

Elias Nehme

Curriculum Vitae, 06/12/2023

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Researcher in Computational Imaging and Machine Learning

Education

- 2018–2024 **Ph.D. Candidate in Electrical Engineering (Direct Track)**, *Technion - IIT*.
 - Thesis: "Deep Learning for Computational Imaging".
 - Supervised by Prof. Tomer Michaeli and Prof. Yoav Shechtman.
- 2011–2016 **B.Sc. in Biomedical Engineering**, *Technion - IIT*.

Professional Experience

- 2021–2022 **Verily (Google Life Sciences)**, *Haifa*.
Research Scientist Intern.
- 2017–2018 **Magentiq Eye**, *Haifa*.
Image Processing and Deep Learning Engineer.
- 2017–2018 **Inspiring Vision**, *Haifa*.
Software and Algorithm Developer.
- 2015–2016 **The Laboratory for Synthetic Biology and Bio-electronics**, *Haifa*.
Research Assistant.
- 2014–2015 **Hospitech Respiration & Rambam Medical Center**, *Haifa*.
Clinical Trials Assistant.

Teaching Experience

- 2018–2023 **Teaching Assistant**, *Technion*.
 - T.A. in charge: "Statistical Methods in Image Processing", EE048954.
 - T.A. in charge: "Algorithms and Applications in Computer Vision", EE046746.
 - T.A. in charge: "Computational Optical Imaging", BME336547.
 - T.A. in charge: "Analysis of Biological Signals", BME336208.
- 2016–2017 **Lab Instructor**, *Technion*.
 - Undergraduate lab on "Digital Systems", BME335002.

Fellowships, Awards, and Honors

- 2022–2023 **Jacobs-Qualcomm Fellowship in 3D Imaging and Reconstruction**, *Technion*.
2022 **Excellent Paper Award**, MLIS-TCE Conference, Israel.
2021 **VATAT Prize in Data Science, Machine Learning and Intelligent Systems**, *Technion*.
- 2020–2021 **Jacobs-Qualcomm Fellowship in 3D Imaging and Reconstruction**, *Technion*.
2019 **VATAT Prize in Data Science, Machine Learning and Intelligent Systems**, *Technion*.
2019 **Best Poster Award**, Quantitative Bio-Imaging Conference, France.
- 2018–2019 **Excellent TA Award**, Biomedical Engineering, *Technion*.
2018 **Lev-Margulis Memorial Prize**, Israeli Society for Microscopy (ISM) Conference, Tel Aviv.
2016 **Dean Excellence Award**, Biomedical Engineering, *Technion*.

Publications

Journal Publications

1. **O. Goldenberg, B. Ferdman, E. Nehme, Y.S. Ezra, and Y. Shechtman**, "Learning Optimal Multicolor PSF Design for 3D Pairwise Distance Estimation", Intelligent Computing, 2022, 0004 (2022).

2. **T. Naor, Y. Nogin, E. Nehme, B. Ferdman, L.E. Weiss, O. Alalouf, and Y. Shechtman**, “*Quantifying cell-cycle-dependent chromatin dynamics during interphase by live 3D tracking*”, *iScience*, 25(5), 104197 (2022).
3. **A. Saguy, F. Jünger, A. Peleg, B. Ferdman, E. Nehme, A. Rohrbach, and Y. Shechtman**, “*Deep-ROCS: from speckle patterns to superior-resolved images by deep learning in rotating coherent scattering microscopy*”, *Optics Express*, 29(15), 23877-23887 (2021).
4. **A. Saguy, T.N. Baldering, L.E. Weiss, E. Nehme, C. Karathanasis, M.S. Dietz, M. Heilemann, and Y. Shechtman**, “*Automated Analysis of Fluorescence Kinetics in Single-Molecule Localization Microscopy Data Reveals Protein Stoichiometry*”, *The Journal of Physical Chemistry B*, 125 (22), 5716-5721 (2021).
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 Transactions on Pattern Analysis and Machine Intelligence*, 43(7), 2179-2192 (2021).
*E. Nehme and B. Ferdman contributed equally to this work.
6. **R. Orange, E. Nehme, L.E. Weiss, B. Ferdman, O. Alalouf, and Y. Shechtman**, “*3D printable diffractive optical elements by liquid immersion*”, *Nature Communications*, 12(1), 1-6 (2021).
7. **L. von Chamier, R.F. Laine, J. Jukkala, C. Spahn, D. Krentzel, E. Nehme, M. Lerche, S. Hernández-Pérez, P.K. Mattila, E. Karinou, S. Holden, A.C. Solak, A. Krull, T. Buchholz, M.L. Jones, L.A. Royer, C. Leterrier, Y. Shechtman, F. Jug, M. Heilemann, G. Jacquemet, and R. Henriques**, “*Democratising deep learning for microscopy with ZeroCostDL4Mic*”, *Nature Communications*, 12(1), 1-18 (2021).
8. **R. Gordon-Soffer, L.E. Weiss, R. Eshel, B. Ferdman, E. Nehme, M. Bercovici, and Y. Shechtman**, “*Microscopic scan-free surface profiling over extended axial ranges by point-spread-function engineering*”, *Science Advances*, 6(44), eabc0332 (2020).
9. **B. Ferdman, E. Nehme, L.E. Weiss, R. Orange, O. Alalouf, and Y. Shechtman**, “*VIPR: Vectorial Implementation of Phase Retrieval for fast and accurate microscopic pixel-wise pupil estimation*”, *Optics Express*, 28(7), 10179-10198 (2020).
10. **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).
11. **N. Granik, L.E. Weiss, E. Nehme, M. Levin, M. Chein, E. Perlson, Y. Roichman, and Y. Shechtman**, “*Single particle diffusion characterization by deep learning*”, *Biophysical Journal* 117, 185-192 (2019).
12. **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).
 - o Research highlighted in *Nature Methods*: R. Strack, “*Deep learning advances super-resolution imaging*”, *Nature Methods* 15, 403 (2018).

Peer-reviewed Conference Proceedings

1. **E. Nehme, O. Yair, and T. Michaeli**, “*Uncertainty quantification via neural posterior principal components*”, Thirty-seventh Conference on Neural Information Processing Systems (NeurIPS), December 12-14, 2023.
2. **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), May 23-25, 2021.
*Selected for a Special Issue of IEEE Transactions on Pattern Analysis and Machine Intelligence.

Preprints

1. **G. Volpe, C. Wählby, L. Tian, M. Hecht, A. Yakimovich, K. Monakhova, L. Waller, I.F. Sbalzarini, C.A. Metzler, M. Xie, K. Zhang, I.C.D. Lenton, H. Rubinsztein-Dunlop, D. Brunner, B. Bai, A. Ozcan, D. Midtvedt, H. Wang, N. Sladoje, J. Lindblad, J.T. Smith, M. Ochoa, M. Barroso, X. Intes, T. Qiu, L. Yu, S. You, Y. Liu, M.A. Ziatdinov, S.V. Kalinin, A. Sheridan, U. Manor, E. Nehme, O. Goldenberg, Y. Shechtman, H.K. Moberg, C. Langhammer, B. Špačková, S. Helgadottir, B. Midtvedt, A. Argun, T. Thalheim, F. Cichos, S. Bo, L. Hubatsch, J. Pineda, C. Manzo, H. Bachimanchi, E. Selander, A. Homs-Corbera, M. Fränzl, K. de Haan, Y. Rivenson, Z. Korczak, C.B. Adiels, M. Mijalkov, D. Veréb, Y. Chang, J.B. Pereira, D. Matuszewski, G. Kylberg, I. Sintorn, J.C. Caicedo, B.A. Cimini, M.A.L. Bell, B.M. Saraiva, G. Jacquemet, R. Henriques, W. Ouyang, T. Le, E. Gómez-de-Mariscal, D. Sage, A. Muñoz-Barrutia, E.J. Lindqvist, and J. Bergman**, "Roadmap on deep learning for microscopy", arXiv, 10.48550/2303.03793, (2023).
2. **D. Xiao, R. Orange, N. Opatovski, A. Parizat, E. Nehme, O. Alalouf, and Y. Shechtman**, "Large-FOV 3D localization microscopy by spatially variant point spread function generation", bioRxiv, 10.1101/2023.07.30.551150, (2023).

Conferences

Talks

1. **Invited Talk**, "Towards intelligent microscopes with deep learned optics", AI for Scientific Data Analysis Mini-conference, Chalmers University of Technology, Gothenburg, Sweden, May 31-Jun 01, 2023.
2. **Paper Talk**, "Learning optimal wavefront shaping for multi-channel imaging", IEEE International Conference on Computational Photography 2021, Leonardo Hotel, Haifa, Israel, May 23-25, 2021.
3. **Plenary Award Lecture**, "DeepSTORM3D: deep learning for dense 3D localization microscopy", Quantitative Biolmaging 2020, Mathematical Institute at the University of Oxford, Oxford, UK, January 6-9, 2020.
4. **Plenary Award Lecture**, "Deep-STORM: super-resolution single-molecule microscopy by deep learning", Israeli Society for Microscopy 2018, Dan Panorama Hotel, Tel Aviv, Israel, June 20, 2018.

Poster Presentations

1. **E. Nehme, O. Yair, and T. Michaeli**, "Uncertainty quantification via neural posterior principal components", Thirty-seventh Conference on Neural Information Processing Systems (NeurIPS), New Orleans, Louisiana, United States of America, Dec 15, 2023.
2. **E. Nehme, L.E. Weiss, D. Freedman, T. Michaeli, and Y. Shechtman**, "Deep learning for dense single-molecule localization microscopy", Learning for Computational Imaging Workshop in conjunction with ICCV 2019, Seoul, South Korea, Nov 2, 2019.
3. **E. Nehme, D. Freedman, T. Michaeli, and Y. Shechtman**, "DeepSTORM3D: deep learning for dense 3D localization microscopy", Quantitative Biolmaging 2019, Rennes, France, Jan 9-12, 2019.
4. **E. Nehme, L.E. Weiss, T. Michaeli, and Y. Shechtman**, "DeepSTORM: super-resolution single-molecule microscopy by deep learning", NANO IL, International convention center, Jerusalem, Israel, Oct 9-11, 2018.

Patents

1. **Y. Shechtman, B. Ferdman, N. Opatovski, E. Nehme and R. Kedem**, "Lens system for wavefront modulation", WO2022259243A1, (2022).

Extracurricular Activities and Academic Service

- 2019-2021 **Teachers Qualification Program**, Israel's Ministry of Education & Biomedical Engineering, Technion-IIT. Basics of biological signal and image processing delivered to electronics high school teachers.
- 2018-Present **Reviewer**, *Optics Express*, *Biomedical Optics Express*, *Optica*, *Nature Scientific Reports*, *Patterns*, and *CVPR*.
- 2015 **Students Semester Representative**, *Biomedical Engineering*, Technion-IIT.
- 2013-2014 **Nachshon Coordinator**, *The Center of Educational Technology (CET) & Perach*. Supervising a group of 60 tutors, each one mentoring a group of 2-3 students from peripheral high schools for the 5-unit curriculum in mathematics.