
EDUCATION

University of Houston*Ph.D student, Computer Science**08/2020 - Present*

- Research 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

TECHNICAL SKILL

- **Research** - Quad and Hexa Mesh Generation, Simplification, Visualization, Entry-level AI
- **Programming Language** - C/C++, Python
- **Simulation Software** - SOFA, MFEM, FEniCS, Deepxde
- **Software & Toolkit** - VTK, Qt5, OpenGL, Blender, Libigl, L^AT_EX

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 a physics-informed neural network for the prediction of the physical fields in the aforementioned benchmark problem.
- Numerically validated the improvement of the performance of existing sensors based on physically 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 Students Innovation Practice Training Program for digital watermark technology.
- Developed a system for mapping any data into a set of GIF images with precomputed encoding rules.
- Designed a library to manage, distribute, and storage 4 TB GIF Images and them property to multiple physical nodes by using Hadoop Distributed File System and SQL. This library uses RAID 5 as its disk redundant configuration.
- Designed a 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.

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.
- Won the second prize in the Beijing Division.

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.
- Won the second prize, and third prize in the Beijing Division.

RESEARCH PROJECT

Hex/Quad Visualization Toolkit for Reveal Poor-quality Element

University of Houston, TX, USA

Geometry Modeling, Visualization

11/2020 - 12/2021

- Proposed a glyph design for highlighting the small elements that have bad mesh quality. This design can effectively allow people focus their attention on the bad quality elements without being disturbed by the element size.
- Developed a cross-platform multi-view mesh quality visualization system to analyze mesh quality globally, regionally, adjacently, and locally.
- Developed a boundary error visualization system by using UV mapping method. This system transferred 3D surface error to the plane height difference.
- Implementing a web application based on three.js for the proposed system for cross-platform access.

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 each interior vertex.
- Produced an inversion free mesh and outperforms the existing methods with best quality meshes.
- Developed a robust Hexa/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 animal in night images with 68 percent average accuracy. For deer, the method is 95 percent 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.
- Covert 12597 attack network traffic data into image format, and label the region of malware.
- Trained a real-time object detection system, named YOLOv3 with the labeled network traffic images.
- On our dataset, the accuracy of this method reaches 99 percent.

PUBLICATION

1. **Si, Lei**, Haowei Cao, and Guoning Chen. Hybrid base complex: Extract and visualize structure for hex-dominant meshes. *IEEE 17th Pacific Visualization Symposium (PacificVis 2024)*(under review), 2024
2. **Si, Lei** and Guoning Chen. A visualization system for hexahedral mesh quality study. *IEEE Visualization*, 2023
3. Muhammad Naeem Akram, **Si, Lei**, and Guoning Chen. An embedded polygon strategy for quality improvement of 2d quadrilateral meshes with boundaries. In *VISIGRAPP (I: GRAPP)*, pages 177–184, 2021
4. Yanhui Guo, Thomas A Rothfus, Amira S Ashour, **Si, Lei**, 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

5. Chunlai Du, Shenghui Liu, **Si, Lei**, 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
6. Chunlai Du, Shenghui Liu, Yanhui Guo, **Si, Lei**, 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
7. Yanhui Guo, Amira S Ashour, **Si, Lei**, 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