

# Haekyu Park

The vision of my research is to cultivate a machine learning (ML) ecosystem where people of diverse backgrounds, skill sets, and domains would work harmoniously to invent the next ML innovation. From equalizing ML education opportunities, broadening access to ML technologies, to promoting trustworthy and interpretable ML models, I research how to help **a wider range of people be empowered by ML**. I design and develop interactive visualization tools that help people quickly learn, confidently understand, and easily use ML models.

At Georgia Tech, I am a member of the Polo Club of Data Science. I have been fortunate to work with amazing researchers, engineers, and scientists at NVIDIA.

[haekyu@gatech.edu](mailto:haekyu@gatech.edu) · [haekyu.com](http://haekyu.com) · [Curriculum Vitae](#) · [Google Scholar](#)

## 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

## Research Experience

### AI Infrastructure Software Intern

May 2020 - Jul 2020

NVIDIA, Santa Clara, CA

Mentor: Joe Eaton, Brad Rees, Bartley Richardson

Developed a visual graph analytics, allowing for interactively running multiple graph algorithms in real-time on large graphs.

Leveraged GPU acceleration for both data analysis and rendering side.

### Data Science Intern

May 2019 - Aug 2019

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](#).

**Graduate Research Assistant** Aug 2018 - Present  
Georgia Institute of Technology, Atlanta, GA

**Undergraduate Research Assistant** June 2016 - Aug 2017  
Seoul National University, Seoul, Republic of Korea

## Awards & Honors

**"Thank a Teacher" Award** 2019  
Center of Teaching & Learning (CTL), Georgia Institute of Technology

**National Scholarship for Science and Engineering** 2015  
National Scholarship for Science and Engineering

## Grants & Funding

**Guaranteeing AI Robustness against Deception (GARD)** 2018-2022  
DARPA Research Grant  
Co-PIs: Jason Martin, Duen Horng (Polo) Chau  
Funded: \$1.35 million  
Helped formulate adversarial defense techniques

**WiML Travel Funding** 2019  
\$550 Travel Funding  
Women in Machine Learning Workshop, co-located with NeurIPS

**Amazon AWS Research Grant** 2018  
Funded \$5,000 in AWS cloud credits  
Co-PIs: Nilaksh Das, Scott Freitas, Duen Horng Chau

## Publication

### Bluff: Interactively Deciphering Adversarial Attacks on Deep Neural Networks

Nilaksh Das\*, [Haekyu Park](#)\*, Zijie Jay Wang, Fred Hohman, Robert Firstman, Emily Rogers, and Duen Horng Chau  
IEEE Conference on Visual Analytics Science and Technology, (VAST), Short Paper, Online, 2020.

\* Authors contributed equally.

► [Demo](#) [PDF](#) [arXiv](#)

### CNN Explainer: Learning Convolutional Neural Networks with Interactive Visualization

Zijie Jay Wang, Robert Turko, Omar Shaikh, [Haekyu Park](#), Nilaksh Das, Fred Hohman, Minsuk Kahng, Duen Horng Chau  
IEEE Conference on Visual Analytics Science and Technology, (VAST), Online, 2020.

► [Demo](#) [PDF](#)

## Argo Lite: Open-Source Interactive Graph Exploration and Visualization in Browsers

Siwei Li, Zhiyan Zhou, Anish Upadhayay, Omar Shaikh, Scott Freitas, [Haekyu Park](#), Zijie Jay Wang, Susanta Routray, Matthew Hull, and Duen Horng Chau

ACM International Conference on Information and Knowledge Management, ([CIKM](#)), Resource Track, Online, 2020.

► [Demo](#)

## 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.

📄 [PDF](#) 📄 [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.

📄 [PDF](#) 📄 [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([WiML](#)), co-located with NeurIPS 2019, 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](#)

# 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](#)

# 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

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 \(in Korean\)](#)

## 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

## 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](#)

## Teaching

### Graduate Teaching Assistant

Georgia Institute of Technology, Atlanta, GA

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

Instructor: Polo Chau

Fall 2019

## 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

## Licenses and Certifications

NVIDIA DLI Certificate - DLI Platform Course for Instructors, NVIDIA Deep Learning Institute  
NVIDIA DLI Certificate - Fundamentals of Deep Learning for Computer Vision, NVIDIA Deep Learning Institute

## Professional Service

**Reviewer**

CIKM 2020  
VIS 2020  
WiML 2019  
KDD 2019  
ICML 2019

**Professional Membership**

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

## 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, Three.js, WebGL, HoloViews, Matplotlib, WebGL, ggplot