Henri Rebecq

PhD student in Computer Vision and Robotics

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French, 28 years old
Driving license

Academic

2015-Now **PhD Student in Computer Science**, *ETH Zürich/University of Zürich*, Expected graduation: Fall 2019.
Thesis: **Robust Computer Vision with Event Cameras**. Advisor: Prof. Dr. Davide Scaramuzza.
A few selected publications:
- Learning High Speed and High Dynamic Range Video with an Event Camera [8, 1].
  PDF, Video, Code
- Visual Odometry with Events, Frames and IMU [16, 2]. **Best Paper (Honorable Mention), RA-L'18**.
  Project page, PDF, Video 1, Video 2
- SLAM with an Event Camera [5].
  PDF, Video, US Patent
- 3D Reconstruction with an Event Camera [17, 3]. **Best Industry Paper, BMVC'16**.
  PDF, Video, Code

2013-2014 **M.Sc. MVA**, *École Normale Supérieure de Cachan*, Mathematics, Vision & Learning.
Received with highest distinction

2011-2014 **Télécom ParisTech**, *Paris*.
- Graduate school for applied mathematics and computer science engineering
- One of France's highly competitive engineering schools in the "Grandes Ecoles" system

2008-2011 **Classes Préparatoires**, *Lycée Aux Lazaristes*, Lyon, France.
Intensive preparatory course for competitive entrance into top French engineering schools

June 2008 **French scientific baccalaureate received with highest distinction**.
Equivalent to A level in Math, Physics and Chemistry

Professional Experience

August 2019 - November 2019 **Research Scientist Intern**, *Intel Labs*, Munich.
- Learning high speed and high dynamic range video reconstruction with an event camera (project page).
- My work lead to two papers: [8] (CVPR 2019) and [1] (submitted to T-PAMI).

2017 - 2018 **Teaching Assistant**, *ETH Zurich*, Zurich, Vision Algorithms for Mobile Robotics.

April 2014 - June 2015 **Research Engineer**, *Orah*, Paris.
- Designed a full pipeline for performing self-calibration of a multiple wide-angle camera system based on video streams (C++/OpenCV).
- Integrated with the latest version of the software and highlighted as a key new feature.

Awards

Best Paper (Honorable Mention), *Robotics and Automation Letters (RA-L)*, 2018.
Awarded for my paper: *Ultimate SLAM? Combining Events, Images, and IMU for Robust Visual SLAM.*

Qualcomm Innovation Fellowship, 2018, 40 000$.
Awarded for my proposal: *Learning Representations for Low-latency Perception with Frame and Event-based Cameras.*

Mischa Mahowald Prize for Neuromorphic Engineering, 2017, 3000$.
Awarded for *"pathbreaking applications of neuromorphic engineering to robot navigation"*.

Best Industry Paper, *British Machine Vision Conference (BMVC)*, 2016.
Awarded for my paper: *EMVS: Event-based Multi-view Stereo.*

People's Choice Prize & Technical Prize, *Final year project at Télécom ParisTech*, 2012.
Awarded for my project: *FLIP: an automated music page turner.*

Patents

H. Rebecq, G. Gallego, D. Scaramuzza, *Simultaneous Localization and Mapping with an Event Camera*, US 2019/0197715 A1, Issued on January 3, 2018. PDF.

H. Rebecq, T. Horstschaefer, D. Scaramuzza, *Visual-Inertial Odometry with an Event Camera*, EU 17189223.5 - 1906, Filed on November 6, 2017.

Publications

Journal Articles

H. Rebecq, R. Ranftl, V. Koltun, and D. Scaramuzza, "High speed and high dynamic range video with an event camera," 2019, **Submitted to T-PAMI**. [Online]. Available: http://arxiv.org/abs/1906.07165

T. Rosinol Vidal*, **H. Rebecq***, T. Horstschaefer, and D. Scaramuzza, "Ultimate SLAM? combining events, images, and IMU for robust visual SLAM in HDR and high speed scenarios," *IEEE Robot. Autom. Lett.*, pp. 994–1001, 2018, **Best Paper award (Honorable Mention)**. (equal contribution).

H. Rebecq, G. Gallego, E. Mueggler, and D. Scaramuzza, "EMVS: Event-based multi-view stereo - 3D reconstruction with an event camera in real-time," *Int. J. Comput. Vis.*, pp. 1394–1414, 2018.

G. Gallego, J. E. A. Lund, E. Mueggler, **H. Rebecq**, T. Delbruck, and D. Scaramuzza, "Event-based, 6-DOF camera tracking from photometric depth maps," *IEEE Trans. Pattern Anal. Machine Intell.*, pp. 2402–2412, 2018.

H. Rebecq*, T. Horstschäfer*, G. Gallego, and D. Scaramuzza, "EVO: A geometric approach to event-based 6-DOF parallel tracking and mapping in real-time," *IEEE Robot. Autom. Lett.*, pp. 593–600, 2017, (equal contribution).

E. Mueggler, **H. Rebecq**, G. Gallego, T. Delbruck, and D. Scaramuzza, "The event-camera dataset and simulator: Event-based data for pose estimation, visual odometry, and SLAM," *Int. J. Robot. Research*, pp. 142–149, 2017.

E. Mueggler, G. Gallego, **H. Rebecq**, and D. Scaramuzza, "Continuous-time visual-inertial odometry for event cameras," *IEEE Trans. Robot.*, pp. 1425–1440, 2018.

Peer-Reviewed Conference papers

H. Rebecq, R. Ranftl, V. Koltun, and D. Scaramuzza, "Events-to-video: Bringing modern computer vision to event cameras," in *IEEE Int. Conf. Comput. Vis. Pattern Recog. (CVPR)*, 2019.

C. Scheerlinck, **H. Rebecq**, T. Stoffregen, N. Barnes, R. Mahony, and D. Scaramuzza, "CED: color event camera dataset," in *IEEE Int. Conf. Comput. Vis. Pattern Recog. Workshops (CVPRW)*, 2019.

J. Delmerico, T. Cieslewski, **H. Rebecq**, M. Faessler, and D. Scaramuzza, "Are we ready for autonomous drone racing? the UZH-FPV drone racing dataset," in *IEEE Int. Conf. Robot. Autom. (ICRA)*, 2019.

S. Bryner, G. Gallego, **H. Rebecq**, and D. Scaramuzza, "Event-based, direct camera tracking from a photometric 3D map using nonlinear optimization," in *IEEE Int. Conf. Robot. Autom. (ICRA)*, 2019.

H. Rebecq, D. Gehrig, and D. Scaramuzza, "ESIM: an open event camera simulator," in *Conf. on Robotics Learning (CoRL)*, 2018.

D. Gehrig, **H. Rebecq**, G. Gallego, and D. Scaramuzza, "Asynchronous, photometric feature tracking using events and frames," in *Eur. Conf. Comput. Vis. (ECCV)*, 2018, *Oral presentation (acceptance rate: 2.4%)*.

Y. Zhou, G. Gallego, **H. Rebecq**, L. Kneip, H. Li, and D. Scaramuzza, "Semi-dense 3D reconstruction with a stereo event camera," in *Eur. Conf. Comput. Vis. (ECCV)*, 2018, pp. 242–258.

G. Gallego, **H. Rebecq**, and D. Scaramuzza, "A unifying contrast maximization framework for event cameras, with applications to motion, depth, and optical flow estimation," in *IEEE Int. Conf. Comput. Vis. Pattern Recog. (CVPR)*, 2018, pp. 3867–3876.

H. Rebecq*, T. Horstschaefer*, and D. Scaramuzza, "Real-time visual-inertial odometry for event cameras using keyframe-based nonlinear optimization," in *British Machine Vis. Conf. (BMVC)*, 2017, (equal contribution) *Oral presentation (acceptance rate: 5.6%)*.

H. Rebecq, G. Gallego, and D. Scaramuzza, "EMVS: Event-based multi-view stereo," in *British Machine Vis. Conf. (BMVC)*, 2016, **Best Industry Paper award.**

Z. Zhang, **H. Rebecq**, C. Forster, and D. Scaramuzza, "Benefit of large field-of-view cameras for visual odometry," in *IEEE Int. Conf. Robot. Autom. (ICRA)*, 2016.

Public Demos

Events-To-Video: Real-Time Image Reconstruction With an Event Camera, *CVPR*, 2019.
UltimateSLAM? Combining Events, Frames and IMU for Robust Visual SLAM, *ECCV & CVPR*, 2018.
EVO: Event-based 6-DOF Parallel Tracking and Mapping in Real-time, *ECCV & CVPR*, 2018.

Skills

Computer

Programming	C++, Python, Java	Scientific	OpenCV, NumPy
Machine Learning	PyTorch	Misc	HTML/CSS, LaTeX

Languages

French	**Native language**	
English	**Fluent**	*Cambridge CAE*
German	**Intermediate**	*Studied for 5 years in high school, 4 years casual speaking in Zurich*
Spanish	**Intermediate**	*Studied for 2 years, volunteer work in Mexico for 2 months*

Other Activities

Music	I have been playing the piano for 20 years (preferred genres : boogie-woogie and classical music).
Video	I am fond of videomontage & visual effects (using tools like Blender, Adobe Premiere, After Effects).