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.

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

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 Assiatant 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

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

National Scholarship for Science and Engineering 2015

National Scholarship for Science and Engineering

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 Konwledge 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

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)

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

Professional Service

Reviewer

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, HoloViews, Matplotlib, WebGL, ggplot