EPFL-TTO

EPFL Innovation Park J
CH-1015 Lausanne
Switzerland
+41 21 693 70 23
http://tto.epfl.ch/

Research Contact

Prof Sahand Jamal Rahi
+41 21 693 04 55
sahand.rahi@epfl.ch

TTO Contact

Dr. Bea Arnold
+41 21 693 69 17
bea.arnold@epfl.ch

Long-Term Automated Behavioral Monitoring of C. elegans

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Description

C. elegans is a cornerstone model organism in biology, aging research, and drug discovery. Existing imaging platforms and analysis tools enable short-term behavioral assays or population-level measurements, but they struggle with continuous, long-term monitoring of individual animals. The technology described here combines custom long-term imaging hardware with a hybrid AI-driven analysis pipeline, integrating deep learning with classical motion-based image processing. This approach enables robust, high-quality, multi-week behavioral monitoring of individual worms with substantially reduced error rates and minimal manual intervention.

Advantages

- Superior accuracy and robustness: 40–50% reduction in segmentation errors,

  reliable tracking over multi-week recordings.
- Reduced manual intervention: reducing significantly the need for manual proofreading and correction, scalable, high-throughput analysis of large image datasets.
- Hybrid AI strategy: broadly applicable framework for combining deep learning with classical motion-based image analysis, potential extension to other small organisms and imaging contexts.

Applications

- Drug discovery, toxicity testing, and lifespan or health span studies
- Research on aging, neurodegeneration, and functional genomics