

Liangfu Chen

Personal Email: liangfu.chen@icloud.com

Work Email: liangfc@amazon.com



Work Experience

Amazon.com Services LLC

Software Dev Engineer

2021.10 ~ present

- ❖ Work on integration between [RAF](#) and MLIR-based tensorizer.
- ❖ Develop MLIR-based single-step tensorizer for custom ML accelerator.

Amazon Information Service (Beijing) Co., Ltd. Shanghai Branch

Innovation Solution Architect

2020.04 ~ 2021.10

- ❖ Participate in developing the award winning [Spot Tagging Bot solution](#) for labelling digital assets.
- ❖ Develop the ML Bot solution for efficient customization of machine learning models.
- ❖ Work on the development of MLIR based tensorizer for efficient execution of tensor programs.

Harman International (China) Holdings Co., Ltd.

Senior Software Engineer

2019.03 ~ 2020.03

Software Engineer

2016.10 ~ 2019.02

- ❖ Develop algorithms for real-time road scene perception to enable autonomous driving.
- ❖ Develop an interactive surround-view system to help drivers aware of the surroundings.
- ❖ Develop computer programs for efficient inference of the deep neural nets on embedded platforms.

Software Engineer at Brainnetome Center & NLPR, CASIA

2013.11 ~ 2016.9

- ❖ Software team lead in developing synchronized fNIRS + EEG data processing systems.
- ❖ Maintain [Brainnetome Atlas](#) for interactive visualization of brain structures and connectivities.
- ❖ Developed [DiffusionKit](#), a software solution for processing and visualizing diffusion MRI data.

Algorithm Engineer at Mobinex Inc.

2012.03 ~ 2013.10

The majority of my work focus on implementing efficient algorithms that detects, tracks human body parts (e.g. hands) and recognize its pose in real time.

Teaching Assistant at Chung-Ang Univ.

C Programming

Spring, 2010 & Spring, 2011

Object-oriented Programming

Fall, 2010

The duty includes reviewing papers, giving guidance during absence of instructor, holding office hours for one-to-one discussions and monitoring the students during exams.

Project Experience

MLIR based Tensorization

2020.10 ~ present

Amazon Information Service (Beijing) Co., Ltd. Shanghai Branch

Systems and Tools: MLIR, C++, Python

Amazon.com Services LLC

- ❖ Project Description: MLIR ecosystem is showing great potential in designing reusable and extensible DSL for tensor programs. In order to improve the efficiency in existing compiler design, we decided to rewrite a Python based tensor compiler in MLIR.
- ❖ Responsibility: 1) Implement basic data structures, operators and attributes in MLIR for compiling multiple operators into nested loops with affine expression based data access patterns; 2) Implement software simulator that simulates the hardware behavior; 3) Convert high-level tensor programs to tensor-based low-level instructions via single-step tensorizer; 4) Work on integration between [RAF](#) and the MLIR-based tensorizer.

Machine Learning Bot

2020.10 ~ 2021.04

Amazon Information Service (Beijing) Co., Ltd. Shanghai Branch

Systems and Tools: AWS CDK, Lambda, Python

- ❖ **Project Description:** Customers often request assistance in resolving common ML challenges. The solution is designed to automate the process in customizing and deploying ML models.
- ❖ **Responsibility:** 1) Leading the development of the solution (including constructing CDK Stacks, API Gateway + Lambda, docker container for training and inference); 2) Participated in writing documents for general availability and hosting internal workshops.

Spot Tagging Bot for Digital Assets

2020.04 ~ 2020.09

Amazon Information Service (Beijing) Co., Ltd. Shanghai Branch

Systems and Tools: SageMaker, Docker, Python

- ❖ **Project Description:** Customers often request to identify labels for their digital assets (e.g. images, videos, documents). The solution is designed to label their digital assets (i.e. unstructured data) with machine learning models.
- ❖ **Responsibility:** 1) Participated (as one of core members) in designing the machine learning models for the solution; 2) Design custom models for customers (e.g. HTSC) and host workshops to deliver the models; 3) Participated in writing GTM documents and hosting internal workshops.

FPGA-based Solution for Efficient Driving Scene Perception

2018.03 ~ 2020.03

Harman International (China) Holdings Co. Ltd

Systems and Tools: Quartus, Chisel, Python, C++

- ❖ **Project Description:** To fill the gap between the performance of proposed neural network that is theoretically efficient and the performance it practically achieved on the embedded systems, we observed recent trend in accelerating CNN with hardware accelerators, and designed a FPGA-based solution for real-time inference of the driving scene perception network.
- ❖ **Responsibility:** I've been working a number of features to reduce the inference time of deep neural networks. First, I've made sparse tensor computation possible based on the compiler stack proposed in TVM. Second, I have worked on the design of the neural network accelerators with the help of Intel HLS and Chisel3. In addition, based on the FPGA design in VTA, I've been trying to optimize the ISA design for depth-wise separable convolution and point-wise convolution layers.

Joint Object Detection, Depth Estimation and Segmentation

2016.10 ~ 2018.12

Harman International (China) Holdings Co. Ltd

Systems and Tools: MXNet, Python, CUDA, C++

- ❖ **Project Description:** As the demand for enabling high-level autonomous driving has increased in recent years and visual perception is one of the critical features to enable fully autonomous driving, we introduce an efficient approach for simultaneous object detection, depth estimation and pixel-level semantic segmentation using a shared convolutional architecture.
- ❖ **Responsibility:** I proposed the initial idea to perceive depth in a detection framework, and integrated the detection and segmentation into a single convolutional architecture. Additionally, I proposed a patent application that related to the system, and wrote a research paper that has been accepted by WACV'18.

Synthetic Surround View System for Driver Assistance

2017.03 ~ 2018.03

Harman International (China) Holdings Co. Ltd

Systems and Tools: OpenCV, Python, C++

- ❖ **Project Description:** As a customer required feature, we implement and optimize a synthetic surround-view system to assist drivers aware of the surroundings. The system is designed to visualize the surroundings of the ego vehicle in arbitrary view angles.
- ❖ **Responsibility:** I collected datasets, calibrate the cameras manually, and performed experiments to build a virtual environment that can generate realistic surround view results in both top-view and arbitrary-view. Additionally, I proposed a patent that related to the system.

Near infrared spectroscopy & ElectroencephaloGraphy

2013.11 ~ 2016.09

Brainnetome Center & NLPR, CASIA

Systems and Tools: Qt, MATLAB, C++

- ❖ **Project Description:** We implemented a system for real-time synchronized fNIRS and EEG data retrieval for capturing electrical activity and functional neuroimaging simultaneously along the scalp.
- ❖ **Responsibility:** Lead the software engineering team in developing Near infrared spectroscopy & ElectroencephaloGraphy (NEG) system, which retrieve simultaneous electronic and optical signal from human brain. A data retrieval software, which communicate with hardware devices via USB interface and store huge amount of data efficiently, along with a data analysis software, which performs signal processing upon the retrieved data, have been developed.

Web-based Interactive Visualization of Brainnetome Atlas

2013.11 ~ 2016.09

Brainnetome Center & NLPR, CASIA

Systems and Tools: Javascript, MATLAB, C++

<http://atlas.brainnetome.org>

DOI: [10.1093/cercor/bhw157](https://doi.org/10.1093/cercor/bhw157)

- ❖ Project Description: We employed a connectivity-based parcellation strategy by which we identified 246 regions in the brain, and then integrated this data with connectivity analyses and functional characterizations to build the Brainnetome Atlas.
- ❖ Responsibility: I maintain the Brainnetome Atlas website for interactive visualization of structures and connectivities human brain, which include: mapping brain regions to statistical connectivities with other brain regions, mapping brain regions to behavior domain analysis, as well as interactive connectogram visualization.

DiffusionKit - Solution For dMRI Data Processing And Visualization 2014.01 ~ 2016.09

Brainnetome Center & NLPR, CASIA

Systems and Tools: Qt, VTK, C++

<http://diffusion.brainnetome.org>

DOI: [10.1016/j.jneumeth.2016.08.011](https://doi.org/10.1016/j.jneumeth.2016.08.011)

- ❖ Project Description: We aim to construct full pipeline for processing and visualizing diffusion MR images that is portable, compact and efficient. Existing solutions we found are either huge in size and hard to deploy to a specific platform, or limited in some functionalities such as DICOM image conversion, portability to MS Windows, visualization of ODF and tractography.
- ❖ Responsibility: I'm responsible to develop visualization software, which provides multiple options to display volume images, tractography results and orientation distribution functions, and integrated the command line toolkits with user friendly graphical interface. I also create daily builds and make redistributable software packages targeting both MS Windows and Linux.

Articulated hand segmentation and tracking using level sets

2012.03 ~ 2013.10

Mobinex Inc.

Systems and Tools: OpenCV, C++

- ❖ Project Description: We started the detection of a hand in the scene using boosted of haar-like features. Then the foreground model and background models are built and updated when a new frame is retrieved. We employ level sets to segment the foreground and background, then maximize the likelihood of the foreground model between frames during the tracking stage.
- ❖ Responsibility: Implement segmentation and tracking system for accurate location of each hand. I integrated a learned shape prior for constraining segmentation result, which improves the robustness of hand tracking. Also, hand pose estimation is done by learning its HOG features and classifying with kernel fisher discriminant.

Quantitative Visualization of 3D biomedical Imaging Data

2010.01 ~ 2011.05

Chung-Ang University

Systems and Tools: Qt, OpenGL, CUDA, C++

- ❖ Project Description: Developing computer algorithms that improves the effectiveness of the data visualization by (semi)automatically computing quantitative information and geometric properties.
- ❖ Responsibility: We analyze 3D volumetric imaging data by constructing contour tree structure from the raw data set. I designed and implemented GPU and multi-core acceleration algorithms for 3D surface extraction of each individual contour components in the volume.

Education

Chung-Ang University, South Korea

2010.01 ~ 2012.02

- Major: Computer Science and Engineering
- Degree: Master of Engineering
- Laboratory: Virtual Reality Lab. < <http://vrlab.cau.ac.kr> >
- Supervisor: Bong-Soo Sohn, Byung-Woo Hong

Woosuk University, South Korea

2007.09 ~ 2009.08

- Major: Pharmaceutical Engineering
- Degree: Bachelor of Science

Nanjing Xiaozhuang University, China

2005.09 ~ 2007.08

- Major: Biological Science
- Degree: Bachelor of Science

Publications

1. **Liangfu Chen**, Zeng Yang, Jianjun Ma, and Zheng Luo. "Driving Scene Perception Network: Real-Time Joint Detection, Depth Estimation and Semantic Segmentation." In *Applications of Computer Vision (WACV), 2018 IEEE Winter Conference on*, pp. 1283-1291. IEEE, 2018.
2. Sangma Xie, **Liangfu Chen**, Nianming Zuo, and Tianzi Jiang. "DiffusionKit: a light one-stop solution for diffusion MRI data analysis." *Journal of neuroscience methods* 273 (2016): 107-119.
3. Lingzhong Fan, Hai Li, Junjie Zhuo, Yu Zhang, Jiaojian Wang, **Liangfu Chen**, Zhengyi Yang et al. "The Human Brainnetome Atlas: A New Brain Atlas Based on Connectional Architecture." *Cerebral Cortex (New York, NY)* 26, no. 8 (2016): 3508.

Patents

1. **Liangfu Chen**, Zeng Yang. (WO2019177562A1). Vehicle system and method for detecting objects and object distance
2. **Liangfu Chen**, Min Xu. (WO2019080051). Surround View System and Method Thereof.
3. Nianming Zuo, Xin Zhang, Tianzi Jiang, **Liangfu Chen**, Yujin Zhang. (CN104287726). Brain activity event synchronous recording system and method.

Awards

1. HARMAN Innovation Awards 2019 (top 50 innovators across HARMAN)
2. Full scholarship 2010 (excellence in graduate study at Chung-Ang University)

IT skills

- ❖ C/C++ programming (daily), Python (very often), MATLAB (sometimes)
- ❖ Experienced with Apache TVM (incl. TOPI, Relay, AutoTVM and TVA), most of AWS services (include but not limited to API Gateway, Lambda, DynamoDB, ECS, CloudFormation, SageMaker), MXNet, Caffe, Boost, pthread, VTK, Qt, CUDA, OpenCL, OpenGL, NDK for Android, LaTeX, Typescript/Javascript, Verilog, Scala, CMake and Makefile etc.
- ❖ Technical document writing and translation, e.g. [DiffusionKit](#), [The Boost C++ Libraries](#)
- ❖ Use Emacs as text editor daily, in Linux of course.