PURDUE INNOVATES | Office of Technology Commercialization

An Object Detection Software for Extreme Low-light Conditions

Low-light object detection algorithm boosts precision >50% at 1 photon/pixel for surveillance, night vision, and microscopy.

â€‹Researchers at Purdue University developed a method of photon detection in low-light conditions that limits noise using a non-local module and a student-teacher network. The non-local module ("student") aggregates the light from bursts of frames instead of single frames, and the student is trained to match the features produced by a teacher, which detects light in high-photon conditions. â€‹Existing techniques for image processing are not designed for photon-limited conditions; attempts to overcome photon-limited conditions are less successful when the noise is strong. Integrated with the latest photon counting devices, the algorithm developed by the Purdue researchers achieves more than 50% mean average precision at a photon level of 1 photon per pixel, which is over 6% higher than the market leader. The high performance demonstrated by this algorithm in low-light conditions has potential applications in night vision, surveillance, and microscopy. â€‹ â€‹

Related Publication: C. Li, X. Qu, A. Gnanasambandam, O. A. Elgendy, J. Ma and S. H. Chan, "Photon-Limited Object Detection using Non-local Feature Matching and Knowledge Distillation,"â€¯2021 IEEE/CVF International Conference on Computer Vision Workshops (ICCVW), Montreal, BC, Canada, 2021, pp. 3959-3970, doi: 10.1109/ICCVW54120.2021.00443.

Technology Validation: â€‹Integrated with the latest photon counting devices, the algorithm achieves more than 50% mean average precision at a photon level of 1 photon per pixel, which is over 6% higher than the market leader. â€‹

Advantages:

-Versatile

-Precise

Technology ID

2022-CHAN-69559

Category

Artificial Intelligence & Machine Learning/Computer Vision & Image Recognition
Artificial Intelligence & Machine Learning/AI Model Optimization & Acceleration Tools
Computing/Networking & Connectivity

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Further information

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View online

-Limits shot noise

Applications:

-Night vision

-Surveillance

-Microscopy

TRL: 4

Intellectual Property:

Provisional-Gov. Funding, 2021-10-10, United States

Utility-Gov. Funding, 2022-10-11, United States

Keywords: Electrical Engineering, Microscopyâ€‹, Night Vision, Surveillance