

# Haekyu Park

My research focuses on **democratizing artificial intelligence (AI)** – helping people more easily access, learn, and understand AI technologies. Specifically, I design and build **interactive visual tools** to help people easily **interpret, explore, and apply AI** to many important domain problems. My long-term goal is to cultivate an AI ecosystem where people of diverse backgrounds, skill sets, and domains would work harmoniously to invent the next AI-powered innovations.

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## Education

### Georgia Institute of Technology

Ph.D., Computer Science  
Advisor: Dr. Polo Chau  
Aug 2018 - Present

### Seoul National University

B.S., Computer Science and Engineering  
Graduated with honors (Cum Laude)  
Mar 2012 - Aug 2017

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## Research Experience

### Data Science Intern

NVIDIA, Austin, TX  
Mentor: Bartley Richardson, Brad Rees, Joe Eaton  
Internship results are integrated into NVIDIA RAPIDS team's [cybersecurity usecase notebook](#), presented at [KDD 2019 NVIDIA RAPIDS tutorial](#).

May 2019 - Aug 2019

### Graduate Research Assistant

Georgia Institute of Technology, Atlanta, GA

Aug 2018 - Present

### Undergraduate Research Assistant

Seoul National University, Seoul, Republic of Korea

June 2016 - Aug 2017

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## Awards & Honors

### "Thank a Teacher" Award

Center of Teaching & Learning (CTL), Georgia Institute of Technology

2019

### WiML Travel Funding

\$550 Travel Funding  
Women in Machine Learning Workshop, co-located with NeurIPS

2019

## Amazon AWS Research Grant

Funded \$5,000 in AWS cloud credits

Co-PIs: Nilaksh Das, Scott Freitas, Duen Horng Chau

2018

## National Scholarship for Science and Engineering

National Scholarship for Science and Engineering

2015

# Publication

### Massif: Interactive Interpretation of Adversarial Attacks on Deep Learning

Nilaksh Das\*, [Haekyu Park\\*](#), Zijie Jay Wang, Fred Hohman, Robert Firstman, Emily Rogers, and Duen Horng Chau

ACM CHI Conference on Human Factors in Computing Systems (CHI), [Late-Breaking Works](#), Honolulu, Hawaii, USA, 2020.

\* Authors contributed equally.

[arXiv](#)

### CNN 101: Interactive Visual Learning for Convolutional Neural Networks

Zijie Jay Wang, Robert Turko, Omar Shaikh, [Haekyu Park](#), Nilaksh Das, Fred Hohman, Minsuk Kahng, and Duen Horng Chau

ACM CHI Conference on Human Factors in Computing Systems (CHI), [Late-Breaking Works](#), Honolulu, Hawaii, USA, 2020.

[arXiv](#)

### Summit: Scaling Deep Learning Interpretability by Visualizing Activation and Attribution Summarizations

Fred Hohman, [Haekyu Park](#), Caleb Robinson, and Duen Horng Chau

IEEE Transactions on Visualization and Computer Graphics (TVCG), Vancouver, BC, Canada, 2020.

[▶ Demo](#) [PDF](#) [arXiv](#)

### Visual Analytics for Interpretability on Deep Neural Networks

[Haekyu Park](#), Fred Hohman, Nilaksh Das, Caleb Robinson, and Duen Horng Chau

Women in Machine Learning Workshop (co-located with NeurIPS 2019) ([WiML](#)), Vancouver, BC, Canada, 2019.

### MLsploit: A Framework for Interactive Experimentation with Adversarial Machine Learning Research

Nilaksh Das, Siwei Li, Chanil Jeon, Jinho Jung, Shang-Tse Chen, Carter Yagemann, Evan Downing, [Haekyu Park](#), Evan Yang, Li Chen, Michael Kounavis, Ravi Sahita, David Durham, Scott Buck, Duen Horng Chau, Taesoo Kim, and Wenke Lee

ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD), [KDD Project](#), Anchorage, Alaska, USA, 2019.

[▶ Demo](#) [PDF](#)

### MLsploit: A Cloud-Based Framework for Adversarial Machine Learning Research

Nilaksh Das, Siwei Li, Chanil Jeon, Jinho Jung, Shang-Tse Chen, Carter Yagemann, Evan Downing, [Haekyu Park](#), Evan Yang, Li Chen, Michael Kounavis, Ravi Sahita, David Durham, Scott Buck, Duen Horng Chau, Taesoo Kim, and Wenke Lee

Black Hat Asia - Arsenal, 2019.

[▶ Demo](#) [Abstract](#) [Video](#)

### NeuralDivergence: Exploring and Understanding Neural Networks by Comparing Activation Distributions

[Haekyu Park](#) Fred Hohman, and Duen Horng Chau

IEEE Pacific Visualization Symposium ([PacificVis](#)), Bangkok, Thailand, 2019.

[▶ Demo](#) [PDF](#) [arXiv](#)

### SIDE: Representation Learning in Signed Directed Networks

Junghwan Kim, [Haekyu Park](#), Ji-Eun Lee, and U Kang

The Web Conference (Previously known as [WWW](#), World Wide Web Conference) Lyon, France, 2018.

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

## A Comparative Study of Matrix Factorization and Random Walk with Restart in Recommender Systems

Haekyu Park, Jinhong Jung, and U Kang

IEEE International Conference on Big Data ([BigData](#)) , Boston, MA, USA, 2017.

Project [PDF](#) [arXiv](#)

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## Open-Source Research Projects

### Summit: Scaling Deep Learning Interpretability by Visualizing Activation and Attribution Summarizations

2019

Keywords: Neural Network Interpretability, Attribution Graph, Interactive Visual Analytics

Interactive visualization that scalably summarizes what features a deep learning model has learned and how those features interact to make predictions.

It was published at IEEE VIS (VAST), 2019.

Fred Hohman, [Haekyu Park](#), Caleb Robinson, Duen Horng Chau

[▶ Demo](#)

### MLsploit: A Framework for Interactive Experimentation with Adversarial Machine Learning Research

2019

Keywords: Adversarial Attacks and Defenses for Machine Learning Models, Interactive Experimentation

User-friendly, cloud-based system that enables researchers and practitioners to rapidly evaluate and compare state-of-the-art adversarial attacks and defenses for machine learning (ML) models.

It was published at a KDD 2019 Project Showcase.

[▶ Demo](#)

### SIDE: Representation Learning in Signed Directed Networks

2018

Keywords: Network Embedding, Signed Weighted Directed Graph

General network embedding method that represents both sign and direction of edges in the embedding space.

It was published at the Web Conference (WWW), 2018.

Project

### A Comparative Study of Matrix Factorization and Random Walk with Restart in Recommender Systems

2017

Keywords: Recommender System, Matrix Factorization, Random Walk with Restart

We provide a comparative study of matrix factorization and RWR, which are the most representative recommender systems.

It was published at IEEE Big Data, 2017.

Project

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## Other Projects

### RAPIDS and Cybersecurity: A Network Use Case

2019

Keywords: RAPIDS, NVIDIA, GPU-acceleration, Graph, Personalized Page Rank

We showcase an approach to flagging anomalous network communications in a large graph using a combination of structural graph features and graph analytics, running end-to-end in RAPIDS.

Presented at [KDD 2019 NVIDIA RAPIDS tutorial](#) with the [cybersecurity](#) use case notebook.

### Recommender System for Videos on Oksusu Application

2017

Keywords: Deep Learning, Sequence/Word Embedding, Approx. k-NN, Heterogeneous Features

Our system recommends videos to users of Oksusu application, handling massive data on users' behaviors and heterogeneous information of videos.

SK Telecom, Seoul, Republic of Korea

## A Fast Data Compression with Shared Virtual Memory in Heterogeneous System Architecture

2017

Keywords: OpenCL, GPGPU, SVM, HSA

I used general purpose computing on graphics processing units (GPGPU) and Shared Virtual Memory (SVM) in Heterogeneous System Architecture (HSA) for fast data deduplication methods. GPGPU and HSA provide a powerful basis for parallel computing in an easy programmable and efficient way.

Undergraduate thesis

## Personalized Recommendation for Credit Card Rewards

2016

Keywords: Coupled Matrix Factorization, Time Series Data

We provide personalized recommendations for credit card rewards to customers using various side information of users and items. The main algorithm is TCMF (Time Coupled Matrix Factorization).

Hyundai Card, Seoul, Republic of Korea

 News article (in Korean)

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## Talks & Presentation

### Accelerated Data Science in the Classroom: Teaching Analytics and Machine Learning with RAPIDS

Polo Chau and [Haekyu Park](#)

Mar 2020, Talk, NVIDIA's GPU Technology Conference (GTC)

### NeuralDivergence: Exploring and Understanding Neural Networks by Comparing Activation Distributions

Apr 2019, Poster Presentation, PacificVis

### A Comparative Study of Matrix Factorization and Random Walk with Restart in Recommender Systems

Dec 2017, Oral Presentation, IEEE Big Data

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## Tutorial

### RAPIDS and Cybersecurity: A Network Use Case

Keywords: RAPIDS, NVIDIA, GPU-acceleration, Graph, Personalized Page Rank

Presented at [KDD 2019 NVIDIA RAPIDS tutorial](#) with the [cybersecurity use case notebook](#)

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## Teaching

### Graduate Teaching Assistant

Georgia Institute of Technology, Atlanta, GA

Fall 2019

[Data and Visual Analytics \(CSE 6242\)](#)

Instructor: Polo Chau

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## Mentoring

### Rob Firstman

B.S. in Computer Science, Georgia Institute of Technology  
Visualization for deep learning interpretability

Fall 2019 - Present

### **Robert Turko**

B.S. in Computer Science, Georgia Institute of Technology  
Visualization for machine learning education

Fall 2019 - Present

### **Omar Shaikh**

B.S. in Computer Science, Georgia Institute of Technology  
Visualization for natural language processing  
Received Outstanding Freshman Award

Fall 2019 - Present

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## **Professional Service**

### **Reviewer**

WiML 2019  
KDD 2019  
ICML 2019

### **Professional Membership**

The Institute of Electrical and Electronics Engineers (IEEE). Since 2019.

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## **Technical Skills**

### **Programming Languages**

Python, JavaScript, HTML, R, Matlab, Java, C, C++, Ocaml, Scheme

### **Machine Learning / Deep Learning / Data Science**

TensorFlow, PyTorch, Keras, scikit-learn, OpenCV, Numpy, Pandas, SciPy, NetworkX

### **GPU-accelerated Data Science**

cuGraph, cuDF, cuML, BlazingSQL, OpenCL

### **Data Visualization**

D3.js, HoloViews, Matplotlib, WebGL, ggplot