

CONG LIU

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EDUCATION

Tsinghua University, China

Sep. 2022 - June. 2025

- M.Eng in Electronic and Information Engineering, Supervisor: Xinghui Li
- GPA: 4.0/4.0 (**Top 1%**)
- University First-class Scholarship (2024) (**Top 3%**)

Northeastern University, China

Sep. 2018 - June. 2022

- B.Eng in Measuring and Control Technology and Instrumentation
- GPA: 4.07/5.00 (**Top 5%**)
- University First-class Scholarship (2021) (**Top 3%**) & University Second-class Scholarship (2019 & 2020)
- Thesis: Research and design on calibration method of 3D laser scanning system (**Outstanding Graduation Thesis Award**)
- **Outstanding Graduate of Northeastern University**, 2022, Northeastern University

PUBLICATIONS & PATENTS

1. **C. Liu**, C. Zhang, X. Liang, *et al.* Attention Mono-depth: attention-enhanced transformer for monocular depth estimation of volatile kiln burden surface. *IEEE Transactions on Circuits and Systems for Video Technology*, doi: 10.1109/TCSVT.2024.3479412. (CCF-B, IF=8.3/JCR Q1).
2. **C. Liu**, X. Li, *et al.* Deformable attention-guided network for multi-task learning. *Optoelectronic Imaging and Multimedia Technology XI*, doi: <https://doi.org/10.1117/12.3036091>.
3. Z. Li, W. Chen, **C. Liu**, *et al.* An efficient exposure fusion method for 3D measurement with high-reflective objects. *Optoelectronic Imaging and Multimedia Technology XI*, doi: <https://doi.org/10.1117/12.3036376>.
4. **C. Liu**, C. Zhang, *et al.* A monocular depth estimation method for materials in the kiln head area of rotary kilns. *China Invention Patent*. CN202410114473.8. Pending.
5. **C. Liu**, Q. Wang, *et al.* High sensitivity LRSPR fiber optic sensor based on Ti_3C_2 and its fabrication method. *China Invention Patent*. CN112730339A. Authorized.
6. **C. Liu**, B. Li. A New Structure Fiber Optic SPR Sensor. *China Utility Model Patent*. CN213516873U. Authorized.

RESEARCH EXPERIENCE

Monocular depth estimation of volatile kiln burden surface

Feb. 2023 - Feb. 2024

Pengcheng Laboratory

- A novel encoder-decoder network integrated with an attention module is proposed for monocular depth estimation of volatile kiln burden surface for the first time. This model **avoids the consistency errors caused by flame interference** and achieves a depth prediction error of **RMSE = 11.008 mm** for the burden surface region, outperforming the SOTA networks.
- The **attention module**, incorporating both global and local attention mechanisms, is developed to learn the relationships between long-range and adjacent pixels, adaptively partition **depth intervals**, and predict probability distribution over depth intervals for each pixel more precisely.
- A scale-down prototype of an industrial on-site volatile kiln is built to simulate the actual operation of the kiln.
- Code is available at: <https://github.com/LLLcong/Attention-MonoDepth>

Research on high sensitivity LRSPR optic fiber biosensors

Mar. 2020 - Jun. 2021

Northeastern University

- A highly sensitive long-range surface plasmon resonance (LRSPR) biosensor, based on Ti_3C_2 -enhanced multi-single-multi cascaded optic fiber, is proposed for the detection of **human immunoglobulin G (IgG)**, achieving a sensitivity of **1.84 nm/(ug/mL)**. The biosensor exhibits the advantages of **small size, ease of fabrication, high sensitivity, label-free and rapid response**.
- A China invention patent and a utility model patent have been granted.

Deformable attention-guided network for multi-task learning

Mar. 2024 - Aug. 2024

Tsinghua University

- A novel deformable attention-guided network is proposed for multi-task learning, which improves the accuracy of both **depth estimation** and **semantic segmentation** tasks, compared with single-task and multi-task baselines.
- The proposed model effectively fuses feature maps with different semantic information by using a **deformable attention mechanism**. Additionally, the proposed model balances the computational complexity and accuracy, achieving an **RMSE = 0.5183m** within a 10m-range and **IoU = 44.82%** on the NYU dataset.

Multimodal large language model for industrial control system

Jul. 2024 - Present

Pengcheng Laboratory

- An industrial multimodal large language model is first proposed as the kiln AI agent, functioning in burning state recognition, temperature map prediction and providing workers with advice on the smooth operation of the volatile kiln.
- A pretrained visual encoder is utilized to extract input RGB and infrared image features. These image features, along with temperature decoder features, are input to the proposed **connector module** to generate embeddings aligned with the large language model. The **multi-head attention mechanism** applied to different image modalities helps boost the image understanding performance of the proposed multimodal large language model.

PROJECTS

Research on image scratch removal method based on deep learning

- A cGAN model, named Pix2Pix, is applied to remove scratches from images. The generator G uses damaged images which contain scratch latent features as input to remove scratches from images, and the repaired images output by G are then fed into the discriminator D along with the real unimpaired images with the constraint of scratch features.
- GAN loss and L1 loss are jointly applied in training the network for retaining both the high and low-frequency components of the images. The algorithm shows high accuracy of removing scratches, with the evaluation metric of **PSNR = 41.1dB**, **MSE = 0.000084**, and **LPIPS = 0.003976**.

Design of high-accuracy temperature measurement system for weak signals

- A high-accuracy multi-point temperature system is designed on a single PCB, featuring functions including temperature drift correction, filtering, overvoltage protection and channel isolation. The system operates in the range of **0 to 1300 degrees Celsius**, achieving **an error of less than 1 degree**.

COMPETITIONS & AWARDS

1. University Computer Games & National Computer Games Tournament, **National First Prize**.
2. Mathematical Contest In Modeling, **Honorable Mention**.
3. National University Student Social Practice and Science Contest on Energy Saving & Emission Reduction, **National Third Prize**.
4. China Undergraduate Mathematical Contest in Modeling, **Second Prize in Liaoning Province**.
5. 'Jianlong Iron and Steel' Electronic Design Competition of Northeastern University, **University Second Prize**.

EXTRACURRICULAR ACTIVITIES

Rural Revitalization Social Practice Activity of Tsinghua University

Jan. 2023 - Feb. 2023

- Awarded as **Silver Prize of Tsinghua University Social Practice**.
- Conduct in-depth field research on rural development and industrial development mode of local products.
- A live streaming plan was organized to support farmers, successfully attracting **420,000** viewers to the broadcast.

SKILLS

Programming: Python/Pytorch, C/C++, Matlab, etc.

Tools: VS Code, PyCharm, SolidWorks, Multisim, Altium Designer, Comsol, etc.

Languages: Mandarin (Native), English (IELTS 7.0).