Omer Yuval

omer1yuval1@gmail.com | Homepage | Google Scholar | Academic profile | GitHub | Linkedin

I am a computational neuroscience researcher with a strong software engineering background. I turn complex ideas into working software—from conceptualization through delivery—by initiating and leading cross-disciplinary projects and collaborating smoothly with teams. I hold a **PhD** in Computational Neuroscience. My core toolkit spans **Python**, **MATLAB**, and **full-stack JavaScript (React + Node.js)**. I specialize in **signal processing** (including 2D/3D image & video), **multi-objective optimization**, and **reinforcement learning for physical simulations**—methods I've used extensively and mastered in my work. My research software and results have been **published in peer-reviewed scientific journals** and presented at scientific conferences.

Education and employment

Postdoctoral researcher (April 2023 - current)

- Faculty of Life Sciences, Tel Aviv University, Israel.
- Subject: Mechanical modelling of insect control of locomotion using model-free reinforcement learning.

Research assistant in Intelligent Transport Systems (July 2022 - November 2022)

- Institute for Transport Studies, University of Leeds, UK.
- Subject: Multi-objective optimisation of vehicle speed profile for reducing emission and fuel consumption.
- Part-time.

Teaching online programming lessons for kids (April 2022 - April 2023)

- Cypher Coders, UK.
- Subject: Using javascript to develop 2D and 3D games.
- Part-time.

PhD in computational neuroscience (2017- January 2022)

- School of Computing, Faculty of Engineering, University of Leeds, UK.
- Subject: The neuromechanical mechanisms underlying the locomotion of the microswimmer *C. elegans* in 3D environments.
- University funded.

Master's degree in computational neuroscience (2014 - 2016)

- Faculty of biology, Technion, Haifa, Israel.
- Subject: Segmentation and morphological analysis of a highly-branched neuron in *C. elegans*, used to study the interconnection between neuronal structure and function.
- University funded.

Bachelor's degree in biology (2010 - 2014)

- Faculty of biology, Technion, Haifa, Israel.

Experience

- **Programming languages**: Python, Javascript (inc. React.js and Node.js), MATLAB, HTML, PHP and SQL.
- **Projects & skillset**: Motor control, Mechanical modelling, Reinforcement learning, Navigation, 3D Computer vision, Image segmentation, 3D Object tracking, multi-objective optimisation, Mathematical modelling of neuronal dynamics, Multi-camera calibration, Parallel computing, HPC (CPU/GPU), Linux, Windows, Graphical user-interface.
- **Teaching assistant**: Machine learning (Python), Procedural programming (C), Object-oriented programming (Java), Bioinformatics practicals (python and statistics), Experimental skills in neuroscience (Java and fiji/imageJ), Intermediate Skills for Professional and Academic Development (C++).
- **Laboratory work**: 3D imaging and calibration, Confocal microscopy, Locomotion and navigation assays, Optogenetics, Calcium-imaging.

Publications

- **Yuval O.**, Amir A., Ozeri E., Lilti L., Ayali A. (2025). Simulating locomotion under anatomical and mechanical constraints. Accepted for presentation at AMAM/LokoAssist, TU Darmstadt, Germany (to appear).
- Amir A., **Yuval O.**, Ayali A. Six-legged bound: a newly described insect gait (2025). *Royal Society Open Science*, 12(6), 250143. https://doi.org/10.1098/rsos.250143.
- Iosilevskii, Y., **Yuval, O.**, Shemesh, T., & Podbilewicz, B. (2024). Protocol for neuron tracing and analysis of dendritic structures from noisy microscopy images using Neuronalyzer. *STAR protocols*, 5(2), 103063. https://doi.org/10.1016/j.xpro.2024.103063.
- Ilett, T. P., **Yuval, O.**, Ranner, T., Cohen, N., & Hogg, D. C. (2023). 3D shape reconstruction of semi-transparent worms. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (pp. 12565-12575).
- **Yuval, O.**, Lin, Z., & Chen, H. (2023). Multiobjective speed profile optimisation considering fuel and NOx. In *Proceedings of 15th ITS European Congress*. Leeds.
- **Yuval, O.** (2022). The neuromechanical control of Caenorhabditis elegans head motor behaviour in 3D environments (Doctoral dissertation, University of Leeds).
- **Yuval, O.**, Iosilevskii, Y., Meledin, A., Podbilewicz, B., & Shemesh, T. (2021). Neuron tracing and quantitative analyses of dendritic architecture reveal symmetrical three-way-junctions and phenotypes of git-1 in C. elegans. *PLoS Computational Biology*, 17(7), e1009185. https://doi.org/10.1371/journal.pcbi.1009185.

- Deng, L., Denham, J. E., Arya, C., **Yuval, O.**, Cohen, N., & Haspel, G. (2021). Inhibition underlies fast undulatory locomotion in Caenorhabditis elegans. *Eneuro*, 8(2). https://doi.org/10.1523/ENEURO.0241-20.2020.
- Salfelder, F., **Yuval, O**., Ilett, T. P., Hogg, D. C., Ranner, T., & Cohen, N. (2020). Markerless 3D spatio-temporal reconstruction of microscopic swimmers from video. *visual observation and analysis of vertebrate and insect behavior*.

Under review and in preparation

- **Yuval O.**, Amir A., Ayali A. Multiple locomotion gaits in the mole cricket. Under review. https://doi.org/10.1101/2025.01.19.633773
- **Yuval O.**, Amir A., Ayali A. Biologically-constrained insect models enable realistic simulations and improve biomechanical predictions of locomotion. Under review.
- **Yuval O.**, Amir A., Ben Zion, M. Y., Ayali A. Vibration of a tilted plane reveals passive mechanical tendency of insects for uphill body alignment and climbing. Manuscript in preparation.
- **Yuval O.**, Amir A., Ayali A. Gait transition in mole crickets: how insects switch between leg coordination patterns? Manuscript in preparation.
- **Yuval O.**, Illett T., Salfelder F., Holbrook R., Runner T., Cohen N. The neuromechanical control of *C. elegans* head motor behaviour in 3D environments. Manuscript in preparation.
- **Yuval O.**, Cohen N. Bistable head motor neurons underlie spontaneous gait selection during chiral forward locomotion. Manuscript in preparation.

Reviews

- Peer reviewer for **Entomological Science,** 2024.
- Peer Reviewer for **The IEEE International Conference on Robotics and Biomimetics (ROBIO),** August 2024**.**

Projects

- **Semantic representation and matching of LaTeX expressions**.
  Demo: https://omer1yuval1.github.io/LaTeXs/.

Conferences and demonstrations

- Poster presentation at the **AMAM/LokoAssist** at TU Darmstadt, Germany (2025).
- Talk at the **27th International Congress of Entomology** at Kyoto, Japan (ICE2024, 2024).
- Poster presentation at the **European Worm Meeting** (2020 and 2022).
- Poster presentation at the **UK Worm Meeting** at Leeds University (2018) and Imperial College London (2019).
- Poster presentation at the **International Worm Meeting** at UCLA (2015 and 2019).
- Poster presentation at the **UK Computational Worm Meeting** at The Royal Society, London, UK (2018).
- Conference presentation at the **annual Biology faculty retreat** in Israel (2014).

- Laboratory demonstrations for master's students in biology (2018-2019).
- Organisation of a stall for an **outreach event** at Leeds city museum (2019).
- Participation in a **fire-fighting robot contest** in Israel (2006 and 200).