

Research Roundup

April 2026

Discover our latest insights
in natural and artificial
intelligence research

⬡ Kempner Graduate Fellow Shubham Choudhary and Associate Faculty Demba Ba published a paper in *Neural Computation* entitled "**Implicit Generative Modeling by Kernel Similarity Matching.**"

⬡ In a new **preprint**, Kempner Associate Faculty David Alvarez-Melis and his collaborators "propose a strategy for computing distances between geospatial domains that leverages geographic information with Optimal Transport methods (GeoSpOT)."

⬡ 2026 Kempner Institute Accelerator Awardee Debora S. Marks and her team released a preprint entitled "**Determinants of Metal Import and Specificity in a Bacterial Transporter.**"

Featured Figure

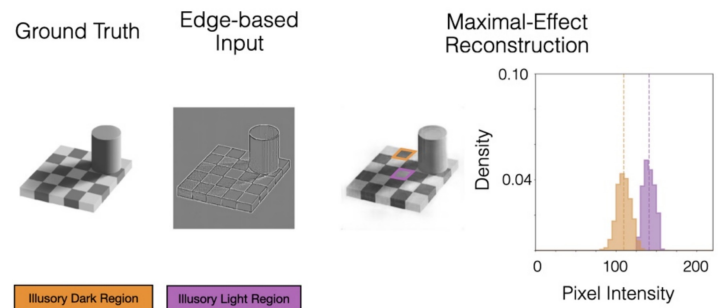


Figure from the preprint "**A Unified Account of Lightness Illusions via Edge-Based Reconstruction of Natural Images.**" presenting an edge-based model reconstruction of the checkerboard illusion.

Featured Formula

$$\theta_{ES} - \theta_0 = \underbrace{(H^T - I) \theta_0}_{\text{signal (GD-like)}} + \underbrace{\sum_{t=1}^T H^{t-1} \eta_{T-t}}_{\text{diffusion}}$$

Formula idealizing Evolution Strategies (ES) in terms of an Ornstein–Uhlenbeck process under a quadratic potential, from the preprint "**Matching Accuracy, Different Geometry: Evolution Strategies vs GRPO in LLM Post-Training.**"

Featured Artifacts

OT on the Map: Quantifying Domain Shifts in Geographic Space.

Haoran Zhang, Livia Betti, Konstantin Klemmer, Esther Rolf, and David Alvarez-Melis

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Matching Accuracy, Different Geometry: Evolution Strategies vs GRPO in LLM Post-Training.

William Hoy, BinXu Wang, and Xu Pan. arXiv:2604.01499v1 (2026).

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Note: The Kempner Research Roundup is a partial list of articles and preprints published by Kempner-affiliated researchers in the last month. Papers are listed by topic and publication/upload date, with the most recent first.



AI Innovation

Discrete Tilt Matching.

Yuyuan Chen, Shiyi Wang, Peter Potaptchik, Jaeyeon Kim, and Michael S. Alberg. arXiv:2604.18739 (2026).

OT on the Map: Quantifying Domain Shifts in Geographic Space.

Haoran Zhang, Livia Betti, Konstantin Klemmer, Esther Rolf, and David Alvarez-Melis. arXiv:2604.16220 (2026).

Discrete Flow Maps.

Peter Potaptchik, Jason Yim, Adhi Saravanan, Peter Holderrieth, Eric Vanden-Eijnden, and Michael S. Alberg. arXiv:2604.09784v2 (2026).

Implicit Generative Modeling by Kernel Similarity Matching.

Shubham Choudhary, Paul Masset, and Demba Ba. Neural Computation: 1-55 (2026).

Interpretability and AI Theory

Masked by Consensus: Disentangling Privileged Knowledge in LLM Correctness.

Tomer Ashuach, Liat Ein-Dor, Shai Gretz, Yoav Katz, and Yonatan Belinkov. arXiv preprint arXiv:2604.12373 (2026).

Manifold Geometry Underlies a Unified Code for Category and Category-Independent Features.

Lorenzo Tiberi and Haim Sompolinsky. bioRxiv:2026.03.23.713692 (2026).

Matching Accuracy, Different Geometry: Evolution Strategies vs GRPO in LLM Post-Training.

William Hoy, Binxu Wang, and Xu Pan. arXiv:2604.01499v1 (2026).

Applications of AI

Towards a General-Purpose Foundation Model for Functional MRI Analysis.

Cheng Wang, Yu Jiang, Zhihao Peng, Chenxin Li, Chang-bae Bang, Lin Zhao, Wanyi Fu et al. Nature Biomedical Engineering (2026): 1-12.

League of Radiologists—an End-to-End AI Framework for Scalable and Gamified Radiology Education: A Pilot Implementation in Chest Radiography.

Hyunji Kim, Young-Tak Kim, Saul Langarica, Kevin P. Fialkowski, Jarrel C. Y. Seah, Jennifer S. N. Tang, Kyoung Doo Song, Dae Chul Jung, Kyongtae Tyler Bae, Rory L. Cochran, Marc D. Succi, Shaunagh McDermott, Manisha Bahl, Jeanne B. Ackman, Michael H. Lev, Michael S. Gee and Synho Do. Journal of Imaging Informatics in Medicine. (2026).

Target Surface-Enhanced Raman Scattering for Highly Accurate Identification of Bacterial Species and Finding Spectral Signatures with Explainable Artificial Intelligence.

Young-Tak Kim, Ju Eun Cho, Min Ji Hwang, Shimayali Kaushal, Nitin Singhal, Jung Bin Kim, Synho Do, and Dong-Kwon Lim. ACS Nano

Applications of AI

Phenotypic Prediction of Missense Variants Via Deep Contrastive Learning.

Jun Wen, Sihang Zeng, Clara-Lea Bonzel, Shilpa Nadimpalli Kobren, Jiangchuan Du, Yi Chai, Hao Wang, Meng Zhu, Siwei Chen, Fangwei Leng, Harrison G. Zhang, Katherine P. Liao, Kelly Cho, Isaac S. Kohane, Marinka Zitnik, Alexandre C. Pereira, Jun S. Liu and Tianxi Cai. Nature Biomedical Engineering (2026).

MedConclusion: A Benchmark for Biomedical Conclusion Generation from Structured Abstracts.

Weiyue Li, Ruizhi Qian, Yi Li, Yongce Li, Yunfan Long, Jiahui Cai, Yan Luo, and Mengyu Wang. arXiv:2604.06505v1 (2026).

Determinants of Metal Import and Specificity in a Bacterial Transporter.

Samuel P. Berry, Camille B. Freedman, Debora S. Marks, and Rachelle Gaudet. bioRxiv:2026.03.30.714904 (2026).

Neuroscience & NeuroAI

Estimating and Interpreting How Humans Prioritize Multiple Movement Goals During Walking.

Jordan N. Feldman, David Morales Loro, Andrew Chin, Sarah Erickson, Sarah Li, Eliana Bonbrest, and Patrick Slade. Journal of Neuroengineering and Rehabilitation (2026).

Spectral Envelopes of Rhythmic Facial Movements Predict Intention and Motor Cortical Representations.

Richard Hakim, Gyuryang Heo, Akshay Jaggi, Sandeep Robert Datta, Simon Musall, and Bernardo L. Sabatini. bioRxiv (2025): 2025-09.

Centralized Brain Networks Controlling Antennal Grooming Coordination.

Pembe Gizem Özdil, Jonathan Arreguit, Clara Scherrer, Femke Hurtak, Auke Ijspeert, and Pavan Ramdya. Nature Communications (2026).

A Unified Account of Lightness Illusions via Edge-Based Reconstruction of Natural Images.

Srijani Saha, Talia Konkle, and George A. Alvarez. bioRxiv:2026.04.07.716245 (2026).

A Theory of Multi-Task Computation and Task Selection.

Owen Marschall, David G. Clark, and Ashok Litwin-Kumar. bioRxiv:2025.12.12.693832 (2026).

The Extended Language Network: Language-Responsive Brain Areas Whose Contributions to Language Remain to be Discovered.

Agata Wolna, Aaron Wright, Colton Casto, Samuel Hutchinson, Benjamin Lipkin, and Evelina Fedorenko. bioRxiv:2025.04.02.646835 (2026).



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