEEE/CVF International Conference on Computer Vision (ICCV)* (2023)
- Henri Rebecq, **Daniel Gehrig**, and Davide Scaramuzza. “ESIM: an Open Event Camera Simulator”. In: *Conference on Robot Learning* 87 (2018) pp. 969–982.  
[PDF](#), [Video](#), [Code](#)
- Mathias Gehrig, Willem Aarents, **Daniel Gehrig**, and Davide Scaramuzza “DSEC: A Stereo Event Camera Dataset for Driving Scenarios”. In: *IEEE International Conference on Robotics and Automation (ICRA)* 6 (2021), pp. 4947–4954.  
[PDF](#), [Video](#), [Code](#), [Dataset](#),
- Nico Messikommer, **Daniel Gehrig**, Mathias Gehrig, and Davide Scaramuzza “Bridging the Gap between Events and Frames through Unsupervised Domain Adaptation”. In: *IEEE International Conference on Robotics and Automation (ICRA)* 7 (2022), pp. 3515–3522  
[PDF](#), [Video](#), [Code](#)
- Florian Mahlknecht, **Daniel Gehrig**, Jeremy Nash, Friedrich M. Rockenbauer, Benjamin Morrell, Jeff Delaune, and Davide Scaramuzza “Exploring Event Camera-based Odometry for Planetary Robots”. In: *IEEE/RSJ International Conference on Intelligent Robotic Systems (IROS)* 7 (2022), pp. 8651–8658 [PDF](#), [Video](#), [Code](#), [Dataset](#)

- Cedric Scheerlinck, Henri Rebecq, **Daniel Gehrig**, Nick Barnes, Robert Mahoney, and Davide Scaramuzza. “Fast Image Reconstruction with an Event Camera”. In: *IEEE Winter Conference on Applications of Computer Vision (WACV)* (2020), pp. 156–163.  
[PDF](#), [Video](#), [Code](#), [Dataset](#)
- Nico Messikommer\*, **Daniel Gehrig**\*, Antonio Loquercio, and Davide Scaramuzza. “Event-based Asynchronous Sparse Convolutional Networks”. In: *Springer: European Conference on Computer Vision (ECCV)* (2020), pp. 415–431.  
[PDF](#), [Video](#), [Code](#)
- Javier Hidalgo-Carrió, **Daniel Gehrig**, and Davide Scaramuzza. “Learning Monocular Dense Depth from Events”. In: *International Conference on 3D Vision (3DV)* (2020), pp. 534–542.  
[PDF](#), [Code](#), [Dataset](#)
- Manasi Muglikar\*, Mathias Gehrig\*, **Daniel Gehrig**, and Davide Scaramuzza. “How to Calibrate Your Event Camera”. In: *IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW)* (2021), pp. 1403–1409.  
[PDF](#), [Video](#), [Code](#),
- Stepan Tulyakov\*, **Daniel Gehrig**\*, Stamatios Georgoulis, Julius Erbach, Mathias Gehrig, Yuanyou Li, and Davide Scaramuzza. “Time Lens: Event-based Video Frame Interpolation”. In: *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)* (2021), pp. 16150–16159.  
[PDF](#), [Video](#), [Code](#), [Dataset](#)
- Mathias Gehrig\*, Mario Millhaeusler\*, **Daniel Gehrig**, and Davide Scaramuzza. “E-RAFT: Dense Optical Flow from Event Cameras”. In: *International Conference on 3D Vision (3DV)* (2021), pp. 197–206.  
[PDF](#), [Video](#), [Code](#), [Dataset](#)
- Nico Messikommer\*, Stamatios Georgoulis\*, **Daniel Gehrig**, Stepan Tulyakov, Julius Erbach, Alfredo Bochicchio, Yuanyou Li, and Davide Scaramuzza. “Multi-Bracket High Dynamic Range Imaging with Event Cameras” In: *IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW)*, (2022), pp. 546–556.  
[PDF](#), [Video](#)
- Simon Schaefer\*, **Daniel Gehrig**\*, and Davide Scaramuzza. “AEGNN: Asynchronous Event-based Graph Neural Networks” In: *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)* (2022), pp. 12361–12371.  
[PDF](#), [Video](#), [Code](#)
- Stepan Tulyakov, Alfredo Bochicchio, **Daniel Gehrig**, Stamatios Georgoulis, Yuanyou Li, and Davide Scaramuzza. “Time Lens++: Event-based Frame Interpolation with Parametric Non-linear Flow and Multi-scale Fusion” In: *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, (2022), pp. 17734–17743.  
[PDF](#), [Video](#), [Dataset](#)
- Zhaoning Sun\*, Nico Messikommer\*, **Daniel Gehrig**, and Davide Scaramuzza “ESS: Learning Event-based Semantic Segmentation from Still Images”. In: *Springer: ESS: Learning Event-Based Semantic Segmentation from Still Images*, (2022), pp. 341–357.  
[PDF](#), [Video](#), [Code](#), [Dataset](#)
- Benedek Forrai\*, Takahiro Miki\*, **Daniel Gehrig**\*, and Davide Scaramuzza “Event-based Agile Object Catching with a Quadrupedal Robot”. In: *IEEE International Conference on Robotics and Automation (ICRA)* (2023) [PDF](#), [Video](#), [Code](#)

## ☰ Experience

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2018 (3 months)	<b>Research Assistant</b> - Robotics and Perception Group @ <b>University of Zurich</b> , Switzerland - Deep Learning for Event-based Vision - <b>Advisor:</b> Prof. Davide Scaramuzza
2017-2018	<b>Software Developer</b> - F&P Robotics @ <b>F&amp;P Robotics</b> , Switzerland Service robotics in artificial intelligence and context management.
2016 (2 months)	<b>Research Assistant</b> - Particle Technology Lab @ <b>ETH Zurich</b> , Switzerland Experimental testing and specific tasks.
2015 (5 months)	<b>Software Developer</b> -F&P Robotics @ <b>F&amp;P Robotics</b> , Switzerland Development of artificial intelligence and context management for service robots

2014	<b>Teaching Assistant</b> - at D-MATH Linear Algebra and Analysis course at ETH Zurich	@ETH Zurich, Switzerland
2014-Current	<b>Private Tutor</b> Physics, mathematics and chemistry tutoring for high school and university students.	
2013 (2 months)	<b>Engineer</b> Various workshop-related tasks	@Prettl Automotive, USA

## 🔗 Open-Source Projects

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- Asynchronous photometric feature tracker (EKLT), [GitHub](#), ★Star 111.
- Recurrent Asynchronous Multimodal Networks (RAM Net), [GitHub](#), ★Star 75
- End-to-End Learnable Representations for Asynchronous Event Data, [GitHub](#) ★Star 111
- Video To Events (VID2E), [GitHub](#), ★Star 240
- DSEC-Detection dataset and utilities, [GitHub](#), ★Star 5
- Event-based Video Frame Interpolation (Time Lens), [GitHub](#), ★Star 569
- Event-based Agile Object Catching with a Quadrupedal Robot, [GitHub](#), ★Star 56
- Event-based Semantic Segmentation, [GitHub](#) ★Star 49
- Event-based Visual Inertial Odometry (EKLT-VIO), [GitHub](#), ★Star 31
- Asynchronous Graph Neural Networks, [GitHub](#), ★Star 88
- Domain Adaptation for Event Data, [GitHub](#), ★Star 32
- Event-based Optical Flow (E-RAFT), [GitHub](#), ★Star 84
- Event Camera Calibration Toolbox (e2calib), [GitHub](#), ★Star 121
- Event Camera Simulator (ESIM), [GitHub](#), ★Star 481

## ☰ Invited Talks/Lectures

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- May 9, 2024. Kolloquium for GI-Dissertation Prize 2023, Schloss Dagstuhl (Invited by [Prof. Rüdiger Reischuk](#))
- September 9 2023. DataFest 2023 in Yerevan, Armenia (Invited by [Dr. Martin Danelljan](#))
- June 19 2023. CVPR 2023 Workshop on Event-based Vision (Invited by [Prof. Guillermo Gallego](#))
- June 12 2023. University of California, Berkeley (Invited by [Prof. Jitendra Malik](#))
- December 8 2022. Lecture of Deep Learning, University of Zurich (Class of Vision Algorithms for Mobile Robotics by [Davide Scaramuzza](#))
- March 23 2022. Prophesee (Invited by [Prof. Christoph Posch](#))
- December 9 2021. Lecture of Deep Learning, University of Zurich (Class of Vision Algorithms for Mobile Robotics by [Davide Scaramuzza](#))
- December 5 2020. Lecture of Deep Learning, University of Zurich (Class of Vision Algorithms for Mobile Robotics by [Davide Scaramuzza](#))
- December 5 2019. Lecture of Deep Learning, University of Zurich (Class of Vision Algorithms for Mobile Robotics by [Davide Scaramuzza](#))

## ☰ Patents

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- DEVICE AND METHOD FOR VIDEO INTERPOLATION,  
Publication Number: WO/2022/096158, [Link](#)
- IMAGE PROCESSING APPARATUS AND METHOD FOR GENERATING INTERPOLATED FRAME,  
Publication Number: WO/2023/083467, [Link](#)

- HIGH DYNAMIC RANGE IMAGING DEVICE AND METHOD OF GENERATING A HIGH DYNAMIC RANGE IMAGE,  
Publication Number: WO/2023/083466, [Link](#)

## Skills

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Programming: C++ & Python  
C++/Python Packages: Eigen, PyTorch, OpenCV, Pandas, Seaborn, Scikit-learn, etc.  
Tools: Git, ROS, CUDA, Vim, Docker, CMake, L<sup>A</sup>T<sub>E</sub>X, GitHub Pages, Bash Script, etc.

## Languages

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German (native)  
English (native)  
French (proficient)

## Reviews

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CVPR, ICCV, ECCV, BMVC, RA-L, ICRA, IROS, T-PAMI, TIP, AAAI

## AWARDS

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UZH Annual Award For outstanding Ph.D. thesis in the Department of Informatics  
ETH Medal For outstanding Master Thesis in Mechanical and Process Engineering  
Willi Studer Prize For the highest grade-point average in Masters degree program (6.0/6.0)  
Presentation Award ONSVP, ICRA 2021 Workshop for the paper “Event-based Asynchronous Sparse Convolutional Networks”  
NCCR Robotics For the paper “Combining Events and Frames using Recurrent Asynchronous Multimodal Networks for Monocular Depth Prediction”  
Master Thesis Award

## References

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Prof. Davide Scaramuzza Professor and Director of the Robotics and Perception Group at UZH  
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Michael Früh CEO and Board Member at F&P Robotics.  
E-mail: michael.frueh@bluewin.ch

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Zurich, 31. Mai 2024