

Charmgil Hong

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INTERESTS

- Developing and applying advanced machine learning techniques to address large-scale and complex data-driven challenges, including applications in medical, industrial, and surveillance domains
- Improving the quality and robustness of predictive models by integrating multiple modalities and data views
- Harnessing state-of-the-art machine learning models for effective anomaly detection across various domains

EDUCATION

Ph.D. in Computer Science - Dissertation: <i>Multivariate Data Modeling and Its Applications to Conditional Outlier Detection</i> <i>Advisor: Dr. Milos Hauskrecht</i> <i>University of Pittsburgh, Pittsburgh, PA, USA</i>	— GPA: 3.92/4.0	2017
B.S.E. in Computer Science and Electronic Engineering (with Distinction) <i>Handong Global University, Pohang, Gyeongbuk, Korea</i>	— GPA: 4.12/4.5	2010
Global Engineering Education Exchange Student <i>University of Pittsburgh, Pittsburgh, PA, USA</i>	— GPA: 4.0/4.0	2008

WORK EXPERIENCES

Assistant Professor <i>School of Computer Science and Electrical Engineering, Handong Global University, Pohang, Gyeongbuk, Korea</i> - Teach courses in machine learning, databases, Linux environments, and computer programming. - Design and implement curricular and extracurricular programs aimed at maximizing student learning outcomes in a teaching-focused institution; This includes developing educational programs, organizing and supervising competitions, and coordinating student internship/exchange opportunities. - Lead the Handong Artificial Intelligence Lab (HAIL) research group, focusing on medical and industrial AI, forensic/surveillance technology, search technologies, and demand and price forecasting.	Feb 2019 - Present
Postdoctoral Associate <i>Department of Computer Science, University of Pittsburgh, Pittsburgh, PA, USA</i> - Conducted predictive data modeling and outlier detection to prevent medical/clinical errors - Analyzed electronic health records (EHRs) and develop machine learning methodologies Supervisor: Dr. Milos Hauskrecht	Oct 2017 - Dec 2018
Graduate Student Researcher <i>Department of Computer Science, University of Pittsburgh, Pittsburgh, PA, USA</i> - Primary focus: Multi-Label Classification that aims to learn and predict multi-dimensional output; Conditional Outlier Detection for clinical applications that monitor and alert on medical errors - Analyzed and processed the EHRs that University of Pittsburgh Medical Center (UPMC) maintains; Developed software packages that help data preprocessing, feature generation for predictive modeling, outlier detection and alerting Supervisor: Dr. Milos Hauskrecht	May 2011 - Aug 2017

Research Intern

May 2015 - Aug 2015

Siemens Corporate Technology, Princeton, NJ, USA

- Topic: Sensory data analysis and multi-target regression for effective facility maintenance
 - Developed a structured prediction framework to address the gas turbine monitoring and reliability prediction problem
- Mentor: Dr. Dmitriy Fradkin

Research Intern

May 2014 - Aug 2014

Bosch Research and Technology Center North America, Palo Alto, CA, USA

- Topic: Cost-sensitive decision-theoretic classification/rule mining for automated identification of scraps from manufacturing processes
 - Implemented a software package that supports decision making in class-imbalance and cost-sensitive scenario
- Mentor: Dr. Rumi Ghosh

REFEREED PUBLICATIONS

- H. Kim, C.H. Lee, **C. Hong**. “Transformer for Point Anomaly Detection.” ACM International Conference on Information and Knowledge Management (CIKM). 2024.
- J. Jung, S. Park, H. Kim, C. Lee, **C. Hong**. “Artificial Intelligence-Driven Video Indexing for Rapid Surveillance Footage Summarization and Review.” International Joint Conference on Artificial Intelligence (IJCAI) Demo Track. 2024.
- H. Kim, M. Kim, T. Kim, K. Cho, **C. Hong**. “AREST: Attention-Based Red-Light Violation Detection for Safety Technology.” IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS). 2024.
- H. Kim, C.H. Lee, **C. Hong**. “VATMAN: Video Anomaly Transformer for Monitoring Accidents and Nefariousness.” IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS). 2024.
- G. Choi, H.J. Cho, S.S. Kim, J.E. Han, J.Y. Cheong, **C. Hong**. “Drug Induced Liver Injury Prediction with Injective Molecular Transformer.” IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI). 2023.
- H. Kim, C.H. Lee, **C. Hong**. “Crime Scene Detection in Surveillance Videos Using Variational AutoEncoder-Based Support Vector Data Description.” Asian Conference on Intelligent Information and Database Systems (ACIIDS). 2023.
- G. Choi, H. Yook, J.W. Han, **C. Hong**. “AWS: GNNs that Aggregate with Self-node Representation for Dehydrogenation Enthalpy Prediction.” Asian Conference on Intelligent Information and Database Systems (ACIIDS). 2023.
- D. Shin, G. Choi, **C. Hong**, and J.W. Han. “Surface Segregation Machine-learned with Inexpensive Numerical Fingerprint for the Design of Alloy Catalysts.” Molecular Catalysis. 2023.
- K. Lee, **C. Hong**, E.H. Lee, W. Yang. “Comparison of artificial intelligence methods for prediction of mechanical properties.” IOP Conference Series: Materials Science and Engineering. 2020.
- G. Trivedi, **C. Hong**, E. Dadashzadeh, R. Handzel, H. Hochheiser, S. Visweswaran. “Identifying incidental findings from radiology reports of trauma patients: An evaluation of automated feature representation methods.” International Journal of Medical Informatics. 2019.
- C. Hong** and M. Hauskrecht. “Multivariate Conditional Outlier Detection: Identifying Unusual Input-Output Associations in Data.” International FLAIRS Conference, Melbourne, FL, USA, 2018.
- C. Hong**, S. Liu, and M. Hauskrecht. “Detection of Unusual Input-Output Associations.” SIAM Workshop on Dimension Reduction, Pittsburgh, PA, USA, 2017.
- M. Hauskrecht, I. Batal, **C. Hong**, Q. Nguyen, G. F. Cooper, S. Visweswaran, and G. Clermont. “Outlier-based detection of unusual patient-management actions: An ICU study.” Journal of Biomedical Informatics 64: 211-221, 2016.
- C. Hong**, R. Ghosh, and S. Srinivasan. “Dealing with Class Imbalance Using Thresholding.” ACM SIGKDD Workshop on Outlier Definition, Detection, and Description on Demand (ODD 4.0), San Francisco, CA, USA, 2016.
- C. Hong** and M. Hauskrecht. “Multivariate Conditional Outlier Detection and Its Clinical Application.” AAAI Conference on Artificial Intelligence (Abstract), Phoenix, AZ, USA, 2016.
- C. Hong**, I. Batal, and M. Hauskrecht. “A Generalized Mixture Framework for Multi-label Classification.” SIAM International Conference on Data Mining (SDM), Vancouver, BC, Canada, 2015.

- C. Hong** and M. Hauskrecht. “*Multivariate Conditional Anomaly Detection and Its Clinical Application.*” AAAI Conference on Artificial Intelligence (Abstract), Austin, TX, USA, 2015.
- C. Hong**, I. Batal, and M. Hauskrecht. “*A Mixtures-of-Trees Framework for Multi-Label Classification.*” ACM Conference of Information and Knowledge Management (CIKM), Shanghai, China, 2014.
- M. Pakdaman, I. Batal, Z. Liu, **C. Hong**, and M. Hauskrecht. “*An Optimization-based Framework to Learn Conditional Random Fields for Multi-label Classification.*” SIAM International Conference on Data Mining (SDM), Philadelphia, PA, USA, 2014.
- I. Batal, **C. Hong**, and M. Hauskrecht. “*An Efficient Probabilistic Framework for Multi-Dimensional Classification.*” ACM Conference of Information and Knowledge Management (CIKM), Burlingame, CA, USA, 2013.
- C. Hong** and M. Hauskrecht. “*Analysis of Temporal Clinical Patterns Using Hidden Markov Models.*” International Conference on Machine Learning (ICML) Workshop on Clinical Data Analysis, Edinburgh, Scotland, UK, 2012.

PATENT / INVENTION DISCLOSURE

- “*Personal Color Diagnosis Method and System Based on Machine Learning and Augmented Reality*” (머신러닝 및 증강 현실 기반의 퍼스널 컬러 진단 방법 및 시스템). Korean Patent No. 10-2425873
- “*Demand Forecasting Method Using Optimization Techniques*” (최적화 기법을 이용한 수요 예측 방법) No. 10-2023-0109200 (pending)
- “*Real-Data-Based Method for Predicting Electric Vehicle Driving Range Using Telematics and BMS Data*” (전기자동차의 텔레매틱스 데이터 및 BMS 데이터를 활용한 실데이터 기반 전기자동차 주행 가능거리 예측 방법) No. 10-2023-0125081 (pending)
- “*Prediction Method Using Pre-Training and Transfer Learning and Target Prediction Framework for Performing the Method*” (사전학습 및 전이학습을 이용한 타겟 예측 방법 및 이를 수행하는 타겟 예측 프레임워크) No. 10-2023-0172099 (pending)
- “*Dashcam Video Analysis Network for Enhanced Safe Driving*” (안전운전 강화를 위한 블랙박스 영상 분석 네트워크) No. 10-2023-0185288 (pending)
- “*Device and Method for Predicting Side Effects of Hepatitis B Antiviral Drugs*” (B형 간염 항바이러스제 부작용 예측 장치 및 그 방법) No. 10-2024-0020843 (pending)
- R. Ghosh, **C. Hong**, and S. Srinivasan. “*Value Addition Dependent Data Mining Techniques for Assembly Lines.*” US Patent Application No. 15/342,677.
- C. Hong**, D. Fradkin, and A. Chakraborty. “*Multi-Target Regression Using Canonical Correlation Analysis.*” Invention disclosure No. 2015E16593US, Siemens.
- H. Hochheiser, S. Visweswaran, G. Trivedi, **C. Hong**, R. Handzel, and E. Dadashzadeh. “*Automation of Useful Secondary Findings From Radiology and Pathology Reports.*” Invention disclosure No. 04737, University of Pittsburgh.
- M. Hauskrecht, G. Clermont, G. F. Cooper, S. Malakouti, **C. Hong**, Z. Luo, M. P. Barren, and S. Liu. “*Real-time Clinical Monitoring and Alerting System.*” Invention disclosure No. 04995, University of Pittsburgh.

HONORS / AWARDS

Best Paper Award, <i>IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS)</i>	2024
Best Paper Award, <i>Korea Multimedia Society</i>	2024
Best Presentation Award, <i>The Liver Week (TLW) 2024</i>	2024
Best Student Paper Award, <i>Korea Software Congress (KSC)</i>	2023
Best Paper Award, <i>Korea Computer Congress (KCC)</i>	2023
Best Paper Award, <i>Korean Society of Medical Informatics</i>	2022
Best Capstone Project in AI Award, <i>Korea Multimedia Society</i>	2022
Best Student Paper Award, <i>Korea Computer Congress (KCC)</i>	2020-2023

Best Paper Award, <i>Spring Conference of Korea Entertainment Industry Association</i>	2020
Certification of Achievement, <i>Korean Institute of Information Scientists and Engineers</i>	2019
3rd Prize (DermaQ), <i>IBM BlueHack, IBM and AmerisourceBergen</i>	2018
Travel Grant, <i>Graduate and Professional Student Government, University of Pittsburgh</i>	2016
1st Prize, Research Competition (Area: Artificial Intelligence), <i>University of Pittsburgh</i>	2015
Doctoral Consortium Scholarship, <i>Association for the Advancement of Artificial Intelligence</i>	2015
Travel Grant, <i>Dietrich School of Arts and Science, University of Pittsburgh</i>	2015 - 2016
Travel Grant, <i>Society for Industrial and Applied Mathematics</i>	2015
Travel Grant, <i>Department of Computer Science, University of Pittsburgh</i>	2012 - 2016
Travel Grant, <i>National Science Foundation</i>	2012, 2015

PRESENTATIONS

Video Anomaly Detection in DeepView <i>GMDSOFT, Seongnam, Gyeonggi, Korea</i>	May 2024
Generation of Parallel Corpus for South and North Korean Languages <i>Korea Institute of Science and Technology Information (KISTI), Daejeon, Korea</i>	Dec 2023
Development of an AI-Driven Analytics System for North Korean Literature <i>Korea Institute for National Unification, Seoul, Korea</i>	Nov 2023
Development of KUBiC (Korean Unification Bigdata Center) <i>Handong Institute for Peace and Reconciliation, Pohang, Gyeongbuk, Korea</i>	Nov 2023
Machine Learning as a Strategic Tool to Support Business Operations <i>Startup Training for African Revival (STAR), St. Paul's University, Limuru, Kenya</i>	Feb 2023
Research on Machine Learning Model Development, Share, and Code Quality Measurement Methods <i>Korea Institute of Science and Technology Information (KISTI), Daejeon, Korea</i>	Nov 2022
Case Studies on Computer Science Education at Handong Using Korean Unification as a Subject <i>Korea Computer Congress (KCC), Korean Institute of Information Scientists and Engineers, Jeju, Korea</i>	Jun 2022
Online Machine Learning Environment for Enhancing Code Quality and Data Usability <i>Korea Institute of Science and Technology Information (KISTI), Daejeon, Korea</i>	Dec 2021
Model Development Environment for Reproducible Machine Learning Artifact Archiving <i>Korea Institute of Science and Technology Information (KISTI), Daejeon, Korea</i>	Dec 2020
An Overview of Outlier Detection Techniques for Complex Data <i>Hancom, Seongnam, Gyeonggi, Korea</i>	Oct 2020
Outlier Detection in Time Series Data <i>Pohang University of Science and Technology (POSTECH), Pohang, Gyeongbuk, Korea</i>	Oct 2020
Building and Application of Medical Decision-Making Models Using Multi-Output Prediction <i>Korea Computer Congress (KCC), Korean Institute of Information Scientists and Engineers, Jeju, Korea</i>	Jun 2019
Artificial Intelligence in Medicine and Clinical Outlier Detection <i>School of Life Science, Handong Global University, Pohang, Gyeongbuk, Korea</i>	Apr 2019
Machine Learning with Multiple Structured Targets <i>POSCO, Pohang, Gyeongbuk, Korea</i>	Mar 2019
Multivariate Data Modeling and Its Applications to Conditional Outlier Detection <i>Department of Computer Science, University of Pittsburgh, Pittsburgh, PA, USA</i>	Aug 2017
Detection of Unusual Input-Output Associations (Poster) <i>SIAM Workshop on Dimension Reduction, Pittsburgh, PA, USA</i>	Jul 2017

Improving Multi-label Classification Accuracy Using a Generalized Mixture Framework (Poster) <i>Advancing Research through Computing (ARC) 2017, Pittsburgh, PA, USA</i>	Mar 2017
Detection of Unusual Input-Output Patterns in Electronic Health Records (Poster) <i>NSF Data Science Workshop, Seattle, WA, USA</i>	Aug 2015
Multi-Target Prediction <i>Siemens Corporate Technology, Princeton, NJ, USA</i>	Jul 2015
Multivariate Conditional Outlier Detection (Poster) <i>SIAM International Conference on Data Mining (SDM) Doctoral Forum, Vancouver, BC, Canada</i>	Apr 2015
Multivariate Conditional Outlier Detection in Clinical Domain <i>Annual Computer Science Day 2015, University of Pittsburgh, Pittsburgh, PA, USA</i>	Mar 2015
Multivariate Conditional Anomaly Detection and Its Clinical Application <i>Association for the Advancement of Artificial Intelligence (AAAI) Doctoral Consortium 2015, Austin, TX, USA</i>	Jan 2015
Multi-label Classification <i>Department of Computer Science, University of Pittsburgh, Pittsburgh, PA, USA</i>	Nov 2014
Building Decision Theoretic Classifiers for Imbalanced Datasets <i>Bosch Research and Technology Center North America, Palo Alto, CA, USA</i>	Aug 2014
Multi-Dimensional Classification with Conditional Tree-structured Bayesian Networks <i>Dietrich School of Arts and Sciences Grad Expo 2014, Pittsburgh, PA, USA</i>	Mar 2014
Multi-Label Classification with Conditional Tree-structured Bayesian Networks (Poster) <i>Google Regional PhD Summit 2014, Pittsburgh, PA, USA</i>	Jan 2014
Classification of Temporal Clinical Patterns Using Hidden Markov Models (Poster) <i>Google Regional PhD Summit 2013, Pittsburgh, PA, USA</i>	Mar 2013

TEACHING EXPERIENCES

Instructor , <i>School of Computer Science and Electrical Engineering, Handong Global University, Pohang, Korea</i>	
- ITP40010 Machine Learning	- ECE30030/ITP30010 Database System
- ECE20010/ITP20001 Data Structures	- ITP20004 Open-source Software Labs
- ECE10020 Intro to Engineering Design	- ECE10003 C Programming Labs
- ECE10002 C Programming	
Instructor , <i>Department of Chemical Engineering, Pohang University of Science and Technology, Pohang, Korea</i>	
- CHEB801Q Machine Learning Practicum for Engineering Students	
Instructor , <i>Data Science Camp in Cambodia, UNESCO-UNITWIN, Phnom Penh, Cambodia</i>	
- Machine Learning	
Teaching Assistant , <i>Department of Computer Science, University of Pittsburgh, Pittsburgh, PA, USA</i>	
- CS2750 Machine Learning	- CS2710 Foundations of Artificial Intelligence
- CS1571 Introduction to Artificial Intelligence	- CS1502 Formal Methods in Computer Science
- CS1501 Algorithm Implementation	- CS401 Intermediate Programming Using Java

VOLUNTEERING / EXTRACURRICULAR ACTIVITY

Session Chair , <i>International Joint Conference on Artificial Intelligence (IJCAI)</i>	2024
Reviewer , <i>Public Library of Science (PLOS)</i>	2024
Reviewer , <i>IEEE Access</i>	2023-2024
Reviewer , <i>ISPRS International Journal of Geo-Information</i>	2023
Reviewer , <i>Korean Institute of Information Scientists and Engineers (KIISE)</i>	2020-2024
Reviewer , <i>Multidisciplinary Digital Publishing Institute (MDPI)</i>	2020-2024

Reviewer , <i>International Joint Conference on Artificial Intelligence (IJCAI)</i>	2018
Reviewer , <i>AAAI Conference on Artificial Intelligence (AAAI)</i>	2016-2018
Reviewer , <i>IEEE Transactions on Knowledge and Data Engineering (TKDE)</i>	2014-2016
Reviewer , <i>IEEE Transactions on Big Data (TBD)</i>	2016
Reviewer , <i>Journal of Biomedical Informatics (JBI)</i>	2015, 2024
Reviewer , <i>Pattern Recognition Letters (PRLETTERS)</i>	2015
Reviewer , <i>Conference on Artificial Intelligence in Medicine (AIME)</i>	2015
Student Volunteer , <i>International Conference on Machine Learning (ICML), Edinburgh, Scotland, UK</i>	2012
Workshop Director , <i>Engineering Design with the Other 90% (D90), Wonju, Korea</i>	2010