Garrett E Katz

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Assistant Professor
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Education

2017   **Ph.D. Computer Science**, University of Maryland, College Park, MD, United States
"A Cognitive Robotic Imitation Learning System Based On Cause-Effect Reasoning"
Advisor: Professor James A. Reggia

2011   **M.A. Mathematics**, City College of New York, New York, NY, United States

2007   **B.A. Philosophy**, *Cum laude*, Cornell University, Ithaca, NY, United States
"Isolation: A Skeptical Thesis Concerning the Human Mind and its Relation to the World"

2003   **High School**, Stuyvesant High School, Stuyvesant, NY, United States

Graduate/Post-Graduate Training

2017 - 2018   Post-Doctoral Associate: Postdoctoral Research Associate, University of Maryland, Computer Science, College Park, MD, United States, (September 2017 - May 2018)

2014 - 2017   Research Assistant: Graduate Research Assistant, University of Maryland, Computer Science, College, MD, United States, (May 2014 - September 2017)

2012 - 2013   Teaching Assistant: Graduate Teaching Assistant, University of Maryland, Computer Science, College Park, MD, United States, (September 2012 - September 2013)
CMSC 289: Rise of the Machines, Fall 2013
CMSC 330: Organization of Programming Languages, Spring 2013
CMSC 131: Introduction to Object-Oriented Programming, Fall 2012

2010 - 2012   Research Associate: Research Associate, City College of New York, Microbiology and Immunology, New York, NY, United States, (September 2010 - May 2012)

Academic Positions

2018 - Present   **Assistant Professor**, Syracuse University, Electrical Engineering and Computer Science, Syracuse, NY, United States (August 2018 - Present)

Awards and Honors

Nominated

2018   ACM Doctoral Dissertation Award, ACM

Received

2020   Best Paper Award, SAI Computing Conference
Senior co-author

2018   Larry S. Davis Doctoral Dissertation Award, UMD

2016   Best Student Paper Award, International Conference on Artificial General Intelligence
First author

2014   Distinguished Graduate Student Teacher, UMD

2013   Distinguished Teaching Assistant, UMD

2013   Excellence and Innovation in Undergraduate Teaching in the I-Series courses, UMD

Consulting

2013 - 2023   Upward Farms, Brooklyn, NY, United States

Publications/Works in Progress

My student advisees are underlined, **my name is bold**, *and my doctoral advisor is italicized*.

In Progress

Akshay, **Katz, G. E.**, Mohan, C. K. (2024). A voxel-representation-based dataset for adversarial grasping.

Under Review

Ding, J., Chen, X., **Katz, G. E.**, Gan, Z. (2024). Leveraging Symmetries in Gaits for Reinforcement Learning: A Case Study on Quadrupedal Gaits. *IEEE/RSJ International Conference on Intelligent Robots and Systems*.

Chen, X., Liu, R., **Katz, G. E.** (2024). Explicit Lipschitz Value Estimation Enhances Policy Robustness Against Perturbation. *Inaugural Reinforcement Learning Conference*.

Liu, R., He, B., Tahir, N., **Katz, G. E.** (2024). On the Feasibility of Single-Pass Full-Capacity Learning in Linear Threshold Neurons with Binary Input Vectors. *International Conference on Machine Learning*.

Plourde, X., **Katz, G. E.** (2024). Keylogging in a Web-Based Code Editor for Fine-Grained Analysis and Early Prediction of Student Performance. *Annual Conference of the American Society for Engineering Education*.

Peer-Reviewed Publications

Abstracts

Shaver, A., Shuggi, I., **Katz, G. E.**, Davis, G., *Reggia, J. A.*, Gentili, R. (2020). Effects of Practicing Structured and Unstructured Complex Motor Sequences on Performance and Mental Workload. *NASPSPA Annual Conference, Journal of Sport & Exercise Psychology* (vol. 42, pp. S56--S56).

Book Chapters

Reggia, J. A., **Katz, G. E.**, Davis, G. P. (2023). Artificial Conscious Intelligence: Why Machine Consciousness Matters to AI. *Computational Approaches to Conscious Artificial Intelligence* (pp. 225--252). World Scientific.

Conference Proceedings

Tahir, N., Liu, Y., Wang, T., **Katz, G. E.**, Chen, B. (2023). An Unsupervised Approach to Motion Detection Using WiFi Signals. *International Conference on Machine Learning and Applications* (pp. 966-972). IEEE.

He, B., **Katz, G. E.** (2023). Will Poppy Fall? Predicting Robot Falls in Advance Based on Visual Input. *International Conference on Machine Learning and Applications* (pp. 226-232). IEEE.

Katz, G. E., Tahir, N. (2022). Towards automated discovery of god-like folk algorithms for Rubik's cube. *Proceedings of the AAAI Conference on Artificial Intelligence* (9th ed., vol. 36, pp. 10210--10218).
*** Acceptance Rate: 15%

Tahir, N., **Katz, G. E.** (2021). Numerical Exploration of Training Loss Level-Sets in Deep Neural Networks. *2021 International Joint Conference on Neural Networks (IJCNN)* (pp. 1--8).

Davis, G. P., **Katz, G. E.**, Soranzo, D., Allen, N., Reinhard, M. J., Gentili, R. J., Costanzo, M. E., *Reggia, J. A.* (2021). A Neurocomputational Model of Posttraumatic Stress Disorder. *2021 10th International IEEE/EMBS Conference on Neural Engineering (NER)* (pp. 107--110).

Salman, A.S., Salman, O.S., **Katz, G. E.** (2020). Extending CNN classification capabilities using a novel Feature to Image Transformation (FIT) algorithm. *Science and Information Conference* (pp. 198-213). Springer, Cham.
***Best Paper Award

Katz, G. E., Gupta, K., *Reggia, J.A.* (2020). Reinforcement-based Program Induction in a Neural Virtual Machine. *2020 International Joint Conference on Neural Networks* (pp. 1-8). IEEE.

Krishnagopal, S., **Katz, G. E.**, Girvan, M., *Reggia, J.A.* (2019). Encoding of a Chaotic Attractor in a Reservoir Computer: A Directional Fiber Investigation. *2019 International Joint Conference on Neural Networks* (pp. 1-8). IEEE.

Katz, G. E., *Reggia, J.A.* (2018). Applications of Directional Fibers to Fixed Point Location and Non-convex Optimization. *Proceedings of the International Conference on Scientific Computing* (pp. 140-146). CSREA Press.

Sosis, B., **Katz, G. E.**, *Reggia, J.A.* (2018). Learning in a Continuous-Valued Attractor Network. *International Conference on Machine Learning and Applications* (pp. 278-284). IEEE.

Katz, G. E., Huang, D.-W., Gentili, R.J., *Reggia, J.A.* (2017). An Empirical Characterization of Parsimonious Intention Inference for Cognitive-level Imitation Learning. *Proceedings of the International Conference on Artificial Intelligence* (pp. 83-89). CSREA Press.

Katz, G. E., Dullnig, D., Davis, G.P., Gentili, R.J., *Reggia, J.A.* (2017). Autonomous Causally-Driven Explanation of Actions. *Proceedings of the International Conference on Computational Science and Computational Intelligence* (pp. 772-778). IEEE.

Katz, G. E., Huang, D.-W., Gentili, R.J., *Reggia, J.A.* (2016). Imitation Learning as Cause-Effect Reasoning. *International Conference on Artificial General Intelligence* (pp. 64-73). Springer International Publishing.
***Best Student Paper Award

Huang, D.-W., **Katz, G. E.**, Langsfeld, J., Gentili, R.J., *Reggia, J.A.* (2015). A Virtual Demonstrator Environment for Robot Imitation Learning. *International Conference on Technologies for Practical Robot Applications*. IEEE.

Huang, D.-W., **Katz, G. E.**, Langsfeld, J.D., Oh, H., Gentili, R.J., *Reggia, J.A.* (2015). An Object-Centric Paradigm for Robot Programming by Demonstration. *Foundations of Augmented Cognition* (pp. 745-756). Springer International Publishing.

Gentili, R.J., Oh, H., Huang, D.-W., **Katz, G. E.**, Miller, R.H., *Reggia, J.A.* (2014). Towards a multi-level neural architecture that unifies self-intended and imitated arm reaching performance. *Engineering in Medicine and Biology Society* (pp. 2537-2540). IEEE.

Journal Articles

Davis, G. P., **Katz, G. E.**, Gentili, R. J., *Reggia, J. A.* (2023). NeuroCERIL: Robotic Imitation Learning via Hierarchical Cause-Effect Reasoning in Programmable Attractor Neural Networks. *International Journal of Social Robotics*, 1--19.

Davis, G. P., **Katz, G. E.**, Gentili, R. J., *Reggia, J. A.* (2022). NeuroLISP: High-level symbolic programming with attractor neural networks. *Neural Networks, 146*, 200--219.

Katz, G. E., Akshay, Davis, G. P., Gentili, R. J., *Reggia, J. A.* (2021). Tunable Neural Encoding of a Symbolic Robotic Manipulation Algorithm. *Frontiers in Neurorobotics*, 167.

Hauge, T. C., **Katz, G. E.**, Davis, G. P., Huang, D.-W., *Reggia, J. A.*, Gentili, R. J. (2021). High-level motor planning assessment during performance of complex action sequences in humans and a humanoid robot. *International Journal of Social Robotics, 13*(5), 981--998.

Davis, G. P., **Katz, G. E.**, Gentili, R. J., *Reggia, J. A.* (2021). Compositional memory in attractor neural networks with one-step learning. *Neural Networks, 138*, 78--97.

Hauge, T.C., **Katz, G. E.**, Davis, G.P., Jaquess, K.J., Reinhard, M.J., Costanzo, M.E., *Reggia, J.A.*, Gentili, R.J. (2019). A Novel Application of Levenshtein Distance for Assessment of High-Level Motor Planning Underlying Performance During Learning of Complex Motor Sequences. *Journal of Motor Learning and Development, 8*(1), 67-86.

Katz, G. E., Davis, G.P., Gentili, R.J., *Reggia, J.A.* (2019). A Programmable Neural Virtual Machine Based on a Fast Store-Erase Learning Rule. *Neural Networks, 119*, 10-30.

Reggia, J.A., **Katz, G. E.**, Davis, G.P. (2019). Modeling Working Memory to Identify Computational Correlates of Consciousness. *Open Philosophy, 2*(1), 252-269.

Katz, G. E., Huang, D.-W., Hauge, T., Gentili, R.J., *Reggia, J.A.* (2018). A Novel Parsimonious Cause-Effect Reasoning Algorithm for Robot Imitation and Plan Recognition. *IEEE Transactions on Cognitive and Developmental Systems, 10*(2), 177-193.

Reggia, J.A., **Katz, G. E.**, Davis, G.P. (2018). Humanoid Cognitive Robots That Learn by Imitating: Implications for Consciousness Studies. *Frontiers in Robotics and AI, 5*, 1.

Katz, G. E., *Reggia, J.A.* (2018). Using Directional Fibers to Locate Fixed Points of Recurrent Neural Networks. *IEEE Transactions on Neural Networks and Learning Systems, 29*(8), 3636-3646.

Huang, D.-W., Gentili, R.J., **Katz, G. E.**, *Reggia, J.A.* (2017). A limit-cycle self-organizing map architecture for stable arm control. *Neural Networks, 85*, 165-181.

Reggia, J.A., Huang, D.-W., **Katz, G. E.** (2017). Exploring the Computational Explanatory Gap. *Philosophies, 2*(1), 5.

Reggia, J.A., **Katz, G. E.**, Huang, D.-W. (2016). What are the computational correlates of consciousness? *Biologically Inspired Cognitive Architectures, 17*.

Gentili, R.J., Oh, H., Huang, D.-W., **Katz, G. E.**, Miller, R.H., *Reggia, J.A.* (2015). A Neural Architecture for Performing Actual and Mentally Simulated Movements During Self-Intended and Observed Bimanual Arm Reaching Movements. *International Journal of Social Robotics*, 1-22.

Reggia, J.A., Huang, D.-W., **Katz, G. E.** (2015). Beliefs Concerning the Nature of Consciousness. *Journal of Consciousness Studies, 22*(5-6), 146-171.

Katz, G. E., Benkarroum, Y., Wei, H., Rice, W.J., Bucher, D., Alimova, A., Katz, A., Klukowska, J., Herman, G., Gottlieb, P. (2014). Morphology of influenza B/Lee/40 determined by cryo-electron microscopy. *PloS one, 9*(2).

Katz, A., Alimova, A., Futerman, E., **Katz, G. E.**, Wei, H., Gottlieb, P. (2012). Bacteriophage phi6 - Structure Investigated by Fluorescence Stokes Shift Spectroscopy. *Photochemistry and photobiology, 88*(2), 304-310.

Katz, G. E., Wei, H., Alimova, A., Katz, A., Morgan, D.G., Gottlieb, P. (2012). Protein P7 of the Cystovirus phi6 is Located at the Three-Fold Axis of the Unexpanded Procapsid. *PLoS One, 7*(10).

Leo-Macias, A., **Katz, G. E.**, Wei, H., Alimova, A., Katz, A., Rice, W.J., Diaz-Avalos, R., Hu, G.-B., Stokes, D., Gottlieb, P. (2011). Toroidal surface complexes of bacteriophage phi12 are responsible for host-cell attachment. *Virology, 414*(2), 103-109.

Technical Report

Katz, G. E., *Reggia, J.A.* (2016). *Identifying Fixed Points in Recurrent Neural Networks using Directional Fibers: Supplemental Material on Theoretical Results and Practical Aspects of Numerical Traversal*. University of Maryland. http://hdl.handle.net/1903/18918

Huang, D.-W., **Katz, G. E.**, Gentili, R.J., *Reggia, J.A.* (2016). *SMILE: Simulator for Maryland Imitation Learning Environment*. University of Maryland. http://hdl.handle.net/1903/18066

Huang, D.-W., **Katz, G. E.**, Gentili, R.J., *Reggia, J.A.* (2014). *The Maryland Virtual Demonstrator Environment for Robot Imitation Learning*. University of Maryland. http://hdl.handle.net/1903/15431

Publications

Invited Conference Proceedings

Shaver, A. A., Peri, N., Mezebish, R., Matthew, G., Berson, A., Gaskins, C., Davis, G. P., **Katz, G. E.**, Samuel, I., Reinhard, M. J., others (2022). Assessment of a novel virtual environment for examining human cognitive-motor performance during execution of action sequences. *International Conference on Human-Computer Interaction* (pp. 361--380).

Akshay, Chen, X., He, B., **Katz, G. E.** (2022). Towards Human-Like Learning Dynamics in a Simulated Humanoid Robot for Improved Human-Machine Teaming. *International Conference on Human-Computer Interaction* (pp. 225--241).

Contracts, Fellowships, Grants, and Sponsored Research

Completed

"A Neurocognitive Approach to Robotic Cause-Effect Reasoning During Learning," Sponsored by University of Maryland. Katz, G. E. (PD/PI), $281,966.00. (January 1, 2019 - December 31, 2021).

"Machine Learning with Baked-In Knowledge for Forecasting Large Complex Spatiotemporal Neurocomputational Systems with Application to Weather Forecasting," Sponsored by University of Maryland. Katz, G. E. (PD/PI), $95,000.00. (September 24, 2018 - May 24, 2020).

Funded

"Feasibility of One-Shot High-Capacity Learning," Sponsored by SRC, Inc. **Katz, G. E. (SubProject PI)**, $50,000.00. (September 1, 2023 - August 31, 2024).

"Program Income for Phase 1 IUCRC Syracuse University: Center for Alternative Sustainable and Intelligent Computing (ASIC)," Sponsored by SRC, Inc. **Katz, G. E. (SubProject PI)**, Qiu, Q. (PD/PI), Varshney, P. K. (Co-PD/PI), $200,000.00. (September 15, 2018 - August 31, 2024).

Pending

"Automated Discovery of Causal Gene Regulatory Relationships with Asymmetric Conditioning of Predictive Models," Sponsored by National Institutes of Health (NIH)/DHHS. **Katz, G. E. (PD/PI).**

"A Deep Look into Trust and Mutual Understanding in Multi-Agent Cooperative Game Through Explainable Reinforcement Learning," Sponsored by Air Force Office of Scientific Research. **Katz, G. E. (Co-PD/PI)**, Qiu, Q. (PD/PI).

"An Adaptive Cognitive-Motor Architecture that Accounts for Individualized Problem-Solving Strategies to Promote Robust Human-Robot Teaming," Sponsored by University of Maryland. **Katz, G. E. (PD/PI).**

"Participant-Centric Optimum Experiment Design For Informative, Individualized Ecological Momentary Assessment Of Food Parenting Practices," Sponsored by Research Foundation of the City University of New York. Brann, L. (Co-Investigator), **Katz, G. E. (PD/PI)**, Salekin, A. (Co-Investigator), Yuhas, M. (Co-PD/PI).

Internal Grants
Funded

Supplement for "Feasibility of One-Shot High-Capacity Learning," Sponsored by the Center for Advanced Systems and Engineering (CASE). **Katz, G. E. (PD/PI)**, $29,079.00. (August 15, 2023 – May 15, 2024).

"Inference of gene regulatory networks using dense time-course mRNA sequencing and evolutionary algorithms," Sponsored by CUSE Grants - Innovative and Interdisciplinary Research Grant. Ahmed-Braimah, Y. H. (PD/PI), **Katz, G. E. (Co-PD/PI)**, Mohan, C. K. (Co-PD/PI), Feng, W. (Co-Investigator), $27,925.00. (June 1, 2020 - May 31, 2023).

Pending

"Causal inference of gene regulatory networks with asymmetric motif and gene expression analyses," Sponsored by FCAR Grants – Faculty Creative Activities and Research Grant. **Katz, G. E. (PD/PI)**, Ahmed-Braimah, Y. H. (Co-PD/PI), Mohan, C. K. (Co-PD/PI), $5000.00 (May 15, 2023 – May 14, 2024).

Teaching Experience

Spring 2024

Course Name	Course Code	Enrollment
Introduction to Discrete Mathematics	CIS 375	37
Selected Topics In CIS - Deep Automated Theorem Proving	CIS 700	5

Fall 2023

Course Name	Course Code	Enrollment
Independent Study	CIS 690	2
Independent Study	CSE 690	1
Introduction to Artificial Intelligence	CIS 467	47
Introduction to Artificial Intelligence	CIS 667	104

Spring 2023

Course Name	Course Code	Enrollment
Fundamentals of Computing and Programming	CIS 151	53

Selected Topics In CIS - Deep Automated Theorem Proving	CIS 700	8

Fall 2022

Course Name	Course Code	Enrollment
Introduction to Artificial Intelligence	CIS 667	48

Spring 2022

Course Name	Course Code	Enrollment
Introduction to Computing	ECS 102	50
Selected Topics In CIS - Deep Learning: Theorem Proving	CIS 700	27

Fall 2021

Course Name	Course Code	Enrollment
Introduction to Artificial Intelligence	CIS 667	31

Spring 2021

Course Name	Course Code	Enrollment
Introduction to Computing (in-person)	ECS 102	38
Introduction to Computing (online)	ECS 102	28
Selected Topics In CIS - Neural Program Learning (in-person)	CIS 700	10
Selected Topics In CIS - Neural Program Learning (online)	CIS 700	7

Fall 2020

Course Name	Course Code	Enrollment
Independent Study	CIS 690	1
Introduction to Artificial Intelligence	CIS 667	73

Spring 2020

Course Name	Course Code	Enrollment
Independent Study	CIS 690	1
Selected Topics In CIS - Neural Program Learning	CIS 700	19

Fall 2019

Course Name	Course Code	Enrollment
Experience Credit	CIS 670	1
Independent Study	CIS 690	1
Independent Study	CIS 690	1
Introduction to Artificial Intelligence	CIS 467	43
Introduction to Artificial Intelligence	CIS 667	78

Summer 2019

Course Name	Course Code	Enrollment
Experience Credit	CIS 670	4

Spring 2019

Course Name	Course Code	Enrollment
Selected Topics In CIS - Neural Program Learning	CIS 700	38

Fall 2018

Course Name	Course Code	Enrollment
Introduction to Artificial Intelligence	CIS 467	30
Introduction to Artificial Intelligence	CIS 667	50

Directed Student Learning

Doctoral Advisor

2022 - Present   Ruipeng Liu, Syracuse University, Electrical Engineering & Computer Science, PhD

QE2 scheduled for April 26, 2024
QE1 passed January 2023

2020 - Present   Xulin Chen, Syracuse University, Electrical Engineering & Computer Science, PhD

Proposal scheduled for May 6, 2024
QE2 passed April 29, 2022
QE1 passed May 2021

2020 - Present   Borui He, Syracuse University, Electrical Engineering & Computer Science, PhD

Proposal scheduled for April 26, 2024

QE2 passed April 29, 2022
QE1 passed May 2021

2020 - Present   Akshay ., Syracuse University, Electrical Engineering & Computer Science, PhD

Proposal scheduled for May 10, 2024
QE2 passed April 25, 2022
QE1 passed May 2021

2018 - Present   Naveed Tahir, Syracuse University, Electrical Engineering & Computer Science, PhD

Defense planned for Fall 2024
Proposal passed May 2, 2023
QE2 passed April 27, 2020
QE1 passed January 2020

Master's Thesis Advisor

2018 - 2019   Dhwani Patel, "Empathy-Based Reinforcement Learning," Syracuse University, Electrical Engineering & Computer Science, MS, 2019 (September 2018 - August 2019)

Supervised Research-Undergraduate

2023   Chad Smith, "A Python wrapper to the Metamath Interactive Proof System," Syracuse University, Electrical Engineering & Computer Science, BS (June 4, 2023 - August 12, 2023)
Summer REU

2022   Xavier Plourde, "Keylogging in a Web-Based Code Editor for Fine-Grained Analysis and Early Prediction of Student Performance," UC Berkeley, BS (June 6, 2022 - August 12, 2022)
Summer REU (visiting SU from UC Berkeley)

2019   Tiara Logan, "A.I.: Animated Intelligence," Syracuse University, Electrical Engineering & Computer Science, BS, 2021 (June 3, 2019 - August 7, 2019)
Summer REU through the Louis Stokes Alliance for Minority Participation

Undergraduate Honors Thesis

2023   Gabriel Ruoff, "Ground-up Development of a Gesture-Controlled Robotic Arm," Syracuse University, Electrical Engineering & Computer Science, BS, 2023 (March 18, 2023 - May 2, 2023)

University Service

2023 – 2024   Member, SU EECS Chair Search Committee

2021 – 2024   Faculty Presenter, SU ECS prospective student events

2020 – 2024   Contributor, SU EECS PhD Qualifying Exam 1

2019 – 2024   Member, SU CISE PhD Admissions Committee

2022   Member, SU eSports Curriculum Committee

2020   Member, SU EECS Faculty Search Committee

Professional Service

2022 – Present   Committee Member, Program Committee for AAAI

2017 – Present   Committee Member, Program Committee for AGI

2023   Reviewer/Referee, IEEE Transactions on Cognitive and Developmental Systems

2023   Panel Reviewer/Referee, National Science Foundation IIS Division (2 panels)

2021   Reviewer/Referee, Elsevier Neurocomputing Journal

2019, 2021   Reviewer/Referee, IEEE Transactions on Neural Networks and Learning Systems

2019   Reviewer/Referee, IEEE Access

2019   Reviewer/Referee, Open Philosophies Journal

2019   Judge, Central NY Science and Engineering Fair, Syracuse, NY, United States