

# Benjamin Hoover

AI Researcher, Engineer, Student

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## Education

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### Machine Learning PhD Student

Aug 2021 - Present

Georgia Tech, Atlanta, GA

Advisor: Duen Horng (Polo) Chau

### Master of Engineering: Electrical and Computer Engineering

May 2018

Duke University, Durham, NC

### Bachelor of Science in Engineering: Biomedical Engineering

May 2017

Duke University, Durham, NC

## Industry Research Experience

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### IBM Research

Sep '18 - Present

Visual AI Lab, Cambridge, MA

Mentors: Hendrik Strobelt • Dmitry Krotov

Member of the Visual AI Lab where we use visualization to breathe insight and interactivity into powerful AI systems.

### Medtronic Diabetes

Summer '17

Algorithms R&D, Northridge, CA

Mentors: Peter Ajemba • Keith Nogueira

Analyze trends in patient blood glucose levels for the sensor R&D team, developing algorithms that were incorporated into product by the end of the summer.

## Academic Research Experience

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### Georgia Institute of Technology

Aug '21 - present

Polo Club at School of Computational Science and Engineering, Atlanta, GA

Mentor: Polo Chau

Member of the Polo Club of Data Science where we innovate scalable, interactive, and interpretable tools that amplify human's ability to understand and interact with billion-scale data and machine learning models.

### International Genetically Engineered Machine (iGEM)

Apr '15 - May '17

Lynch Lab, Durham, NC

Mentors: Eirik Adim Moreb • Michael D. Lynch

Designed experiments to analyze CRISPR-Cas9 binding effects in bacteria, using machine learning to discover patterns in the data.

## Awards and Honors

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### Best Poster Award

Oct. 2024

Transformer Explainer receives Best Poster at IEEE VIS 2024

### Best Poster Award

Energy Transformer receives 2nd place 🏆 in GATech's annual Graduate Poster Symposium

Mar. 2024

### Best Paper Award, Honorable Mention

DiffusionDB receives a Best Paper, Honorable Mention Award at ACL 2023

July 2023

### Spotlight Paper Award

HAMUX is spotlighted (top 5 submissions) at the Deep Learning and Differential Equation Workshop at NeurIPS 2022

Dec. 2022

### Highlighted Reviewer

ICLR 2022

Apr. 2022

### Best Poster Award

RXNMapper wins Best Poster award at #IOPPoster 2020

July 2020

### Best Demo Award

LMdiff is Best Demo at NeurIPS 2020

Dec. 2020

### (Runner Up) Best Demo

exBERT is runner up for Best Demo at NeurIPS 2019

Dec. 2019

### Dean's List

In the highest one third of engineering class by GPA at Duke

2013-2017

### Raul Buelvas Award

Given to one freshman at Duke University who "best exemplifies honor, optimism, and selflessness" as voted by peers and faculty

Apr. 2014

## Publications

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### Conference

#### Dense Associative Memory through the Lens of Random Features

**Benjamin Hoover**, Polo Chau, Hendrik Strobelt, Parikshit Ram, Dmitry Krotov

*Neural Information Processing Systems (NeurIPS '24)*. 2024.

(coming soon)

#### Transformer Explainer: Interactive Learning of Text-Generative Models

Aeree Cho, Grace C. Kim, Alexander Karpekov, Alec Helbling, Zijie J. Wang, Seongmin Lee,

**Benjamin Hoover**, and Others

*IEEE Transactions on Visualization and Computer Graphics (VIS)*. 2024.

Demo

PDF

Code

Video

🏆 Best Poster @VIS '24 🏆 Went Viral on X (❤️ 1.9k+) 🏆 #1 paper of the day 🥳

#### Energy Transformer

**Benjamin Hoover**, Yuchen Liang, Bao Pham, Rameswar Panda, Hendrik Strobelt, Polo Chau, Mohammed J. Zaki, and Others

*Conference on Neural Information Processing Systems (NeurIPS)*. 2023.

PDF

Poster

Home

Code

Video (5m)

Video (45m)

#### ConceptEvo: Interpreting Concept Evolution in Deep Learning Training

Haekyu Park, Seongmin Lee, **Benjamin Hoover**, Austin Wright, Omar Shaikh, Rahul Duggal, Nilaksh Das, and Others

*ACM International Conference on Information and Knowledge Management (CIKM)*. 2023.

PDF

## Diffusion Explainer: Visual Explanation for Text-to-image Stable Diffusion

Seongmin Lee, **Benjamin Hoover**, Hendrik Strobelt, Zijie J. Wang, ShengYun Peng, Austin Wright, Kevin Li, and Others

*IEEE Transactions on Visualization and Computer Graphics (VIS)*. 2024.

[Demo](#) [PDF](#) [Video](#) [Code](#)

## DiffusionDB: A Large-scale Prompt Gallery Dataset for Text-to-Image Generative Models

Zijie J. Wang, Evan Montoya, David Munechika, Haoyang Yang, **Benjamin Hoover**, Polo Chau

*Association for Computational Linguistics (ACL)*. 2023.

[Home](#) [Code](#) [Dataset](#) [PDF](#)

🏆 **Best Paper Award, Honorable Mention** 🏆 **Went Viral** 🏆 **Oral Presentation**

## Fairness Evaluation in Text Classification: Machine Learning Practitioner Perspectives of Individual and Group Fairness

Zahra Ashktorab, **Benjamin Hoover**, Mayank Agarwal, Casey Dugan, Werner Geyer, Hao Bang Yang, Mikhail Yurochkin

*Conference on Human Factors in Computing Systems (CHI)*. 2023.

[PDF](#)

## Interactive and Visual Prompt Engineering for Ad-hoc Task Adaptation with Large Language Models

Hendrik Strobelt, Albert Webson, Victor Sanh, **Benjamin Hoover**, Johanna Beyer, Hanspeter Pfister, Alexander Rush

*IEEE Transactions on Visualization and Computer Graphics (VIS)*. 2022.

[PDF](#) [Demo](#)

## Shared Interest: Measuring Human-AI Alignment to Identify Recurring Patterns in Model Behavior

Angie Boggust, **Benjamin Hoover**, Arvind Satyanarayan, Hendrik Strobelt

*ACM Conference on Human Factors in Computing Systems (CHI)*. 2022.

[Project](#) [Demo](#) [Video](#) [PDF](#) [Code](#)

## Can a Fruit Fly Learn Word Embeddings?

Yuchen Liang, Chaitanya K. Ryali, **Benjamin Hoover**, Leopold Grinberg, Saket Navlakha, Mohammed J. Zaki, Dmitry Krotov

*International Conference for Learning Representations (ICLR)*. 2021.

[Project](#) [PDF](#) [Poster](#) [Code](#)

## The Design and Development of a Game to Study Backdoor Poisoning Attacks: The Backdoor Game

Zahra Ashktorab, Casey Dugan, James Johnson, Aabhas Sharma, Dustin Ramsey Torres, Ingrid Lange, **Benjamin Hoover**, and Others

*International Conference on Intelligent User Interfaces (IUI)*. 2021.

[PDF](#)

## CogMol: Target-Specific and Selective Drug Design for COVID-19 Using Deep Generative Models

Enara Vijil, Payel Das, Samuel Hoffman, Hendrik Strobelt, Inkit Padhi, Kar Wai Lim, **Benjamin Hoover**, and Others

*Neural Information Processing Systems (NeurIPS)*. 2020.

[Project](#) [Demo](#) [PDF](#)

## exBERT: A Visual Analysis of Transformer Models

**Benjamin Hoover**, Hendrik Strobelt, Sebastian Gehrmann

*Association for Computational Linguistics: System Demonstrations (ACL)*. 2020.

[Project](#) [Demo](#) [PDF](#) [Video](#) [Code](#)

## Journal

### Operational response simulation tool for epidemics within refugee and IDP settlements

Joseph Bullock, Carolina Cuesta-Lazaro, Arnau Quera-Bofarull, Anjali Katta, Katherine Hoffmann Pham, Benjamin Hoover, Hendrik Strobel, and Others

*Public Library of Science: Computational Biology (PLOS)*. 2021.

PDF

### RXNMapper: Unsupervised Attention Guided Atom Mapping

Philippe Schwaller, Benjamin Hoover, JL Reymond, Hendrik Strobel, Teodoro Laino

*Science Advances (AAAS)*. 2020.

Project

Demo

PDF

Video

Code

### Managing the SOS Response for Enhanced CRISPR-Cas-Based Recombineering in *E. coli* through Transient Inhibition of Host RecA Activity

Eirik Adim Moreb, Benjamin Hoover, Adam Yaseen, Nisakorn Valyasevi, Zoe Roecker, Romel Menacho-Melgar, Michael D. Lynch

*American Chemical Society: Synthetic Biology (ACS)*. 2017.

PDF

## Workshop

### Memory in Plain Sight: A Survey of the Uncanny Resemblances between Diffusion Models and Associative Memories

Benjamin Hoover, Hendrik Strobel, Dmitry Krotov, Judy Hoffman, Zsolt Kira, Polo Chau

*NeurIPS Workshop on Associative Memory and Hopfield Networks (AMHN@NeurIPS)*. 2023.

PDF

Poster

Home

### HAMUX: A Universal Abstraction for Hierarchical Hopfield Networks

Benjamin Hoover, Polo Chau, Hendrik Strobel, Dmitry Krotov

*Symbiosis of Deep Learning and Differential Equations II Workshop at NeurIPS (DLDE)*. 2022.

Code

Project

PDF

Video

## Preprints

### Fairytaylor: A multimodal generative framework for storytelling

Eden Bensaïd, Mauro Martino, Benjamin Hoover, Hendrik Strobel

*ArXiv preprint (ArXiv)*. 2021.

PDF

Demo

## Talks

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### Hopfield Networks 2.0: Associative Memory for the Modern Era of AI

Physics Informed ML Workshop at Los Alamos National Laboratory Invited

Sep 2024

Plectics Lab Colloquium Invited

May 2024

### Energy Transformer

McMahon Lab at Cornell University Invited

Sep 2023

### HAMUX: Inventing Hopfield Networks 2.0

Georgia Tech CSE Hotseat

Nov 2022

### Comparing Language Models with LMDiff

Demo at NeurIPS 2020

Dec 2020

## exBERT: Exploring Learned Embeddings in Transformer Models

System Demonstration at ACL 2020

Jul 2020

IBM Exposition Demo at ICLR 2020

Apr 2020

System Demonstration at NeurIPS 2019

Dec 2019

## Unsupervised Attention Guided Atom Mapping with RXNMapper

ML Interpretability for Scientific Discovery Workshop at ICML 2020

Jul 2020

IBM Exposition Demo at ICML 2020

Jul 2020

## Breaking the Wall of Black Box AI

Falling Walls Lab Boston"

Oct 2020

## The Inside Story

MEng Graduation elected speaker Invited

May 2018

## Using Matlab's PRT to Accelerate Algorithm Development

Medtronic Diabetes R&D

Jul 2017

## The Impact of Encouragement

Cary Christian School Valedictorian Speech Invited

May 2013

# Teaching

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## Graduate Teaching Assistant

Fall '23 - Spring '24

Georgia Institute of Technology, Atlanta, GA

Instructors: Polo Chau • Mahdi Roozbahani

Organized project teams, graded projects, and held weekly office hours for an online graduate course with 947 students enrolled.

## Graduate Teaching Assistant

Spring '18

Duke University, Durham, NC

Instructor: Patrick Wang

Designed homeworks, supervised projects, and occasionally teach lectures.

## Graduate Teaching Assistant

Spring '18

Duke University, Durham, NC

Instructor: Jonathan Viventi

Supervised and graded capstone projects where students designed and assembled 2-channel EEG readers

## Graduate Teaching Assistant

Spring '18

Duke University, Durham, NC

Instructors: Stacy Tantum • Paul Bendich

As a TA, I helped setup class infrastructure (Python, jupyter) and initial curriculum for this 25 student pilot course for Duke's Data+ Program.

## Undergraduate Teaching Assistant

Spring '17

Duke University, Durham, NC

Instructor: Jonathan Viventi

Prepared, supervised, and graded labs where students designed medical devices such as Ultrasound, ECGs, Baby Incubators, and functional FitBits.

## Undergraduate Teaching Assistant

Jan '15 - May '18

Duke University, Durham, NC

Instructor: Stacy Tantum

Graded homeworks, held weekly office hours, supervised labs, and private tutored students.

## Boeing Fellow

Jan '16 - May '17

Duke University, Durham, NC

Instructor: Carmen Rawls

Wrote STEM lesson plans to engage middle and high school students in the Durham area.

# Service

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## Reviewer

Neural Information Processing Systems (**NeurIPS**) 2024 · 2023 · 2021

International Conference for Learning Representations (**ICLR**) 2025 · 2024 · 2023 · 2022

International Conference for Machine Learning (**ICML**) 2023 · 2022

Workshop on Associative Memory & Hopfield Networks at NeurIPS (**AMHN@NeurIPS**) 2023

Blogpost Track at ICLR (**BP@ICLR**) 2023

Workshop on the Symbiosis of Deep Learning and Differential Equations at NeurIPS  
(**DLDE@NeurIPS**) 2022

ACM Conference on Human Factors in Computing Systems (**CHI**) 2023

## Committee

Associative Memory & Hopfield Network Workshop (**AMHN@NeurIPS**) 2023

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