Kaiyi Jiang

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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA — April 2025
Doctor of Philosophy (Ph.D.) in Biological Engineering
GPA: 5.0 out of 5.0
Thesis title: Harnessing biological diversity and machine learning to develop a cell engineering toolbox
Advisors: Omar Abudayyeh, Jonathan Gootenberg, and Michael Birnbaum

Rice University, Houston, TX
Bachelor of Engineering in Biomedical Engineering — May 2021
GPA: 4.0 out of 4.0 (**Summa cum laude**)
Thesis title: Engineering synthetic phosphorylation signaling networks in mammalian cells
Advisors: Caleb Bashor, Pankaj Mehta, and Gang Bao

PROFESSIONAL EXPERIENCE

Incoming Assistant Professor of Bioengineering, Princeton University — 2026-2027

Amgen Science Fellow, Amgen — 2025-2026
- Developing immunogenicity prediction and engineering models for peptide/antibody therapeutics

Graduate Student, Abudayyeh-Gootenberg Lab, MIT & Harvard Medical School — 2021-2025
- Developed a robust mammalian cell state sensor RADARS
- Characterized the first RNA-guided protease (Craspase) and eukaryotic RNA-guided nuclease (Fanzor)
- Developed a robust few-shot protein evolution foundation model (EVOLVEpro)

Rotational student with Prof. James Collins, MIT — 2021

Rotational student with Prof. Michael Birnbaum, MIT — 2021

Undergraduate Research Assistant, Caleb Bashor Lab, Rice University — 2018-2021
- Engineered a fully synthetic phosphorylation network in mammalian cell

Intern, Regeneron Pharmaceuticals (Therapeutic antibody group) — 2019
- Elucidated molecular mechanisms driving different humoral responses for adjuvants

Undergraduate Research Assistant, Gang Bao Lab, Rice University — 2017-2021
- Designed a nanoparticle system for in vivo hyperthermia therapy

PUBLICATIONS (* denotes co-first author)

[1] **Jiang, K.*,** Yan, Z.*, Bernardo, MD., Sgrizzi, S.R., Villiger, L., Kayabolen, A., Kim, B., Carscadden, J.K., Hiraizumi, M., Nishimasu, H., Gootebnerg, J.S., Abudayyeh, O.O. (2025). Rapid in silico directed evolution by a protein language model with EVOLVEpro. ***Science***.
- **Summary:**
  We developed EVOLVE-Pro, a state-of-the-art (SOTA) method that uses protein language model to rapidly design protein variants with up to 100-fold higher activity. EVOLVEpro achieves SOTA prediction accuracy across 12 deep mutational scanning datasets and we demonstrate its utility in rapidly engineering monoclonal antibodies, genome editing, and mRNA therapeutics.
- **Highlight:**
  This work was highlighted in Eric Topol's Expert Voices (Science, 2025)

[2] Yang, X., Rocks, JW., **Jiang, K.**, Walters, AJ., Rai, K., Liu, J., Nguyen, J., Olson, SD., Mehta, P., Collins, JJ., Daringer, NM., Bashor, CJ. (2025). Engineering synthetic phosphorylation signaling networks in human cells. ***Science***.

[3] **Jiang, K.*,** Koob, J.*, Chen, X.D.*, Krajeski, R.N.*, Zhang, Y., Volf, V., Zhou, W., Sgrizzi, S.R., Villiger, L., Gootenberg, J.S., Chen, F., Abudayyeh, O.O. (2023). Programmable eukaryotic protein synthesis with RNA sensors by harnessing ADAR. ***Nature Biotechnology***.
- **Summary:**
  We engineered the first robust mammalian RNA-sensor based on ADAR called RADARS. The sensor can be reprogrammed to track any RNA species inside eukaryotic cells and allow conditional cargo expression based on the presence/expression of target mRNA(s). We demonstrate that the system can be readily integrated into AAV, lentivirus, and synthetic mRNA to selectively turn on an arbitrary protein of interest. We showcase the use of this system in cell specific killing, lineage tracing and *in vivo* recording for reprogrammable cell control.
- **Highlight:**
  This work was highlighted in Derek Lowe's IN THE PIPELINE. (2022), Ono et al, RNA Biology. (2023) and Twist Bioscience's Top Moments in Biotech (2022)

[4] **Jiang, K.*,** Lim, J.*, Sgrizzi, S.R., Trinh, M., Kayabolen, A., Yutin, N., Bao, W., Kato, K., Koonin, E., Gootenberg, J.S., Abudayyeh, O.O. (2023). Programmable RNA-guided DNA endonucleases are widespread in eukaryotes. ***Science Advances.***
- **Summary:**
  We discovered a novel group of RNA-guided DNA endonucleases widespread in eukaryotes and their viruses named Fanzor. This was the first evidence of reprogrammable RNA-guided DNA nucleases in eukaryotes, and we characterized Fanzors' (eukaryotic homologs of TnpB) adaptations into the eukaryotic world with nuclear localization signal (NLS), introns and association with diverse transposons. This work established the presence of RNA-guided DNA nucleases in all three kingdoms of life and the diversity of RNA-guided reprogrammable systems.
- **Highlight:**
  This work was highlighted in Patinios et al, Mol. Cell. (2023) & Karvelis et al, The CRISPR Journal. (2023)

[5] Kato, K.*, Okazaki, S.*, Schmitt-Ulms, C.*, **Jiang, K.***, Zhou, W., Ishikawa, J., Isayama, Y., Adachi, S., Nishizawa, T., Makarova, K.S., et al. (2022). RNA-triggered protein cleavage and cell death by the RNA-guided type III-E CRISPR-Cas nuclease-protease complex. ***Science***.

- **Summary:**
  We discovered the first RNA-guided protease systems in prokaryotic antiviral defense systems. We biochemically characterized the Cas7-11/Csx29/Csx30 systems in the context of abortive infection module against phage invasion. We then engineered the system and adapted it as an RNA-sensor system in mammalian cell.
- **Highlight:**
  This work was highlighted in Burgess et al, Nature Reviews Genetics. (2023), Chen et al, Trends in microbiology. (2023), and Wang et al, Nucleic Acids Research. (2022).

[6] Yarnall, M.T.N.*, Ioannidi, E.I.*, Schmitt-Ulms, C.*, Krajeski, R.N.*, Lim, J., Villiger, L., Zhou, W., **Jiang, K.**, Roberts, N., Zhang, L., et al. (2022). Drag-and-drop genome insertion without DNA cleavage with CRISPR-directed integrases. ***Nature Biotechnology***.

[7] Sebesta, C., Torres Hinojosa, D., Wang, B., Asfouri, J., Li, Z., Duret, G., **Jiang, K.**, Xiao, Z., Zhang, L., Zhang, Q., et al. (2022). Subsecond multichannel magnetic control of select neural circuits in freely moving flies. ***Nature Materials***.

[8] Zhang, L., Zhang, Q., Hinojosa, D.T., **Jiang, K.**, Pham, Q.K., Xiao, Z., Colvin, V.L., Bao, G. (2022) Multifunctional Magnetic Nanoclusters Can Induce Immunogenic Cell Death and Suppress Tumor Recurrence and Metastasis. ***ACS Nano***.

[9] **Jiang, K.**, Zhang, Q., Hinojosa, D.T., Zhang, L., Xiao, Z., Yin, Y., Tong, S., Colvin, V.L., Bao, G. (2021) Controlled oxidation and surface modification increase heating capacity of magnetic iron oxide nanoparticles. ***Applied Physics Reviews.***

[10] **Jiang, K.**, Zhang, L., Bao, G. (2021) Magnetic iron oxide nanoparticles for biomedical applications. ***Current Opinion in Biomedical Engineering***.

AWARDS & HONORS

- Schmidt Science Fellow Finalist 2025
- **Innovators Under 35** (TR35), MIT Technology Review, Asia-Pacific Region 2024
- **30 under 30,** All-America Chinese Youth Federation, The Log Angeles Post 2024
- The Wishnok Prize, Massachusetts Institute of Technology 2024
- MiraclePlus (Former Y Combinator China) Fellow 2024
- Distinction in Research and Creative Works 2021
- Outstanding Junior in Bioengineering 2020
- Tau Beta Pi Member 2019
- Louis J. Walsh Scholarships 2019-2021
- Best Oral Presentation Award, Rice University Research Symposium 2019
- President's Honor Roll 2017-2021

RESEARCH INTERESTS

- Harnessing evolutionary diversity to discover novel reprogrammable systems
- AI/ML models to engineer RNA and proteins
- Synthetic biology for *in vivo* recording and lineage tracing
- Gene/cell therapy for autoimmune disease and cancer

INVITED TALKS & PRESENTATIONS

- 2024 ML Protein Engineering Seminar Series. (Virtual)
- 2024 Cradle Bio invited seminar on machine learning for protein engineering. (Virtual)
- 2024 Harvard Medical School Machine learning to accelerate biology journal club, Boston, MA.
- 2024 SynBYSS, Rising star junior speaker. (Virtual)
- 2024 Bunker Hill community college, STEM Seminar, Boston, MA.
- 2024 Tufts BME162 Molecular Biotech invited lecture, Boston, MA.
- 2023 Bioengineering and Toxicology Seminar, Boston, MA.
- 2023 Harvard Medical School Genome Engineering Symposium, Boston, MA.
- 2023 Broad Gene regulation observatory seminar, Boston, MA.
- 2023 Mammalian Synthetic Biology Workshop (Poster presentation), Stanford, CA.
- 2023 Broad Institute Cell Circuits and Epigenetics Seminar, Boston, MA.
- 2022 Harvard Medical School Genome Engineering Seminar Series, Boston, MA. (Virtual)
- 2022 Boston Mammalian Synthetic Biology Symposium, Boston, MA.
- 2022 Single Cell Genomics Day, NYC, NY. (Virtual)
- 2019 Annual meeting of Biomedical Engineering Society (BMES), Philadelphia, PA.

PATENTS

1. Abudayyeh, O., Gootenberg, J., Nishimasu, H., Kazuki, K., Okazaki, S., Schmitt-Ulms, C., and **Jiang, K.** (2024). RNA-triggered protein cleavage and applications by the CRISPR Cas7-11-Csx29 complex. US Patent App. 18/234,690
2. **Jiang, K.**, Krajeski, R.N., Abudayyeh, O.O., Gootenberg, J.S., Zhang, Y., Chen, F., Chen, X., and Koob, J.G. (2023). Deaminase-based rna sensors. US Patent App. 17/806,879

3. Abudayyeh, O., Gootenberg, J., Villiger, L., and **Jiang, K.** (2023). Programmable insertion approaches via reverse transcriptase recruitment. US Patent App. 18/067,214
4. Abudayyeh, O., Gootenberg, J., and **Jiang, K**. (2023). Site specific genetic engineering utilizing trans-template rnas. US Patent App. 18/303,533
5. **Jiang, K.,** Villiger, L., Abudayyeh, O., and Gootenberg, J. (2023) Systems, methods, and compositions comprising miniature CRISPR nucleases for gene editing and programmable gene activation and inhibition. US Patent App. 63/211,610
6. Abudayyeh, O., Gootenberg, J., **Jiang, K**, and Lim, J. (2023). Fanzors are rna-guided nucleases encoded in eukaryotic genomes. US Patent App. 18/406,066

MENTORSHIP

Josephine Carscadden, Katrina Yang, Rahul Rajendran, Jett Liu, Kai Wang, Samantha Sgrizzi, Michael Trinh, Rayya Reda Frayn, Benyapa Khowpinitchai, Shuchen Luo, Kathrin Kajderowicz

Professional Societies

- Biomedical Engineering Society (BMES) 2020-Now
- American Institute of Chemical Engineers (AIChE) 2023-Now

Journal Reviewer

*PLOS ONE *Frontiers in Neuroscience *Science of the Total Environment *Nature Chemical Biology