

Research Interests - James A. Reggia

(last updated 6/25/24)

Topics artificial intelligence, machine learning, robotics, cognitive modeling
neural computation, self-organization, machine consciousness
nature-inspired computation, swarm intelligence, evolutionary computation
symmetry and asymmetry, causality, electrodynamics, consciousness

Selected Publications

2025

Reggia, J. Time, Memory, and the Physical Basis of Consciousness, *Journal of Consciousness Studies*, 32 (3-4), 2025, 34-62. <https://doi.org/10.53765/20512201.32.3.034>

2024

Reggia, J. Maximizing the Symmetry of Maxwell's Equations, *Frontiers in Physics*, 12, June, 2024. <https://doi.org/10.3389/fphy.2024.1388397>

Reggia, J. Generalizing Maxwell's Equations to Complex-Valued Electromagnetic Fields, *Physica Scripta*, 99 (1), 2024, 015513. <https://doi.org/10.1088/1402-4896/ad10dc>

Jayashankar J, Packy A, Teymourlouei A, Shaver A, Katz G, Reggia J, Purtilo J, Gentili R. Assessment of a novel virtual environment for examining cognitive-motor processes during execution of action sequences in a human-robot teaming context, *Proc. Human Computer Interactions Intl. (HCII)*, Springer, 2024.

Teymourlouei A, Hu M, Gentili R, Reggia J. Functional Connectivity Methods for Multi-Class Mental Workload Classification, *46th Annual International Conference of the IEEE Engineering in Medicine & Biology Society*, July 2024.

Packy A, Jayashankar J, Teymourlouei A, Stone J, Oh H, Katz G, Reggia J, Gentili R. Neurocognitive Assessment under Various Human-Robot Teaming Environments, *46th Annual International Conference of the IEEE Engineering in Medicine & Biology Society*, July 2024.

2023

Davis G, Katz G, Gentili R, Reggia J. NeuroCERIL: Robotic Imitation Learning via Hierarchical Cause-Effect Reasoning in Programmable Attractor Neural Networks, *International Journal of Social Robotics*, 2023. <https://doi.org/10.1007/s12369-023-00997-z>

Reggia J, Katz G, Davis G. Artificial Conscious Intelligence: Why Machine Consciousness Matters to AI, in *Computational Approaches to Conscious Artificial Intelligence*, A. Chella, editor, 2023, in press.

Teymourlouei A, Gentili R, Reggia J. Decoding EEG Signals with Visibility Graphs to Predict Varying Levels of Mental Workload, *57th Annual Conference on Information Sciences and Systems*, Baltimore MD, March 22-24, 2023.

Shaver A, Liu C, Reggia J, Purtilo J, Gentili R. Cognitive-Motor Performance Assessment During In-Person and Remote Practice of Action Sequences, *Proceedings of the Eleventh International IEEE/EMBS Conference on Neural Engineering*, 2023.

Teymourlouei A, Stone J, Gentili R, Reggia J. Multiplex Temporal Networks for Rapid Mental Workload Classification, *Proceedings 16th International Conference on Brain Informatics*, Hoboken NJ and New York NY, August 1-3, 2023, <https://doi.org/10.1109/CIBS56502.2023.10089662>; Chapter 18 in *Lecture Notes in Artificial Intelligence*, 13974, F Liu et al., editors, 203-214.

2020

Davis G, Katz G, Gentili R, Reggia J. NeuroLISP: High-Level Symbolic Programming with Attractor Neural Networks, *Neural Networks*, 146, 2022, 200-219.

Shaver A, Peri N, Mezebish R, Matthew G, Berson A, Gaskins C, Davis G, Katz G, Samuel I, M. Reinhard, M. Costanzo, J. Reggia, J. Purtilo, R. Gentili. Assessment of a novel virtual environment for examining human cognitive-motor performance during execution of action sequences, *24th International Conference on Human-Computer Interaction*, June 26 - July 1, 2022.

2021

Davis G, Katz G, Gentili R, Reggia J. Compositional Memory in Attractor Neural Networks with One-Step Learning, *Neural Networks*, 138, 2021, 78-97.

Davis G, Katz G, Soranzo D, Allen N, Reinhard M, Gentili R Costanzo M, and Reggia J. A Neurocomputational Model of Posttraumatic Stress Disorder, *Proceedings of the 10th International IEEE EMBS Conference on Neural Engineering (NERS'21)*, May 4-6, 2021, 107-110.

Reggia J, Katz G, Davis G, Gentili R. Avoiding Catastrophic Forgetting with Short-Term Memory, *Proc. of the 23rd International Conference on Artificial Intelligence (ICAI'21)*, July 26-29, 2021.

Lin R, Katz G, Reggia J. Effectiveness of Proximal Policy Optimization Methods in Training a Neural Virtual Machine, *Proc. of the 23rd International Conference on Artificial Intelligence (ICAI'21)*, July 26-29, 2021.

2020

Hauge T, Katz G, Davis G, Jaquess K, Reinhard M, Costanzo M, Reggia J, Gentili R. A Novel Application of Levenshtein Distance for Assessment of High-Level Motor Planning Underlying Performance During Learning of Complex Action Sequences, *Journal of Motor Learning and Development*, 8, 2020, 67-86.

Reggia J, Katz G, Davis G. Artificial Conscious Intelligence, *Journal of Artificial Intelligence and Consciousness*, 7, 2020, 1-13.

Hauge T, Katz G, Davis G, Huang D, Reggia J, Gentili R. High-level Motor Planning Assessment During Performance of Complex Action Sequences in Humans and a Humanoid Robot, *International Journal of Social Robotics*, August 2020.

Katz G, Gupta K, Reggia J. Reinforcement-Based Program Induction in a Neural Virtual Machine, *Proceedings of the International Joint Conference on Neural Networks (IJCNN)*, Glasgow, UK, 2020, July 2020, 1-8.

Selected Journal Publications Before 2020 (reverse chronological order)

Reggia J., Nau D., and Wang P. Diagnostic Expert Systems Based on a Set Covering Model, *International Journal of Man-Machine Studies*, 19, 1983, 437-460.

Reggia J., Tabb D., Price T., Banko M., and Hebel R. Computer-Aided Assessment of Transient Ischemic Attacks: A Clinical Evaluation, *Archives of Neurology*, 41, 1984, 1248-1254.

Reggia J., Perricone B., Nau D., and Peng Y. Answer Justification in Diagnostic Expert Systems. *IEEE Trans on Biomedical Engineering*, 32, 1985, 263-272.

Ahuja S. and Reggia J. Automated Classification of Complex Errors in Discrete Sequential Processes, *IEEE Transactions on Systems, Man and Cybernetics*, 15, 1985, 527-532.

Reggia J., Nau D., Wang P., Peng, Y. A Formal Model of Diagnostic Inference. *Information Sciences*, 37, 1985, 227-285.

Peng Y. and Reggia J. A Probabilistic Causal Model for Diagnostic Problem-Solving. *IEEE Transactions on Systems, Man and Cybernetics*, 17, 1987, Part 1: 146-162 and Part 2: 395-406.

Peng Y. and Reggia J. Diagnostic Problem-Solving with Causal Chaining, *International Journal of Intelligent Systems*, 2, 1987, 265-302.

Reggia J. and Sutton G. Self-Processing Networks and Their Biomedical Implications, *Proceedings of the IEEE*, 76, 1988, 680-692.

- Reggia J., Marsland P., and Berndt R. Competitive Dynamics in a Dual-Route Connectionist Model of Print-to-Sound Transformation, *Complex Systems*, 2, 1988, 509-547.
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- Peng Y. and Reggia J. A Connectionist Model for Diagnostic Problem Solving, *IEEE Transactions on Systems, Man and Cybernetics*, 19, 1989, 285-298.
- Wald J, Farach M, Tagamets M, & Reggia J. Generating Plausible Diagnostic Hypotheses with Self-Processing Causal Networks, *Jour. of Experimental and Theoretical Artificial Intelligence*, 1, 1989, 91-112.
- Dasigi V., and Reggia J. Parsimonious Covering as a Method for Natural Language Interfaces to Expert Systems, *Artificial Intelligence in Medicine*, 1, 1989, 49-60.
- Reggia J., and Edwards M. Phase Transitions in Connectionist Models Having Rapidly Varying Connection Strengths, *Neural Computation*, 2, 1990, 523-535.
- Chu B., and Reggia J. Modelling Diagnosis at Multiple Levels of Abstraction, *International Journal of Intelligent Systems*, 6, 1991, 617-671.
- Tuhrim S., Reggia J., Goodall S., and Horowitz D. Abductive Localization of Brain Damage Incorporating Spatial Adjacency Relations, *Artificial Intelligence in Medicine*, 3, 1991, 75-85.
- Tuhrim S., Reggia J., and Goodall S. An Experimental Study of Criteria for Hypothesis Plausibility, *Journal of Experimental and Theoretical Artificial Intelligence*, 3, 1991, 129-144.
- Reggia J, D'Autrechy C, Sutton G & Weinrich M. A Competitive Distribution Theory of Neocortical Dynamics, *Neural Computation*, 1992, 4, 287-317.
- Reggia J, Peng Y & Tuhrim S. A Connectionist Approach to Diagnostic Problem-Solving Using Causal Networks, *Information Sciences*, 70, 1993, 27-48.
- Cho S. and Reggia J. Learning Competition and Cooperation, *Neural Computation*, 5, 1993, 242-259.
- Reggia J. Neural Computation in Medicine, invited paper, *Artif. Intelligence in Medicine*, 5, 1993, 143-157.
- Cho S. and Reggia J. Multi-Disorder Diagnosis with Adaptive Competitive Networks, *Artificial Intelligence in Medicine*, 5, 1993, 469-487.
- McFadden F, Peng Y. and Reggia J. Local Conditions for Phase Transitions in Neural Networks with Variable Connection Strengths, *Neural Networks*, 6, 1993, 667-676.
- Reggia J, Armentrout S, Chou H, and Peng Y. Simple Systems That Exhibit Self-Directed Replication, *Science*, 259, 1993, 1282-1287.
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- Tuhrim S, Reggia J & Peng Y. High-Specificity Neurological Localization Using a Connectionist Model, *Artificial Intelligence in Medicine*, 6, 1994, 521-532.
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Oh H, Braun A, Reggia J, Gentili R. Fronto-Parietal Mirror Neuron System Modeling: Visuospatial Transformations Support Imitation Learning Independently of Imitator Perspective, *Human Movement Science*, 65, 2019, 121-141.

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