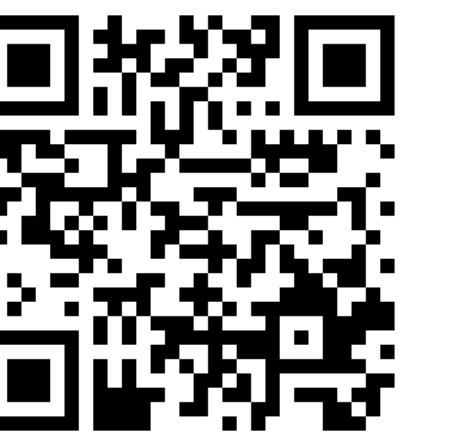


Asynchronous, Photometric Feature Tracking using Events and Frames



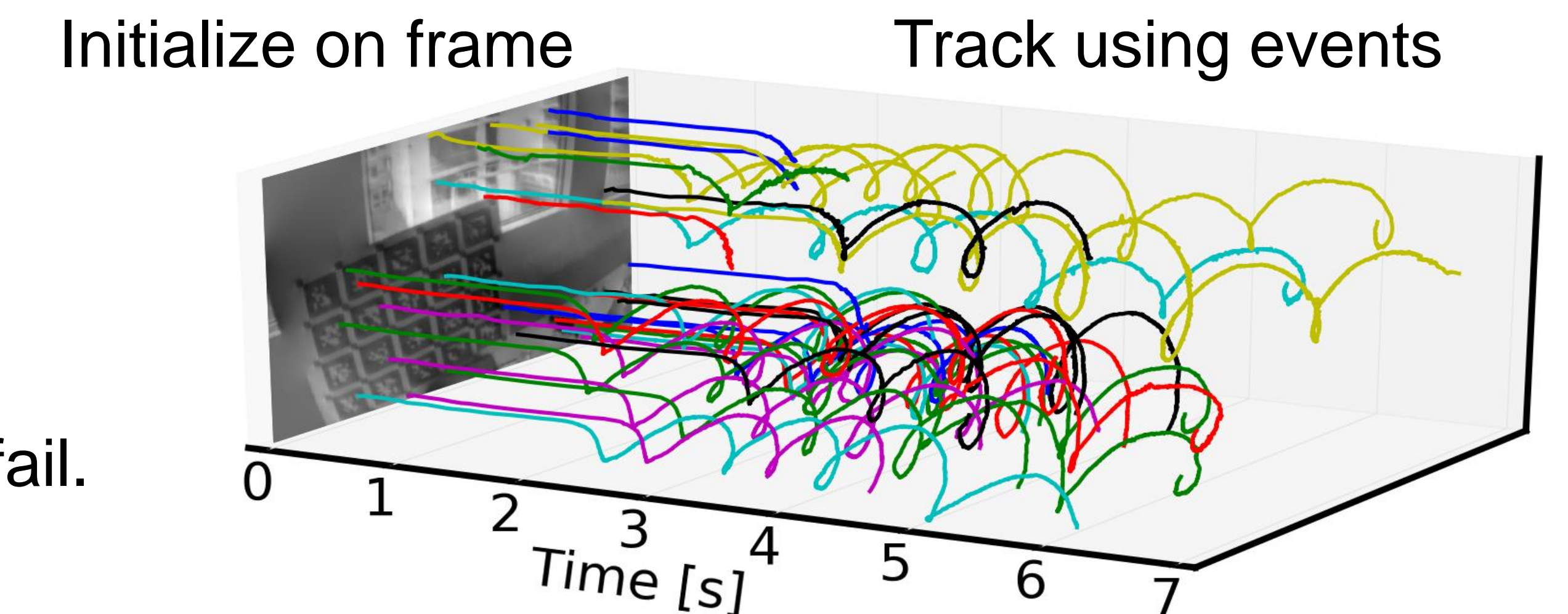
Daniel Gehrig, Henri Rebecq, Guillermo Gallego, Davide Scaramuzza

Motivation: Feature tracking using standard cameras is not robust to motion blur, HDR and large displacements.

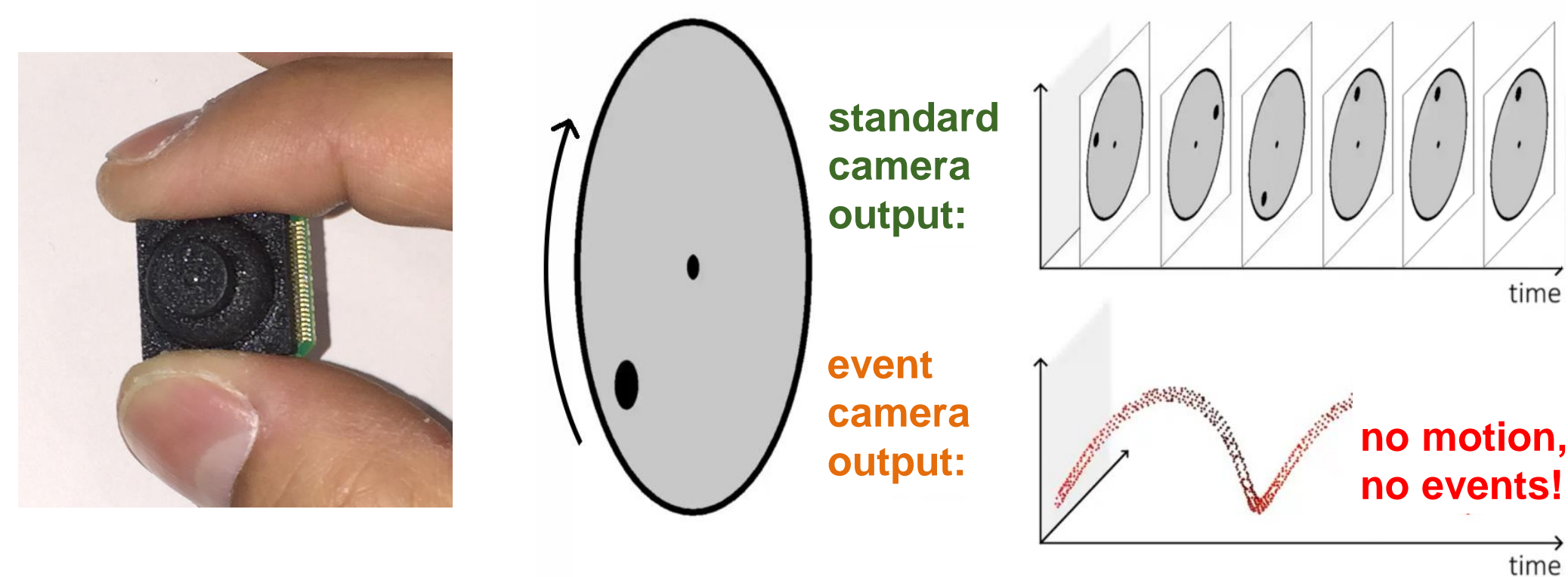
Goal: Combine frame- and event- based cameras to achieve **unprecedented accuracy and robustness** in challenging HDR and **high-speed** scenarios

Key Properties:

- **Asynchronous, low-latency tracking**
- **Initialize features using frames and track using events.**
- **Joint estimation of warp parameters and optic flow.**
- Works even in **high-speed** and **HDR** scenes, where standard cameras fail.
- **More accurate and robust than state-of-the-art**

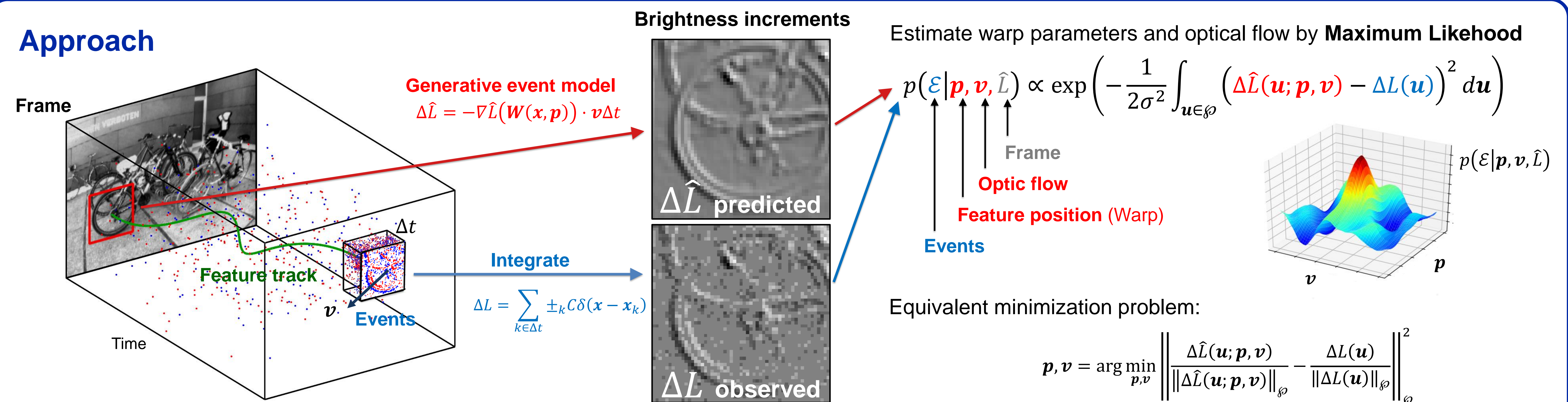


What is an Event Camera?

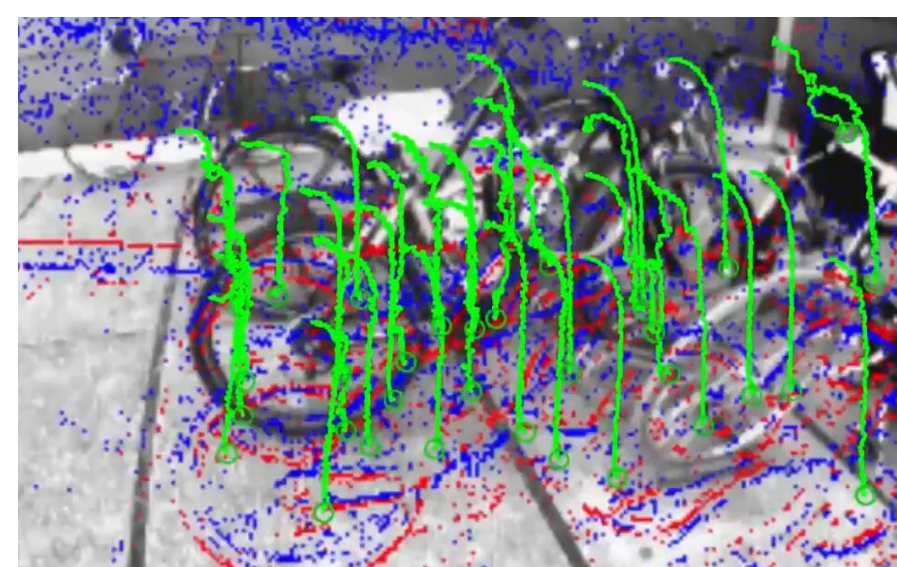


- Only transmits **brightness changes**.
- Output is a stream of **asynchronous events**.
- **Advantages:** low latency, no motion blur, HDR.

Approach



Watch Video!

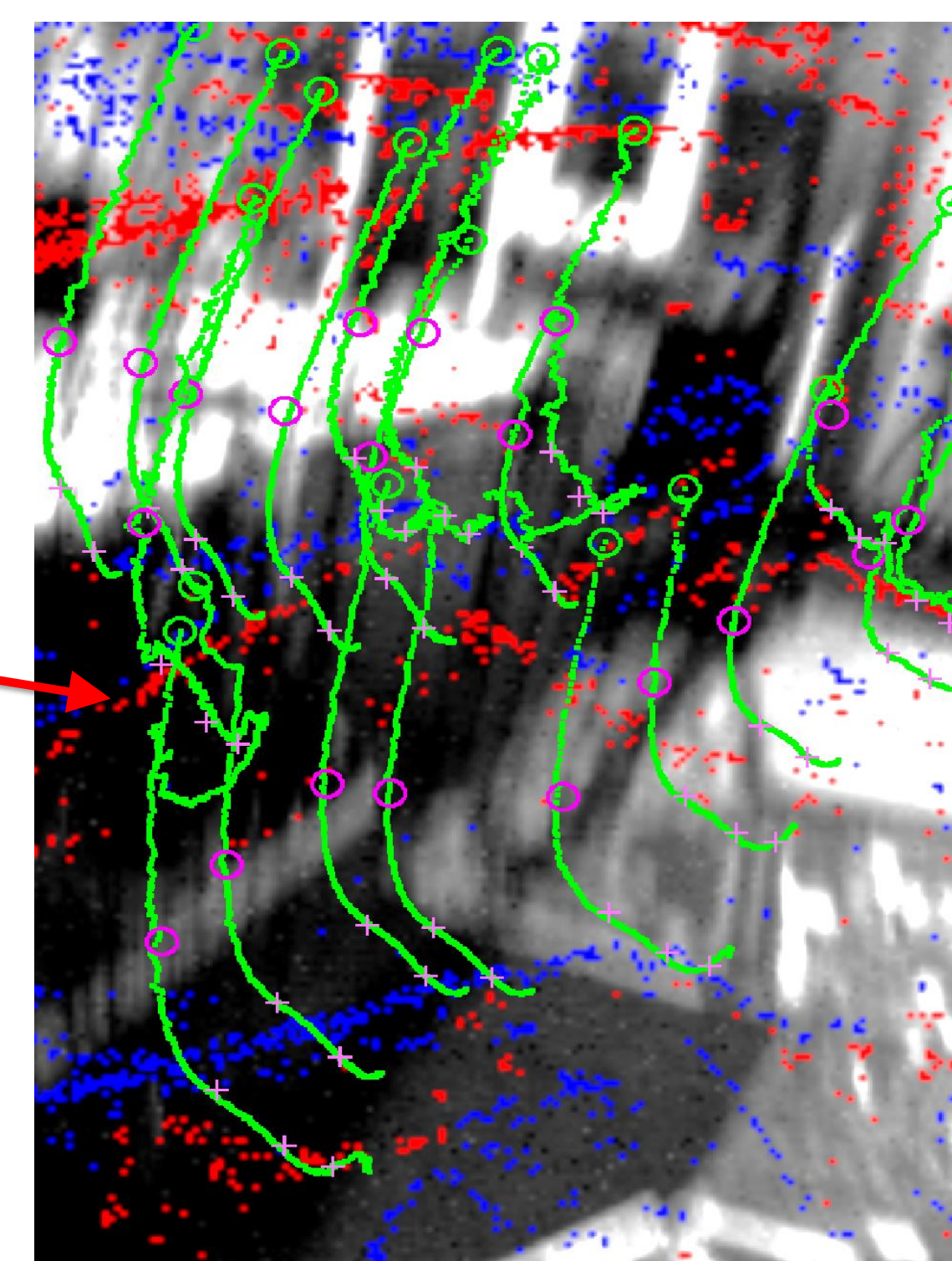


Sponsors



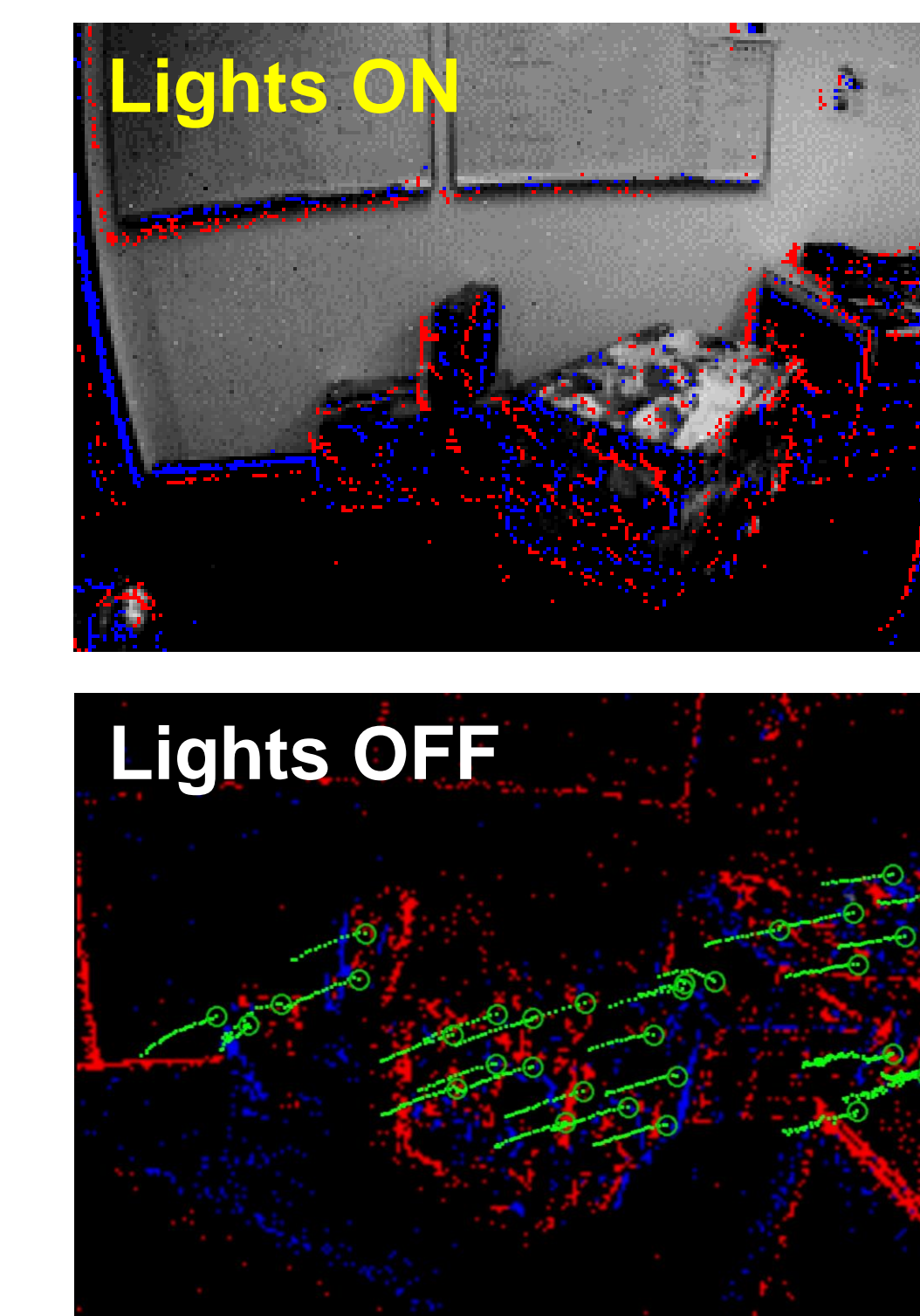
High-Speed Tracking

- **Tracks** in the **blind-time** between frames
- **Events** do not suffer from motion blur.
- **Frame-based methods** fail.



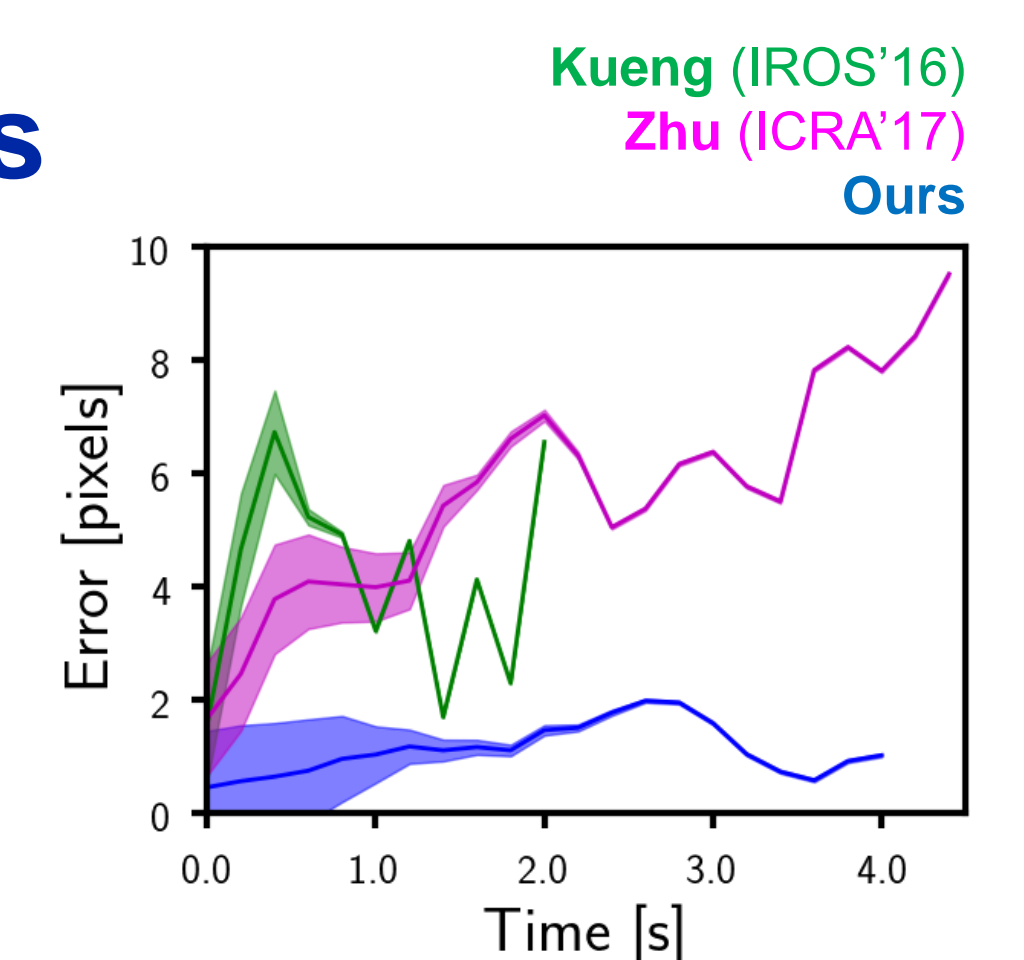
Blurred frames! ↑

Low-Light Tracking



Tracks in the dark!

Quantitative Analysis



Scene	Datasets	Error [px]			Feature age [s]		
		Ours	Kueng	Zhu	Ours	Kueng	Zhu
Black and White	shapes_6dof	0.64	1.75	3.04	3.94	1.53	1.30
	checkerboard	0.78	1.58	2.36	8.23	2.76	7.12
High contrast	poster_6dof	0.67	2.86	2.99	2.65	0.65	2.56
	boxes_6dof	0.90	3.10	2.47	1.56	0.78	1.56
Natural	bicycles	0.75	3.65	3.66	1.15	0.49	1.26
	rocks	0.80	2.11	3.24	0.78	0.85	1.13