

# 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

Mar. 2024

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

## Best Paper Award, Honorable Mention

July 2023

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

## Spotlight Paper Award

Dec. 2022

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

## Highlighted Reviewer

Apr. 2022

ICLR 2022

## Best Poster Award

July 2020

RXNMapper wins Best Poster award at #IOPPoster 2020

## Best Demo Award

Dec. 2020

LMdiff is Best Demo at NeurIPS 2020

## (Runner Up) Best Demo

Dec. 2019

exBERT is runner up for Best Demo at NeurIPS 2019

## Dean's List

2013-2017

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

## Raul Buelvas Award

Apr. 2014

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

# Publications

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## Conference

### 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.

[Video](#) [Code](#) [Demo](#) 🏆 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 Strobelt, and Others  
*Public Library of Science: Computational Biology (PLOS)*. 2021.

[PDF](#)

## RXNMapper: Unsupervised Attention Guided Atom Mapping

Philippe Schwaller, Benjamin Hoover, JL Reymond, Hendrik Strobelt, 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 Strobelt, 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 Strobelt, 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 Bensaid, Mauro Martino, Benjamin Hoover, Hendrik Strobelt  
*ArXiv preprint (ArXiv)*. 2021.

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

## Talks

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

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

Workshop on Associative Memory & Hopfield Networks at NeurIPS (**AMHN@NeurIPS**) 2023  
International Conference for Learning Representations (**ICLR**) 2024 · 2023 · 2022  
International Conference for Machine Learning (**ICML**) 2023 · 2022  
Blogpost Track at ICLR (**BP@ICLR**) 2023  
Workshop on the Symbiosis of Deep Learning and Differential Equations at NeurIPS  
(**DLDE@NeurIPS**) 2022  
Neural Information Processing Systems (**NeurIPS**) 2024 · 2023 · 2021  
ACM Conference on Human Factors in Computing Systems (**CHI**) 2023

## **Committee**

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

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