Emmanouil Theodosis

Contact Information

150 Western Avenue
Science and Engineering Complex 3.422
Allston, MA 02134, USA

etheodosis@g.harvard.edu
github.com/manosth
manosth.github.io

Research Interests Representation learning, equivariance and group theory, nonlinear optimization, deep learning theory, model-based autoencoders, tropical geometry, compressive sensing

Education

Harvard University Sep 2019 - Present
PhD in Computer Science, GPA: 3.89/4.00
Thesis: "*Learning structured representations in deep learning*"
Advisor: **Demba Ba**

National Technical University of Athens Oct 2012 - Oct 2018
BSc & MSc in Electrical and Computer Engineering, GPA: 8.56/10
Thesis: "*Tropical analysis of algorithms on graphs*"
Advisor: **Petros Maragos**

Work Experience

Amazon, USA May 2021 - Aug 2021
Applied Scientist Intern at *Amazon Web Services*
Project: "*Blind source synchronization using model-based deep learning*"
Supervisor: Karim Helwani

National Technical University of Athens, Greece Oct 2018 - Jun 2019
Research Assistant at *CVSP*
Project: "*Optimal curve fitting using tropical approximations*"
Supervisor: **Petros Maragos**

Teaching Experience

AM 231/ES 201: Decision Theory, Harvard University Spring 2023
ES 157: Biological Signal Processing, Harvard University Fall 2022
ES 157: Biological Signal Processing, Harvard University Fall 2020

Honors and Awards

A. G. Leventis Scholarship 2021-2024
Amazon Post-internship Fellowship Aug 2021
Certificate of Distinction in Teaching Fall 2021
Robert L. Wallace Prize Fellowship 2019-2021
Gerondelis Foundation Scholarship May 2020
Thomaidio Award (Publications) 2018
"**The Great Moment of Education" Eurobank EFG Scholarship** Oct 2012

Publications

Highlighted publications

[1] **Theodosis, E.**, Ba, D., and Dehmamy, N. "Constructing gauge-invariant neural networks for scientific applications". In *GRaM* and *AI4Science Workshops* at *ICML* (2024)

[2] Tasissa, A., **Theodosis, E.**, Tolooshams, B., and Ba, D. "Discriminative reconstruction via simultaneous dense and sparse coding". In *Transactions in Machine Learning Research* (2024)

[3] **Theodosis, E.**, Helwani, K., and Ba, D. "Learning group representations in neural networks". In *arXiv* (2024)

Journal articles

[4] Maragos, P., Charisopoulos, V., and **Theodosis, E.** "Tropical geometry and machine learning". In *Proceedings of the IEEE*, vol. 109, no. 5, pp. 728-755, 2021.

Conference papers

[5] **Theodosis, E.** and Ba, D. "Learning silhouettes with group sparse autoencoders". In *IEEE International Conference on Acoustics, Speech, and Signal Processing* (2023)

[6] Maragos, P. and **Theodosis, E.** "Multivariate tropical regression and piecewise-linear surface fitting". In *IEEE International Conference on Acoustics, Speech, and Signal Processing* (2020)

[7] Retsinas, G., Filntisis, P., Efthymiou, N., **Theodosis, E.**, Zlatintsi, A., and Maragos, P. "Person identification using deep convolutional neural networks on short-term signals from wearable sensors". In *IEEE International Conference on Acoustics, Speech, and Signal Processing* (2020)

[8] **Theodosis, E.** and Maragos, P. "Tropical modeling of weighted transducer algorithms on graphs". In *IEEE International Conference on Acoustics, Speech, and Signal Processing* (2019)

[9] **Theodosis, E.** and Maragos, P. "Analysis of the Viterbi algorithm using tropical algebra and geometry". In *IEEE International Workshop on Signal Processing Advances in Wireless Communications* (2018)

Book chapters

[10] Maragos, P. and **Theodosis, E.** "Tropical geometry and piecewise-linear approximation of curves and surfaces on weighted lattices". In *Shape Analysis: Euclidean, Discrete and Algebraic Geometric Methods*, edited by M. Breuss, A. Bruckstein, C. Kiselman, and P. Maragos, Springer, to appear.

Workshops

[11] **Theodosis, E.** and Ba, D. "Learning unfolded networks with a cyclic group structure". In *NeurIPS Workshop on Symmetry and Geometry in Neural Representations* (2022)

Preprints

[12] **Theodosis, E.**, Tolooshams, B., Tankala, P., Tasissa, A., and Ba, D. "On the convergence of group-sparse autoencoders". *arXiv* (2020)

[13] **Theodosis, E.** and Maragos, P. "A robust, adaptive pruning algorithm based on tropical geometry". In *arXiv* (2019)

Talks

Learning cyclic groups in neural networks Oct 2023
IAIFI Journal Club Talk

Learning cyclic groups in neural networks Sep 2023
Baylor/Rice/University of Houston Journal Club Talk

Constraining neural networks for inverse problems Apr 2023
DISC & TIAI Annual Symposium

Constraining neural networks to craft representations Mar 2023
IAIFI Lighting Talks

Posters

Constructing gauge-invariant neural networks for scientific applications Jul 2024
GRaM and *AI4Science Workshops* at *ICML*

Learning silhouettes with group sparse autoencoders Jun 2023
IEEE International Conference on Acoustics, Speech, and Signal Processing

Learning unfolded networks with a cyclic group structure Dec 2022
NeurReps Workshop at *NeurIPS*

Tropical modeling of weighted transducer algorithms on graphs May 2019
IEEE International Conference on Acoustics, Speech, and Signal Processing

Analysis of the Viterbi algorithm using tropical algebra and geometry Jun 2018
IEEE International Workshop on Signal Processing Advances in Wireless Communications

Professional Service

Invited Reviewer (Journals)
TMLR (2024), Algebraic Statistics (2023), Signal Processing (2021, 2023)

Invited Reviewer (Conferences)
ICRL (2025), NeurIPS (2024), NeurReps (2022-2024), AISTATS (2021), ICASSP (2019, 2023-2025), ITCS (2021), EUSIPCO (2020-2023)

Workshops
IAIFI Wokrshop 2024
Organizing committee

Summer schools
IAIFI Summer School 2024
Organizing committee

Tutorials
"*Deep Learning in Neuroscience*", Neurosur 2021

Committees
IAIFI Summer School and Workshop Committee Oct 2023 - Present
IAIFI Industry Partnership Committee Jul 2022 - Present

Panels
Harvard GSAS International Student Orientation Panel Aug 2024
Harvard SEAS Admission Panel Oct 2023
IAIFI Career Panel (Moderator) Oct 2023
Harvard SEAS G1 Student Panel Aug 2023
Harvard SEAS G2 Student Panel Aug 2023
Harvard SEAS New Admits Student Panel Mar 2023
Harvard SEAS Perspective Applicants Webinar Nov 2021

Mentoring Service

"MentoRes" mentoring initiative (58 total students) Oct 2021 - Present
Harvard Pre-Concentrator Advisor Aug 2024 - May 2025

Student mentoring
Valérie Consta (Harvard) Aug 2024 - Jan 2025
Emma Finn (Harvard) Dec 2023 - Dec 2024
Vironas Ziambaras (NTUA) Feb 2023 - Aug 2024
George Tsilimigkounakis (NTUA) Spring 2022
Pranay Tankala (Harvard) Spring 2020

Programming Skills

Languages: Python, C, MATLAB
Libraries: PyTorch, wandb

Languages

Greek (*Native*), English (*Fluent*)