

Linghao Kong

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Education

- ❖ **Massachusetts Institute of Technology (MIT)** Cambridge, MA
 - PhD candidate in Electrical Engineering and Computer Science (GPA: 4.91/5.00) Sep 2022 – Present
 - Being advised by Professor Nir N. Shavit
 - SM in Electrical Engineering and Computer Science (GPA: 4.91/5.00) Sep 2022 – May 2024
 - Advised by Professor Nir N. Shavit
 - Thesis: “Sparse Expansion and Neuronal Disentanglement”
- ❖ **Columbia University in the City of New York (CU)** New York, NY
 - BA in Computer Science and in Neuroscience and Behavior (GPA: 3.97/4.00) Sep 2018 – May 2022
 - Honors: *magna cum laude*, Dean’s List for all semesters

Research Experience

- ❖ **PhD Candidate, *Shavit Lab*, MIT** Sep 2022 – Present
 - Investigating the relationship between neuronal entanglement and sparsity in large language models to discover new techniques to induce sparsity in such models to vastly save computational power
 - Analyzing the MICrONS anatomical and functional connectome of the mouse visual cortex to better characterize the border between visual areas and to model the degree of synchrony in neurons
 - Modeling the octopus hippocampus and fruit fly anatomical connectomes as artificial neural networks to investigate the capacity and capabilities of biological neural networks
- ❖ **Research Assistant, *Peter Sims Laboratory*, CU** Jan 2019 – Aug 2022
 - Leveraged machine learning model scGen to identify fates of multiple cancer cell types following perturbations
 - Identified the cause of low efficiency in the novel SCOPE-Seq2 technique to be false hybridization
 - Utilized various biochemical assays to demonstrate the inability of emetine-stalled puromycylated polypeptides to remain bound to ribosomes, despite widespread acceptance of their ability to do so in the field of active translation
- ❖ **Research Assistant, *Laboratory for Fluorescence Dynamics*, UC Irvine** Aug 2015 – Jul 2018
 - Implemented skills accumulated over three years for independent research project on cancer cell metabolism
 - Became adept in lab techniques such as passaging, transfecting, amplifying DNA, and generating stable cell lines
 - Self-taught in the ImageJ Macro language to expedite batch analysis of images
- ❖ **Research Participant, *COSMOS Summer Research Program*, UC Irvine** Jul 2016 – Aug 2016
 - Studied effects of different drugs on the growth rate of tumor spheres and modeled such growth in MATLAB

Professional Experience

- ❖ **Research Intern, *Machine Learning Research Team*, Neural Magic** Jun 2024 – Aug 2024
 - Spearheaded initiative to quantize LLMs to new FP8 data format to maintain performance while reducing cost – primary contributor to top-8 trending, most extensive FP8 [model collection](#) on Hugging Face with over 2 million total downloads, work featured by [NVIDIA](#) and [MarkTechPost](#)
 - Tested a variety of different approaches, such as knowledge distillation and speculative decoding, to create more performant compressed LLMs

Publications (* denotes equal contribution, † denotes co-correspondence)

- ❖ Sawmya, S. *, **Kong, L. ***, Markov, I., Alistarh, D., & Shavit, N. N. (2025). **Wasserstein distances, neuronal entanglement, and sparsity**. *The 13th International Conference on Learning Representations (ICLR 2025, Spotlight Presentation)*. <https://openreview.net/pdf?id=cnKhHxN3xj>
- ❖ Tumma, N. *, **Kong, L. *†**, Sawmya, S., Wang, T. T., & Shavit, N. N.† (2024). **A connectomics-driven analysis reveals novel characterization of border regions in mouse visual cortex**. *bioRxiv* preprint. <https://www.biorxiv.org/content/10.1101/2024.05.24.595837v1>
- ❖ Hobson, B. D., **Kong, L.**, Angelo, M. F., Lieberman, O. J., Mosharov, E. V., Herzog, E., Sulzer, D., & Sims, P. A. (2022). **Subcellular and regional localization of mRNA translation in midbrain dopamine neurons**. *Cell Reports*, 38(2) (Cell Rep). <https://doi.org/10.1016/j.celrep.2021.110208>
- ❖ Hobson, B. D., **Kong, L.**, Hartwick, E. W., Gonzalez, R. L., Jr., & Sims, P. A. (2020). **Elongation inhibitors do not prevent the release of puromycylated nascent polypeptide chains from ribosomes**. *eLife* 9, e60048 (eLife). <https://doi.org/10.7554/eLife.60048>
- ❖ **Kong, L. ***, Murata, M. M. *, & Digman, M. A. (2018). **Absence of REV3L promotes p53-regulated cancer cell metabolism in cisplatin-treated lung carcinoma cells**. *Biochemical and Biophysical Research Communications*, 496(1), 199-204 (BBRC). <https://doi.org/10.1016/j.bbrc.2018.01.026>

Conferences (* denotes equal contribution)

- ❖ **Kong, L.***, Durrezi, H., Mi, L., & Shavit, N. N. (2025, March). **Presynaptic input synchrony at scale** [Poster presentation]. *Computational and Systems Neuroscience (COSYNE 2025)*, Montreal, QC, Canada.
- ❖ Sawmya, S.*, **Kong, L.***, Markov, I., Alistarh, D., & Shavit, N. N. (2024, August). **Neuronal disentanglement and Sparse Expansion** [Poster presentation]. *New England Mechanistic Interpretability Workshop Series (NEMI 2024)*, Boston, MA, United States.
- ❖ Hobson, B. D., **Kong, L.**, Angelo, M. F., Lieberman, O. J., Mosharov, E. V., Herzog, E., Sulzer, D., & Sims, P. A. (2021, October). **Subcellular and regional localization of mRNA translation in midbrain dopamine neurons** [Poster presentation]. *2021 Columbia Undergraduate Research Symposium*, New York, NY, United States.
- ❖ Hobson, B. D., **Kong, L.**, Hartwick, E. W., Gonzalez, R. L., Jr., & Sims, P. A. (2020, October). **Elongation inhibitors do not prevent the release of puromycylated nascent polypeptide chains from ribosomes** [Poster presentation]. *2020 Columbia Undergraduate Research Symposium*, New York, NY, United States.
- ❖ **Kong, L.**, Hobson, B. D., & Sims, P. A. (2019, October). **Toward visualization of active translation in dopaminergic neurons** [Poster presentation]. *2019 Columbia Undergraduate Research Symposium*, New York, NY, United States.
- ❖ **Kong, L.***, Murata, M. M.*, & Digman, M. A. (2017, October). **Fighting the (chemotherapeutic) resistance: restoring p53 function and silencing REV3L suppresses the cancerous metabolic phenotype in cisplatin treated human non-small lung carcinoma cells** [Poster presentation]. *2nd World Congress on Cancer Research and Therapy (WCCRT 2017)*, San Diego, CA, United States.

Honors and Achievements

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| ❖ Spotlight Presentation at ICLR – Top 5% of submissions | 2025 |
| ❖ COSYNE New Attendee Travel Grant – Awardee | 2025 |
| ❖ Cerebras Research Fellowship – Awardee | 2024 |
| ❖ NSF Graduate Research Fellowship Program – Honorable Mention | 2024 |
| ❖ Columbia University I.I. Rabi Scholar – One of 17 students in class awarded yearly research funding | 2018 – 2022 |
| ❖ American Invitational Mathematics Examination (AIME) qualifier – Top 5% nationally | 2015 – 2018 |
| ❖ USA Biology Olympiad (USABO) semifinalist – Top 10% nationally | 2015 |

Teaching Experience

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| ❖ Research Mentor , <i>Department of Electrical Engineering and Computer Science</i> , MIT | Dec 2022 – Present |
| • Mentoring undergraduate students to conduct research in mechanistic interpretability, model efficiency, and connectomics. Graduated mentees: | |
| • Heidi Durrezi, now PhD candidate at MIT | Sep 2023 – Sep 2024 |
| • Neehal Tumma, now PhD candidate at MIT | Dec 2022 – May 2024 |
| ❖ Course Assistant , <i>Computer Science Department</i> , CU | Jan 2021 – May 2022 |
| • Guided students to implement the mathematical and theoretical principles taught in class in Python-based applications and problem sets through weekly office hours and biweekly lab sessions in the following courses: | |
| • COMS W4701 Artificial Intelligence | Spring 2022 |
| • COMS W4733 Computational Aspects of Robotics | Fall 2021 |
| • COMS W4701 Artificial Intelligence | Summer 2021 |
| • COMS W3251 Computational Linear Algebra | Spring 2021 |
| ❖ Vice President , <i>Orange County Math Circle</i> (OCMC), Orange County, CA | Nov 2013 – May 2018 |
| • Oversaw logistics of all other math clubs within OCMC; resolved club issues in weekly diagnostic meetings | |
| • Directed volunteers to serve 2800+ students yearly; trained others to better instruct students | |

Invited Talks

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| ❖ Talk on <i>Wasserstein Distances, Neuronal Entanglement, and Sparsity</i> , Red Hat, Cambridge, MA, USA | Mar 2025 |
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Extracurricular Activities

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| ❖ Editor in Chief , <i>Columbia Science Review</i> , CU | Sep 2018 – May 2022 |
| • Supervise over 40 writers and editors to ensure the smooth operation of an online and a biannual publication | |
| • Coordinate between different teams, including illustrators and layout designers, to produce a cohesive product | |
| ❖ Vice President , <i>Columbia Synapse</i> , CU | Sep 2019 – May 2021 |
| • Oversee the organization of events to help unite the community in support of those with traumatic brain injuries, including research panels, socials, as well as of a large conference held during March 13 th and 14 th , 2021 | |
| ❖ RASC-AL Mission Member , <i>Columbia Space Initiative</i> , CU | Nov 2018 – May 2020 |
| • Semifinalist for NASA's RASC-AL competition to design a lunar lander, focused on thermal management | |