Elias Nehme

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My research lies at the intersection of computational imaging, computer vision, and machine learning, and their application to computational microscopy. Previously, I worked on optimal sensing, reconstruction, and uncertainty quantification of challenging measurements (for example snapshot 3D sensing). More recently, I'm excited about exploring the potential of foundational vision-language models in science.

EDUCATION

Electrical and Computer Engineering | *Doctor of Philosophy (direct track)* OCT. 2018 – JUN. 2024
Technion - IIT
- *Thesis*: "Deep Computational Imaging: Optimal sensing, reconstruction, and uncertainty quantification".
- *Supervisors*: Prof. Tomer Michaeli and Prof. Yoav Shechtman.

Biomedical Engineering | *Bachelor of Science* OCT. 2011 – MAR. 2016
Technion - IIT

WORK EXPERIENCE

Verily (Google Life Sciences) | *Research Scientist Intern* SEP. 2021 – FEB. 2022
- Reliable and explainable deep learning for healthcare applications.

Magentiq Eye | *Image Processing and Deep Learning Engineer* JUN. 2017 – JAN. 2018
- Polyp detection, classification, and tracking in video colonoscopy.

Inspiring Vision | *Software and Algorithm Developer* MAY. 2017 – JAN. 2018
- Teeth segmentation, classification, and tracking in dental data.

TEACHING EXPERIENCE

Technion – IIT | *Teaching Assistant* MAR. 2017 – JUN. 2023
- T.A. in charge: "Statistical Methods in Image Processing", EE048954; "Algorithms and Applications in Computer Vision", EE046746; "Computational Optical Imaging", BME336547; "Analysis of Biological Signals", BME336208.
- Lab writing/instructing: "Diffusion Models", EE045107; "Digital Systems", BME335002.

SELECTED PUBLICATIONS (CITATIONS: 1700+, SEE 🎓 SCHOLAR)

[1] **E. Nehme**, R. Mulayoff, and T. Michaeli. "Hierarchical uncertainty exploration via feedforward posterior trees." *arXiv, 10.48550/2405.15719*, 2024. *Under review at **NeurIPS**.

[2] N. Opatovski*, **E. Nehme***, A. Parizat, O. Alalouf, and Y. Shechtman. "Depth-enhanced high throughput microscopy by compact PSF engineering." **Nature Communications**, 15(1), 4861, 2024. *Equal contribution.

[3] O. Yair, **E. Nehme**, and T. Michaeli, "Uncertainty visualization via low-dimensional posterior projections", *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2024.

[4] **E. Nehme**, O. Yair, and T. Michaeli, "Uncertainty quantification via neural posterior principal components", *Thirty-seventh Conference on Neural Information Processing Systems (**NeurIPS**)*, 2023.

[5] **E. Nehme***, B. Ferdman*, L.E. Weiss, T. Naor, D. Freedman, T. Michaeli, and Y. Shechtman, "Learning optimal wavefront shaping for multi-channel imaging", *IEEE International Conference on Computational Photography (**ICCP**)*, 2021. *Selected for a Special Issue of IEEE Transactions on Pattern Analysis and Machine Intelligence.

[6] **E. Nehme**, D. Freedman, R. Gordon, B. Ferdman, L.E. Weiss, O. Alalouf, R. Orange, T. Michaeli, and Y. Shechtman. "DeepSTORM3D: dense 3D localization microscopy and PSF design by deep learning", **Nature Methods**, 17(7), 734-740, 2020. *Best poster award at QBI 2019.

[7] **E. Nehme**, L.E. Weiss, T. Michaeli, and Y. Shechtman. "Deep-STORM: super-resolution single-molecule microscopy by deep learning". **Optica** 5, 458-464, 2018. *Highlighted in Nature Methods.

PATENTS

[1] Y. Shechtman, B. Ferdman, N. Opatovski, **E. Nehme**, and R. Kedem. "Lens system for wavefront modulation." **U.S. Patent** *Application No. 18/567,431*, 2024.

HONORS AND AWARDS

- Jacobs-Qualcomm Fellowship in 3D Imaging and Reconstruction, 2020-2021, 2022-2023.

- Excellent Paper Award, MLIS-TCE Conference, 2022.
- VATAT Prize in Data Science, Machine Learning and Intelligent Systems, 2019, 2021.
- Best Poster Award, Quantitative Bio-Imaging Conference, France, 2019.
- Excellent TA Award, Biomedical Engineering, 2018, 2019.
- Lev-Margulis Memorial Prize, Israeli Society for Microscopy (ISM) Conference, 2018.

SKILLS

- **Languages:** Arabic – Native, Hebrew – Native, English – Professional, Russian – Elementary.
- **Programming:** Python (Pytorch, Scikit-image, Pandas), MATLAB, C, C++, HTML, CSS.
- **Tools:** Linux, Git, Github, LaTeX.

TALKS

[1] **Invited Talk**, "Visualizing reconstruction uncertainty in imaging inverse problems." *Vision Seminar, Hebrew University of Jerusalem, Jerusalem, Israel*, Jun 16, 2024.

[2] **Invited Talk (Virtual)**, "Visualizing reconstruction uncertainty in imaging inverse problems." *AstraZeneca Center for Artificial Intelligence, Cambridge, UK*, Jun 14, 2024.

[3] **Invited Talk**, "Quantifying and visualizing reconstruction uncertainty for imaging." *Artificial Intelligence for Imaging, Sant Carles de la Rapita, Tarragona, Spain*, May 26-Jun 01, 2024.

[4] **Invited Talk**, "Towards intelligent microscopes with deep learned optics." *AI for Scientific Data Analysis, Chalmers University of Technology, Gothenburg, Sweden*, May 31-Jun 01, 2023.

[5] **Journal Club (Intern)**, "Learning optimal wavefront shaping for multi-channel imaging." *Verily Research, Haifa, Israel*, Feb 16, 2022.

[6] **Paper Oral Talk**, "Learning optimal wavefront shaping for multi-channel imaging." *IEEE International Conference on Computational Photography 2021, Leonardo Hotel, Haifa, Israel*, May 23-25, 2021.

[7] **Plenary Award Lecture**, "DeepSTORM3D: deep learning for dense 3D localization microscopy." *Quantitative BioImaging 2020, Mathematical Institute at Oxford University, Oxford, UK*, Jan 6-9, 2020.

[8] **Invited Talk**, "Deep learning for dense single molecule localization microscopy." *Medical Machine Learning Meetup, Zebra Medical, Herzliya, Israel*, Sep 23, 2019.

[9] **Journal Club**, "Deep-STORM: super-resolution single-molecule microscopy by deep learning." *Prof. Gabriela Schlau-Cohen's group, Massachusetts Institute of Technology, Boston, Massachusetts, United States of America*, Aug 31, 2018.

[10] **Plenary Award Lecture**, "Deep-STORM: super-resolution single-molecule microscopy by deep learning." *Israeli Society for Microscopy 2018, Dan Panorama Hotel, Tel Aviv, Israel*, Jun 20, 2018.

ACADEMIC SERVICE

Israel's Ministry of Education & Technion-IIT | *Teachers Qualification Program* MAR. 2019 – MAR. 2021
- Basics of biological signal and image processing delivered to electronics high school teachers.

Journals & Conferences | *Reviewer* MAY. 2018 – PRESENT
- Optics Express, Optica, Nature Scientific Reports, IEEE TCI, CVPR, NeurIPS, ICLR.