

# Linfeng Cao

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## EDUCATION

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Sep. 2018-Present

### Shanghai Jiao Tong University

Candidate for Master in Mechatronic Engineering

Robotics Institute, School of Mechanical Engineering

- Research interests: Machine learning, Brain-computer interface, Robotics
- GPA: 3.42/4.00
- Honor & Awards: First-class Scholarship/ Second-class Scholarship
- IELTS: 6.5

Sep. 2014-Jun. 2018

### Southwest Jiaotong University

Bachelor in Vehicle Engineering

School of Mechanical Engineering

- GPA: 3.63/4.00
- Honor & Awards: Tongmao Scholarship, Merit Student, Innovation Award

## PROJECT & ACADEMIC EXPERIENCE

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### *(John Hopcroft Center for Computer Science, SJTU, Research Intern)*

**Out-of-Distribution Generalization for HDR Image Compression** (Project Leader) Jan. 2021 - Sept. 2021

- Proposed a novel Out-of-Distribution (OoD) HDR image compression framework (OoDHDR-codec), which improved the compression model's OoD generalization ability for HDR image compression. Extensive experimental results indicated that our OoDHDR codec showed strong generalization capabilities across multiple datasets. To the best of our knowledge, our proposed approach is the first work to model HDR compression as OoD generalization problems to achieve the state-of-the-art HDR image compression performance
- This work has been submitted to AAAI 2022

**Fault Tolerant Deep Neural Networks on Analog Circuitry** (Project Member) May. 2021 – Jul. 2021

- Systematically explored the weight drifting tolerance of different neural network components
- Used Bayesian optimization to search for the optimal neural architecture robust to weight drifting. The experiments demonstrated that our algorithmic framework had outperformed the state-of-the-art methods on various tasks, such as image classification and object detection. (Mainly responsible for paper writing and the evaluation experiments including image classification, object detection, large-scale point cloud tasks)

### *(Robotics Institute, School of Mechanical Engineering, SJTU, Master)*

**A Brain-Actuated Robotic Arm System Using Non-invasive Hybrid Brain-Computer Interface and Shared Control Strategy** (Project Leader) Sep. 2019 - Nov. 2020

- Designed a hybrid brain computer interface (BCI) scheme (i.e., integrated motor imagery and steady-state visual evoked potentials) and the corresponding parallel decoding algorithm to provide multi-dimensional BCI control and optimize resources allocation
- Proposed a shared control strategy which inferred the user's intention, constructed the machine autonomy and human intention models dynamically based on the inference confidence and user's characteristic, and fused them using Bayesian fusion theory to provide machine automatic assistance

during online control, thus enhanced the BCI control performance

- This work has been published in *Journal of Neural Engineering*
- This work is nominated in *BCI Award 2021*

**Object Recognition and Pose Estimation of Task Scene** (Project Leader) Jan. 2019 - Sep. 2019

- Implemented a Fully Convolutional Network (FCN) for the target object recognition and point cloud segmentation in the picking task scene of robotic arm, and employed the Iterative Closest Point (ICP) algorithm to obtain the poses of the segmented objects, which were used as the knowledge base of the online BCI experiment (This work served for the machine vision perception function in the brain-actuated robotic arm system)

**A Shared Control Strategy for Reach and Grasp of Multiple Objects Using Robot Vision and Non-invasive Brain-Computer Interface** (Project Member) Nov. 2018 - Apr. 2019

- Utilized a simple left- vs right- hand motor imagery as non-invasive brain computer interface (BCI) paradigm to control the movement of the robotic arm and proposed a parallel shared control strategy based on machine vision guidance to integrate the user's BCI command and the machine instruction for providing the machine independent auxiliary control. (Mainly involved in the design of EEG interface paradigm, the design of shared control principle and experiments)
- This work has been published in *IEEE Transactions on Automation Science and Engineering*

**Visual Intelligence Analysis | Mathematical contest in modeling** (Project Member) Sep. 2019

- Aiming at the problem of camera parameter calibration and image content analysis without camera parameters, combined with the invariant information in perspective projection, the calculation of camera matrix and daily prior information to reverse information in the single image, and combined two or more frames of video information to perform camera parameter calibration and 3D reconstruction of objects in videos. (Mainly responsible for the construction of UAV video information inverse model and the writing of related content)
- This work won the second prize of the "Huawei Cup" 16th China Post-Graduate Mathematical Contest in Modeling

## **PATENT/PUBLICATION**

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1. **L. Cao**, A. Jiang, W. Li, H. Wu and N. Ye, "OoD HDR-codec: Out-of-Distribution Generalization for HDR Image Compression", *36th AAAI Conference on Artificial Intelligence*. (submitted)
2. **L. Cao**, G. Li, Y. Xu, H. Zhang and D. Zhang, "A Brain-Actuated Robotic Arm System Using Non-invasive Hybrid Brain-Computer Interface and Shared Control Strategy", *Journal of Neural Engineering*, vol. 18, no. 4, 2021. (SCI, IF:5.379, published)
3. **L. Cao**, D. Zhang, "A Bayesian Fusion Based Shared Control Strategy for Brain-Actuated Robotic Arm System", *IEEE International Conference on Real-time Computing and Robotics*, 2021. (conference abstract)
4. Y. Xu, H. Zhang, **L. Cao**, X. Shu and D. Zhang, "A Shared Control Strategy for Reach and Grasp of Multiple Objects Using Robot Vision and Noninvasive Brain-Computer Interface", *IEEE Transactions on Automation Science and Engineering*, pp. 1-13, 2020. (SCI, IF:5.083, published)
5. Utility model patent, "一种压感能源装置", No: 201720477072.4
6. Utility model patent, "一种具有能量采集功能的高压电力线防震锤系统", No: 201720688201.4