Joshua Engels

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GitHub: github.com/JoshEngels **Website:** joshengels.com **Google Scholar:** [link]

EDUCATION

Massachusetts Institute of Technology **August 2023 - August 2028**
PhD in Computer Science Cambridge, MA
Advisor: Prof. Max Tegmark

Rice University **August 2018 - December 2021**
Bachelor of Science in Computer Science Houston, TX
Bachelor of Arts in Mathematics
Graduated summa cum laude (4.00 GPA)

SELECTED PUBLICATIONS

Not All Language Model Features Are One-Dimensionally Linear
Joshua Engels, Eric J. Michaud, Isaac Liao, Wes Gurnee, and Max Tegmark
International Conference on Learning Representations (ICLR) 2025.

Efficient Dictionary Learning with Switch Sparse Autoencoders
Anish Mudide, **Joshua Engels**, Eric Michaud, Max Tegmark, Christian Schroeder de Witt
International Conference on Learning Representations (ICLR) 2025.

Approximate Nearest Neighbor Search with Window Filters
Joshua Engels, Benjamin Landrum, Shangdi Yu, Laxman Dhulipala, Julian Shun
International Conference on Machine Learning (ICML) 2024.

DESSERT: An Efficient Algorithm for Vector Set Search with Vector Set Queries
Joshua Engels, Benjamin Coleman, Vihan Lakshman, and Anshumali Shrivastava
Advances in Neural Information Processing Systems (NeurIPS) 2023.

Practical Near Neighbor Search via Group Testing.
Joshua Engels*, Benjamin Coleman*, and Anshumali Shrivastava
Advances in Neural Information Processing Systems (NeurIPS) 2021: Spotlight - top 3%

$*$ indicates equal contribution

SELECTED PREPRINTS

Decomposing The Dark Matter of Sparse Autoencoders
Joshua Engels, Logan Riggs, Max Tegmark

Are Sparse Autoencoders Useful? A Case Study in Sparse Probing
Subhash Kantamneni*, **Joshua Engels***, Senthooran Rajamanoharan, Max Tegmark, Neel Nanda

Low-Rank Adapting Models for Sparse Autoencoders
Mathew Chen*, **Joshua Engels***, Max Tegmark

The Geometry of Concepts: Sparse Autoencoder Feature Structure
Yuxiao Li*, Eric J. Michaud*, David D. Baek*, **Joshua Engels**, Xiaoqing Sun, Max Tegmark

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TALKS

Sparse Autoencoders: Limitations, Progress, and Dreams
David Klindt Group Meeting, 2025

Not All Language Model Features Are Linear
Joint Mathematics Meetings AMS Special Session on Geometry and Machine Learning, 2025

Not All Language Model Features Are Linear
BITS Physics of Intelligence Workshop Talk, 2024

DESSERT: An Efficient Algorithm for Vector Set Search with Vector Set Queries
NeurIPS 2023: Poster talk.

Practical Near Neighbor Search via Group Testing
NeurIPS 2021: Spotlight talk.

SELECTED HONORS

NSF Graduate Research Fellowship (GRFP) **2024 - 2027**

Louis J. Walsh Scholarship in Engineering **2020, 2021**

National Merit Finalist Scholarship **2018 - 2019**

OTHER RESEARCH EXPERIENCE

ThirdAI Corp **August 2021 - May 2023**
Artificial Intelligence Engineer *Houston, TX*

Lead engineer on nearest neighbor search. Made core contributions to ThirdAI's internal machine learning engine, including work on the computation DAG (directed acyclic graph), distributed training, and extensive sparsity-based optimizations. Created DESSERT, a general algorithm for performing vector-set search with vector-set queries.

Rice University Sketching and Hashing Lab **August 2020 - August 2021**
Undergraduate Researcher, PI: Prof. Anshumali Shrivastava *Houston, TX*

Implemented and benchmarked FLINNG, a high performance C++ nearest neighbor search algorithm build with locality sensitive hashing and group testing.

TEACHING AND MENTORING EXPERIENCE

MIT Graduate Application Assistance Program **August 2023 - December 2023**
Mentor *Cambridge, MA*

Mentored students from underrepresented backgrounds applying to graduate schools.

Rice University Computer Science Department **January 2020 - May 2020**
Algorithmic Thinking (Comp 182) Teaching Assistant *Houston, TX*

Held office hours and led review sessions for Rice's algorithms and discrete mathematics intro class.

Rice University Catalyst Eureka Program **September 2018 - May 2019**
Mentor *Houston, TX*

Mentored a student working on a year-long research project analyzing characteristics of popular songs.