Chen Hu

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EDUCATION

University of Minnesota – Twin Cities

Ph.D. Geo-Engineering 2019 - Present
Research Area: Experimental Mechanics, Probabilistic Fracture Mechanics, Machine Learning

M.S. Computer Science - **Machine Learning and Computer Graphics Emphasis** 2021 - Present

M.S. Geo-Engineering 2017 - 2019

B.CE. Civil Engineering - **Structural Engineering Emphasis** 2014 - 2017

TECHNICAL SKILLS

Programming Languages	Python, C, C++, C#, MATLAB, HTML/CSS, JavaScript, SQL
Machine Learning	PyTorch, TensorFlow, OpenCV, Scikit-learn, NumPy, Pandas
High-performance Computing	OpenMP, MPI, CUDA
Graphics and Simulation	Unity Engine, OpenGL, Blender, Abaqus, AutoCAD
Web Development Framework	Vue, React

EXPERIENCE

Graduate Research Assistant, Department of CEGE, UMN Sep 2017 - Present

- Designed and conducted experiments on quasi-brittle material including rock and SiC/SiC composites with Acoustic Emission (AE) and Digital Image Correlation (DIC)
- Performed numerical simulation and reliability analysis to extrapolate laboratory results to structural applications
- Constructed machine learning framework to investigate damage mechanics with laboratory and simulation data

Graduate Teaching Assistant, Department of CEGE, UMN Sep 2017 - Present

- Lectured Rock Mechanics and Civil Engineering Material lab section, explained concepts of experiments and guided students to perform tests

Design Intern, MnDOT, Metro Design Office, MN Jun 2016 - Sep 2016

- Designed and drew construction plan for Minnesota highway with MicroStation

Undergraduate Research Assistant, Department of CEGE, UMN Jan 2016 - May 2016

- Developed Finite Element code for Geo-Engineering slope stability problem

PROJECTS

Characterization and Localization of AE with Deep Learning github.com/chenhu2015/ML-AE

- Developed data integration and cleaning techniques for noisy experimental dataset
- Explored Spectral Clustering, Random Forest, and Convolution Neural Network to classify acoustic emission signals
- Imposed Physics-informed neural network to generalize model for different testing scenarios and load configurations, improved classification accuracy from 70% to 90% for most testing cases

Reinforcement Learning for Game Super Crate Box github.com/chenhu2015/RL-Games

- Integrated OpenAI Gym library for a 2D platform game Super Crate Box
- Explored generic cross-entropy method, Deep Q network and its refinements to create game agent which maximized survive time

Computer Vision Pipeline for Cat Emotion Recognition github.com/chenhu2015/CV-CatEM

- Developed a CV pipeline which included cat face detection, facial feature extraction, mouth open/close classification and emotion recognition
- Improved recognition accuracy from 33% to 74% compared to HOG + SVM baseline methods
- Conducted an AI dubbing application which can pair corresponding cat sound to soundless cat meow video

PUBLICATION

Xiaoran Wang, Pouyan Asem, **Chen Hu**, and Joseph F. Labuz. *Microcracking in tensile fracture of a brittle rock Engineering*. Fracture Mechanics, 2021

Pouyan Asem, Xiaoran Wang, **Chen Hu**, and Joseph F. Labuz. *On tensile fracture of a brittle rock*. International Journal of Rock Mechanics and Mining Sciences, 2021

Chen Hu, Jacob Sharpe, Joseph Labuz, *Mechanical Response of a Composite Steel, Concrete-Filled Pile*, Minnesota Department of Transportation, 2018

COURSEWORK

Computer Science

Machine Learning:

CSCI5521 Introduction to Machine Learning
CSCI5525 Advanced Machine Learning
CSCI5561 Computer Vision
CSCI5980 Think Deep Learning
CSCI8980 Theoretical Foundations of Deep learning
IE5080 Reinforcement Learning

Computer Graphics:

CSCI5607 Computer Graphics I
CSCI5611 Animation & Planning in Games
CSCI5609 Visualization
CSCI5619 VR and 3D Interaction
CSCI8980 Real-time Game Engine Technique
CSCI8980 Real-time Simulation & Planning

Computer System:

CSCI5103 Operating Systems
CSCI5105 Distributed Systems
CSCI5451 Introduction to Parallel Computing

Application:

CSCI5117 Developing the Interactive Web
CSCI5123 Recommender Systems

Civil Engineering and Mechanics

Math:

CEGE5351 Advanced Engineering Math I
CEGE8351 Advanced Engineering Math II

Mechanics:

AEM5501 Continuum Mechanics
AEM5503 Elasticity
AEM8531 Fracture Mechanics
CEGE8321 Thermoporoelasticity
CEGE 8413 Fracture and Scaling
CEGE8421 Structural Dynamics

Application:

CEGE5341 Wave Method
CEGE8401 Fundamental Finite Element Method
CEGE8411 Plate Structures