Omri Azencot

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ACADEMIC POSITIONS

2020–present **Senior Lecturer (Assistant Professor) of Computer Science**.
Ben-Gurion University of the Negev, Be'er Sheva, Israel

2017–2020 **Assistant Adjunct Professor of Mathematics**.
University of California Los Angeles, California

EDUCATION

2011–2017 **Ph.D. in Computer Science**.
Technion–Israel Institute of Technology, Israel
Dissertation: *Operator Representations in Geometry Processing*
Committee: Mirela Ben-Chen, Yaron Lipman, Ron Kimmel

2005–2010 **B.Sc. in Computer Science and Mathematics**.
Technion–Israel Institute of Technology, Israel

RESEARCH INTERESTS

Sequential modeling, machine learning, deep learning, dynamical systems, differential geometry, Koopman theory.

RESEARCH DIRECTIONS

Representation learning [18, 20] deals with encoding complex high-dimensional information in a meaningful way for various downstream tasks. Our research focuses on disentangling data to its underlying explanatory factors, where we achieved state-of-the-art results on sequential disentanglement.

Generative modeling [22] aims to capture the statistical distribution of data for sampling new examples using machine learning tools. Our work demonstrates state-of-the-art performance on the fundamental challenge of generative modeling of regular and irregular time series data.

Understanding neural networks [17, 21] and their inner mechanisms is necessary for modern machine learning frameworks. We developed techniques based on dynamical systems and differential geometry to characterize the latent manifolds of learned representations. Through these tools, we gained fundamental insights on learning.

Forecasting [12, 13, 14, 24] future sequences from past observations is essential in numerous science and engineering domains. We suggested forecasting frameworks leveraging recurrent neural networks, differential geometry, and dynamical systems.

ACADEMIC SERVICE

Grant Reviews	ISF
Conference Program Committees	ICLR (2022–2024), NeurIPS (2021–2023), ICML (2021–2024), ICCV (2021), SIGGRAPH (2016–2021), SGP (2018–2023), Eurographics (2019), SPM (2019–2020), SMI (2018–2019)
Journal Reviews	TMLR (2023–), Chaos (2023), PNAS (2021), JNLS (2021), SIMODS (2018–2020), TOG (2019)

GRANTS AND AWARDS

2021-2025	Israel Science Foundation (ISF), Personal Research Grant 668/21
2021-2025	Israel Science Foundation (ISF), Equipment Grant 3262/21
2019	US Junior Oberwolfach Fellow
2018	American Mathematical Society-Simons Travel Grant
2018-2021	Marie Skłodowska-Curie Actions Individual Fellowship Project 793800 – Quad Remeshing via the Ginzburg–Landau Potential
2017-2019	Zuckerman Postdoctoral Fellowship Funded by the Zuckerman STEM Leadership Program
2016	Prof. Rahamimoff Travel Grant for Young Scientists, granted by the BSF
2015-2017	Adams Fellowship Program (a three year program) Granted by the Israel Academy of Sciences and Humanities
2013-2017	Excellence Scholarship from the Faculty of Computer Science, Technion

PEER-REVIEWED PUBLICATIONS

[22] I. Naiman, N. B. Erichson, P. Ren, M. W. Mahoney, and **O. Azencot**. Generative Modeling of Regular and Irregular Time Series Data via Koopman VAEs. *International Conference on Learning Representations (ICLR)*, 2024

[21] I. Kaufman, and **O. Azencot**. Data Representations' Study of Latent Image Manifolds. *International Conference on Machine Learning (ICML)*, 2023

[20] I. Naiman*, N. Berman*, and **O. Azencot**. Sample and Predict Your Latent: Modality-free Sequential Disentanglement via Contrastive Estimation. *International Conference on Machine Learning (ICML)*, 2023

[19] F. Hartwig, J. Sassen, **O. Azencot**, M. Rumpf, and M. Ben-Chen. An Elastic Basis for Spectral Shape Correspondence. *SIGGRAPH Conference*, 2023

[18] N. Berman*, I. Naiman*, and **O. Azencot**. Multifactor Sequential Disentanglement via Structured Koopman Autoencoders. *International Conference on Learning Representations (ICLR)*, **notable-top-25%**, 2023

[17] I. Naiman, and **O. Azencot**. An Operator Theoretic Approach for Analyzing Sequence Neural Networks. *Association for the Advancement of Artificial Intelligence (AAAI)*, 2023

[16] **O. Azencot**, and R. Lai. Shape Analysis via Functional Map Construction and Bases Pursuit. *Computer Graphics Forum (Proc. SGP)*, 2021

[15] I. Cohen, **O. Azencot**, P. Lifshitz, and G. Gilboa. Modes of Homogeneous Gradient Flows. *SIAM Journal on Imaging Sciences*, 2021

[14] N. B. Erichson, **O. Azencot**, A. Queiruga, L. Hodgkinson, and M. W. Mahoney. Lipschitz Recurrent Neural Networks. *International Conference on Learning Representations (ICLR)*, 2021

[13] **O. Azencot***, N. B. Erichson*, V. Lin, and M. W. Mahoney. Forecasting Sequential Data using Consistent Koopman Autoencoders. *International Conference on Machine Learning (ICML)*, 2020

[12] **O. Azencot**, W. Yin, and A. Bertozzi. Consistent Dynamic Mode Decomposition. *SIAM Journal on Applied Dynamical Systems (SIADS)*, 2019

[11] **O. Azencot***, A. Dubrovina*, and L. Guibas. Consistent Shape Matching via Coupled Optimization. *Computer Graphics Forum (Proc. SGP)*, 2019

[10] D. Ezuz, B. Heeren, **O. Azencot**, M. Rumpf, and M. Ben-Chen. Elastic Correspondence between Triangle Meshes. *Computer Graphics Forum (Proc. Eurographics)*, 2019

[9] **O. Azencot**, O. Vantzos, and M. Ben-Chen. An Explicit Structure-Preserving Numerical Scheme for EPDiff. *Computer Graphics Forum (Proc. SGP)*, 2018

[8] **O. Azencot**, E. Corman, M. Ben-Chen, and M. Ovsjanikov. Consistent Functional Cross Field Design for Mesh Quadrangulation. *ACM Transactions on Graphics (Proc. SIGGRAPH)*, 2017

[7] O. Vantzos, **O. Azencot**, M. Wardetzky, M. Rumpf, and M. Ben-Chen. Functional Thin Films on Surfaces. *IEEE Transactions on Visualization and Computer Graphics*, 2016

[6] **O. Azencot**, O. Vantzos, and M. Ben-Chen. Advection-based Function Matching on Surfaces. *Computer Graphics Forum (Proc. SGP)*, 2016

[5] **O. Azencot**, O. Vantzos, M. Wardetzky, M. Rumpf, and M. Ben-Chen. Functional Thin Films on Surfaces. *Proc. ACM SIGGRAPH/Eurographics SCA*, **best paper award**, 2015

[4] **O. Azencot**, M. Ovsjanikov, F. Chazal, and M. Ben-Chen. Discrete Derivatives of Vector Fields on Surfaces – An Operator Approach. *ACM Transactions on Graphics*, 2015

[3] **O. Azencot***, S. Weißmann*, M. Ovsjanikov, M. Wardetzky, and M. Ben-Chen. Functional Fluids on Surfaces. *Computer Graphics Forum (Proc. SGP)*, 2014

[2] **O. Azencot**, M. Ben-Chen, F. Chazal, and M. Ovsjanikov. An Operator Approach to Tangent Vector Field Processing. *Computer Graphics Forum (Proc. SGP)*, 2013

[1] R. M. Rustamov, M. Ovsjanikov, **O. Azencot**, M. Ben-Chen, F. Chazal, and L. Guibas. Map-Based Exploration of Intrinsic Shape Differences and Variability. *ACM Transactions on Graphics (Proc. SIGGRAPH)*, 2013

* = equal contribution

TECHNICAL REPORTS AND MANUSCRIPTS

[23] J. W. Miller, C. O'Neill, N. C. Constantinou, and **O. Azencot**. Eigenvalue Initialisation and Regularisation for Koopman Autoencoders. Preprint arXiv:2212.12086, 2022

[24] **O. Azencot**, N. B. Erichson, M. Ben-Chen, and M. W. Mahoney. A Differential Geometry Perspective on Orthogonal Recurrent Models. Preprint arXiv:2102.09589, 2021

[25] **O. Azencot**. Operator Representations in Geometry Processing *Technion, Ph.D. thesis*, 2017

INVITED PUBLICATIONS

[26] M. Ben-Chen, and **O. Azencot**. Operator-Based Representations of Discrete Tangent Vector Fields. *The Handbook of Numerical Analysis, Elsevier*, 2019

INVITED TALKS and TALKS

Sep. 11, 2023 Koopman-based Causal Representation Learning, University of Utah, USA

Sep. 6, 2023 Koopman-based Causal Representation Learning, ICSI, USA

Mar. 01, 2023 Multifactor Sequential Disentanglement via Structured Koopman Autoencoders
SIAM Conference on Computational Science and Engineering, Netherlands

Apr. 20, 2021 A Differential Geometry Perspective on Orthogonal Recurrent Models
Applied Math Seminar, TAU (online)

Mar. 12, 2021 Forecasting Sequential Data Using Consistent Koopman Autoencoders
Data Analysis Seminar, Japan (online)

Feb. 17, 2021 Analyzing Neural Networks using Koopman Theory
Technion (online)

Feb. 8, 2021 Latent Vector Field Models
ML and Science Forum, Berkeley (online)

Nov 6, 2020 Robust prediction of high-dimensional dynamics using Koopman deep networks
NERSC Data Seminar (online)

Oct 24, 2019 Applications of Koopman theory in nonlinear dynamics
Los Angeles, California

Oct 21, 2019 Discovering Dynamics in Violence Prevention Programs
Washington D.C.

Sep 11, 2019 Shape Analysis via Functional Map Construction and Bases Pursuit
Laboratoire d'Informatique (LIX), École Polytechnique, France

Apr 16, 2019 Functional Map and Bases Design via ADMM
IPAM Workshop on Shape Analysis, Los Angeles, California

Jul 23, 2018 Discrete Tangent Vector Fields and PDEs on Surfaces
The 13th World Congress on Computational Mechanics, New York

Jul 3, 2018 Representations and Applications of Differential Operators in Geometry Processing
International Conference on Curves and Surface, Arcachon, France

May 9, 2017	Representations and Applications of Differential Operators in Geometry Processing Institute of Science and Technology, Austria
Dec 5, 2016	Operator Representations in Geometry Processing and Applications MIT, Massachusetts
Jan 26, 2015	Simulation of Singular Waves on Curved Surfaces Mathematical Imaging and Surface Processing Workshop, Oberwolfach, Germany
Jun 13, 2014	Discrete Derivatives of Vector Fields on Surfaces – An Operator Approach ICGD, Israel
Dec 9, 2013	An Operator Approach to Tangent Vector Field Processing Laboratoire d'Informatique (LIX), École Polytechnique, France
Jun 21, 2013	An Operator Approach to Tangent Vector Field Processing Israel SIGGRAPH, Inter-Disciplinary Center, Herzliya, Israel

TEACHING

Lecturer	BGU, Applied Deep Learning (Spring 2023, Spring 2024)
Lecturer	BGU, Sequential Modeling (Winter 2023)
Lecturer	BGU, Deep Learning (Spring 2021, Spring 2022, Winter 2024)
Lecturer	BGU, Mini-Project: Topics in Deep Learning (Winter 2021)
Instructor	UCLA, PIC 20A – Principles of Java Language with Applications (Winter 2018, Spring 2018, Winter 2019, Spring 2019, Winter 2020)
Instructor	UCLA, PIC 10A – Introduction to Programming (Fall 2017, Winter 2018)
Speaker	Representations and Applications of Tangential Vector Fields International Geometry Summit Summer School, Berlin, Germany (June 2016)
TA	Technion, CS 236629 – Vector Field Analysis on Surfaces (Winter 2015,Spring 2017)
TA	Technion, CS 236329 – Digital Geometry Processing (Spring 2015, Winter 2016)
TA	Technion, CS 234325 – Computer Graphics (Winter 2014, Spring 2016)
TA	Technion, CS 236373 – Image Synthesis (Winter 2013)
Head TA	Technion, CS 234123 – Operating Systems (Winter 2012, Spring 2013, Spring 2014)
TA	Technion, CS 234123 – Operating Systems (Spring 2012)
TA	Technion, CS 234114 – Introduction to Computer Science M (Winter 2011)

MENTORING

Ph.D.	Tal Barami (joint with Dr. Ilan Dinstein)	expected graduation Oct. 2024
	Ilya Kaufman	expected graduation Oct. 2024
	Amihay Elboher	expected graduation Oct. 2025
	Ilan Naiman	expected graduation Mar. 2026
	Hedi Zisling	expected graduation Mar. 2027
	Nimrod Berman	expected graduation Oct. 2027
	Liran Nochumsohn	expected graduation Oct. 2027

M.Sc.	Michael Ptitsyn, Roee Weiss-Lipshitz	
		expected graduation Oct. 2023
	Inon Gdolim, Amos Haviv Hason, Yuval Levy, Israel Zexer	
		expected graduation Oct. 2024
	Idan Arbiv, Omer Asher, Gal Fadlon, Tal Gonen, Tom Or, Itai Pemper	
		expected graduation Oct. 2025
B.Sc.	Ofri Tirosh	
Alumni	Ilan Naiman	M.Sc. graduate, Mar. 2022, now Ph.D. candidate
	Oz Mishli	M.Sc. graduate, Mar. 2023
	Amir Ziskind	M.Sc. graduate, Oct. 2023, now at General Motors
	Nimrod Berman	M.Sc. graduate, Oct. 2023, now Ph.D. candidate
	Liran Nochumsohn	M.Sc. graduate, Oct. 2023, now Ph.D. candidate