Lei Si

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EDUCATION

University of Houston
Ph.D student, Computer Science *08/2020 - Present*
- Instructional Assistant
- Cumulative G.P.A - 4.0/4.0
- Anticipated Graduation Date - 05/2025

University of Illinois at Springfield
Master of Science, Computer Science *01/2019 - 05/2020*
- Graduate Assistant
- Graduated with honor
- Cumulative G.P.A - 4.0/4.0

North China University of Technology
Bachelor of Science, Cyber Security *09/2013 - 07/2018*
- Undergraduate Research Assistant
- Cumulative G.P.A - 3.5/4.0

COURSE WORK

- **Graphic Related** - Computer Graphics, Visualization
- **Others** - Data Structures & Algorithms, Parallel Computations, Machine Learning, Computer Vision

TECHNICAL SKILL

- **Research Topics** - Mesh Generation and Optimization, Visualization, Computer Graphics, Computer Vision, Machine Learning, Digital Twin, UI/UX design
- **Programming Language** - C/C++, Python, R, SQL
- **Simulation Software** - SOFA, MFEM, FEniCS, Deepxde, OpenFOAM
- **Software & Toolkit** - MATLAB, VTK, Qt5, OpenGL, Blender, Libigl, LaTeX

EXPERIENCE

ABB Corporate Research Center Ladenburg, Germany
Research Intern *06/2023 - 09/2023*
- Created of a benchmark simulation of a lid-driven cavity problem based on the finite element method for the coupled system of Navier-Stokes equations and heat equation.
- Developed and validated improvement of sensor performance based on physical-informed neural networks.

State Key Laboratory of Information Security, Chinese Academy of Sciences Beijing, China
Research Intern *07/2016 - 07/2018*
- Attended Chinese Academy of Sciences Innovation Practice Training Program for digital watermark.
- Designed a library to manage, distribute, and store 4 TB GIF images and their property to multiple physical nodes using the Hadoop distributed file system and SQL.
- Designed an algorithm using Apache Spark to calculate the encoding rules for the 4 TB GIF image data set on 6 physical nodes and 250 GB DRAM.

RESEARCH PROJECT

Graph Neural Networks for Meshing University of Houston, TX, USA
Geometry Modeling, Machine Learning *01/2024 - Present*
- Conduct research on embedding geometric information into Graph Neural Networks (GNNs) for mesh processing tasks, such as mesh generation, smoothing, and simplification.

Hex-dominant Mesh Structure Extraction, Analysis, Simplification University of Houston, TX, USA
Geometry Modeling, ***Open Source*** *01/2022 - Present*

- Organized the individual elements into larger components, provides a coarse representation for mesh element.
- Extracted an optimized valence-based singularity graph wireframe to analyze the mesh structure, the structure provides a better internal visualization of hex-dominant meshes.
- Write NSF funding proposal.

The Impact of covid-19 on Computer Science Education University of Houston, TX, USA
Statistic, Data Analysis, Visualization *08/2021 - 6/2023*

- Collected survey data from over one hundred students majoring in computer science over a two-year period. Half of the participants completed the survey twice, with a one-year interval between the two surveys.
- Cleaned and categorized the data into 37 different categories, including ratings of the quality of learning before and after the implementation of a hybrid format, as well as preferences for course delivery methods.
- Analyzed the data to determine whether students from different backgrounds, countries, or living locations had different ratings or comments about the impact of COVID-19. The methods used for analysis included t-tests, Wilcoxon tests, and data visualization techniques.

Hex/Quad Visualization Toolkit for Reveal Poor-quality Element University of Houston, TX, USA
Geometry Modeling, Visualization, ***Open Source*** *11/2020 - 12/2021*

- Proposed a glyph design for highlighting the small elements that have bad mesh quality. This design can effectively allow people to focus on the bad quality elements without being disturbed by the element size.
- Developed a boundary error visualization system using the UV mapping method. This system transferred 3D surface error to the plane height difference.

Quadrilateral Mesh Optimization University of Houston, TX, USA
Geometry Modeling *08/2020 - 11/2020*

- Optimized the configuration of an embedded polygon constructed based on the one-ring neighbors of vertex.
- Produced an inversion-free mesh and outperforms the existing methods with best quality meshes.
- Developed a robust Hex/Quad mesh half-edge data structure.

Wild Life Detection University of Illinois at Springfield, IL, USA
Deep Learning *10/2019 - 05/2020*

- Employed the animal images and their background images in the region proposal component to extract region candidates for the animal's location.
- The proposed method can detect wildlife animals in night images with an average accuracy of 68%. For deer, the method is 95% accurate.

Network Intrusion Detection University of Illinois at Springfield, IL, USA
Cyber Security, Deep Learning *08/2018 - 09/2019*

- Collected 246 unique exploit-payload pairs from two common operating systems.
- Converted 12597 attack network traffic data in image format, and label the region of malware.
- Trained a real-time object detection system with 99% accuracy on the dataset.

Melanoma Classification University of Illinois at Springfield, IL, USA
Deep Learning *08/2018 - 02/2019*

- Proposed a serialized neural network structure, which includes multiple Convolutional Neural Networks.
- Explored different deep learning network architectures, such as AlexNet, VGG16, GoogLeNet, and ResNet.
- Through a worst-case enhanced training strategy, the proposed model achieved 81% accuracy.

National Undergraduate Electronics Design Contest Beijing, China
Team Leader *07/2015 - 07/2016*

- Designed a real-time control algorithm for a quadcopter to control height, speed, attitude and moving based on sensor data in real time on STM32 microcontroller.
- Developed a object detection algorithm using first derivative operator on KL25 microcontroller.

National University Students Intelligent Car Race Beijing, China
Team Leader, Director *07/2014 - 07/2015*

- Designed a real-time autopilot algorithm by using proportional-integral-derivative method on KL25 microcontroller with 16 KB RAM.
- Adopted Kalman filtering algorithm to correct path direction.

AWARD

- 2023 - DAAD (German Academic Exchange Service) 2023 RISE Professional Scholarship
- 2019 - University of Illinois Springfield Graduate with Honors
- 2017 - Chinese Academy of Sciences Undergraduate Innovation Practice Training Program
- 2016 - National Undergraduate Freescale Smart Car Contest Beijing Regional Second Prize
- 2015 - National Undergraduate Robotics Contest National Second Prize
- 2015 - National Undergraduate Electronic Design Contest Beijing Regional Third Prize
- 2015 - National Undergraduate Game Design Contest Third Prize

TEACHING ASSISTANT

- **Introduction to Immersive Technology and Spatial Computing** - Introduce students to Extended Reality (XR)(includes Augmented, Mixed, and Virtual Reality) application development.

RESEARCH ACTIVITY

- **Reviwer** - Frontiers of Information Technology & Electronic Engineering
- **Reviwer** - Computer Graphics International 2024

PUBLICATION

1. Aobo Jin*, Qixin Deng*, Xianyong Fang, Qiang Fu, Wenhui Chu, **Si, Lei**, and Zhigang Deng. Detail-recovery free-form sketch based modeling. *ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games*, Under Review, 2025
2. Muhammad Naeem Akram*, **Lei Si***, and Guoning Chen. Practical structure simplification of quad meshes. *Computers & Graphics*, Under Review, 2025
3. **Lei Si** and Guoning Chen. Structure-informed hex-dominant mesh simplification. *IEEE Transactions on Visualization and Computer Graphics*, Under Review, 2025
4. **Lei Si**, Haowei Cao, and Guoning Chen. Hybrid base complex: Extract and visualize structure of hex-dominant meshes. *IEEE Transactions on Visualization and Computer Graphics*, 31(3):1818–1829, 2025
5. Giulia Toti, **Lei Si**, David Daniels, Matin Amoozadeh, Mohammad Alipour, and Guoning Chen. Students and instructors reflections on the impact of covid-19 on computer science education after one year of remote teaching. 12 2023
6. **Lei Si** and Guoning Chen. A visualization system for hexahedral mesh quality study. In *2023 IEEE Visualization and Visual Analytics (VIS)*, pages 86–90, 2023
7. Muhammad Naeem Akram, **Lei Si**, and Guoning Chen. An embedded polygon strategy for quality improvement of 2d quadrilateral meshes with boundaries. In *VISIGRAPP (1: GRAPP)*, pages 177–184, 2021
8. Yanhui Guo, Thomas A Rothfus, Amira S Ashour, **Lei Si**, Chunlai Du, and Tih-Fen Ting. Varied channels region proposal and classification network for wildlife image classification under complex environment. *IET Image Process.*, 14(4):585–591, 2020
9. Chunlai Du, Shenghui Liu, **Lei Si**, Yanhui Guo, and Tong Jin. Using object detection network for malware detection and identification in network traffic packets. *CMC-COMPUTERS MATERIALS & CONTINUA*, 64(3):1785–1796, 2020
10. Chunlai Du, Shenghui Liu, Yanhui Guo, **Lei Si**, and Tong Jin. Detection and information extraction of similar basic blocks used for directed greybox fuzzing. In *International Conference on Artificial Intelligence and Security*, pages 353–364. Springer, 2020
11. Yanhui Guo, Amira S Ashour, **Lei Si**, and Deep P Mandalaywala. Multiple convolutional neural network for skin dermoscopic image classification. In *2018 IEEE International Symposium on Signal Processing and Information Technology (ISSPIT)*, pages 365–369. IEEE, 2018