Hao Fang

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RESEARCH INTERESTS:

Machine learning, Biomedical signal processing, image processing, BCI, etc.

EDUCATION

09/2021-09/2022 University of Edinburgh **Edinburgh, UK**

MSc Signal Processing and Communications **Merit**

Main courses: *Machine Learning in Signal Processing, Discrete-Time Signal Analysis, Image Processing, Advanced Wireless Communication, Advanced Coding Techniques, Adaptive Signal Processing, Array Processing Methods and MIMO Systems, Probability, Estimation Theory and Random Signals (PETARS), Engineering Research Methods with Grand Challenge, etc*

09/2017-06/2021 University of Leeds (Joint Program with Southwest Jiaotong University) **Leeds, UK/Chengdu, CN**

BEng Electronic and Electrical Engineering (Leeds) **First class**

Main courses: *Engineering Mathematics, High Frequency Electronics, Transistors and Optoelectronic Devices, Power Electronics, Embedded Systems Project, Microprocessors and Programmable Logic, Circuit Analysis and Design, Circuit Theory, Communications Networks and Signals, Communications Systems, Digital Electronics and Microcontrollers, etc.*

Awards and Honours:

- 2020 Winner of Leeds's Monthly Technology Contest
- 2019-2020 First Class Comprehensive Scholarship (Top 3%)
- 2019-2020 Merit Student

WORK EXPERIENCE

11/2022-Present Jiangsu JITRI Brain-Machine Fusion Intelligence Institute **Jiangsu, CN**
Software algorithm engineer

- Design, develop WeChat mini-programs.
- Designing and developing algorithms for image processing and biomedical signals processing.

01/2020-02/2020 Institute of Ocean Electronic Engineering and Intelligent Systems, Zhejiang University **Zhejiang, CN**
Intern Project Assistant

- Assisted in the circuit analysis and design of a marine state monitoring device and engaged with the design of multiple sub-circuits, including PreAmp, Filter, and Light sensor.

PROJECT EXPERIENCE

12/2022-12/2022 Bluetooth console and music station for EEG acquisition and tDCS headset based on WeChat mini-programs

- Set the communication protocol between the WeChat mini-program and the Bluetooth Low Energy (BLE) of the head-mounted hardware device;
- Designed and developed the console of the WeChat mini-program with which the users can select and switch the working mode of the headset between EEG acquisition mode and transcranial electrical stimulation mode;
- Designed and developed the music station of the WeChat mini-program with which the users can select songs from other music stations and play them on the mini-program;
- Tested and launched the WeChat mini-program.

12/2022-12/2022 Image fusion algorithm software for visible light images and short-wave infrared images

- ➢ Designed and developed the interactive software based on the image fusion algorithm of the designed visible light images and short-wave infrared images; users can select the images above that they want to input on the software side, and obtain the corresponding fusion image;
- ➢ The software has applied for copyright.

RESEARCH EXPERIENCE

03/2023-Present Towards Usable and Cost-Effective Closed-Loop EEG-Based BCIs: Emotion Recognition with Minimal Electrode Channels

- ○ The R&D of algorithms, JITRI Brain-Machine Fusion Intelligence Institute, Jiangsu Industrial Technology Research Institute.;
- ➢ Exploring the location of brain regions associated with the changes in human emotion.
- ➢ Extracting, based on the SEED dataset, different electrode combinations, especially the electrodes in the temporal lobe; applying deep learning in model training and emotion recognition testing;
- ➢ Conducting the comparison test that includes SVM, RF, DT, CNN, RNN algorithm;
- ➢ Designing the Hybrid (CNN+RNN) scheme and the Ensemble (SVM+CNN + RNN + Hybrid) solution, rendering that this scheme achieves higher robustness.

03/2023-03/2023 The EEG-based detection of epilepsy status

- ○ The R&D of algorithms, JITRI Brain-Machine Fusion Intelligence Institute, Jiangsu Industrial Technology Research Institute.;
- ➢ Performed model training and testing for epilepsy detection using epilepsy EEG data sets combined with deep learning;
- ➢ Conducted the comparison test on multiple algorithms including CNN, ResNet, SVM, MLP, Random Forest, Decision Tree and Gradient Boosting, etc.

11/2022-12/2022 Image fusion algorithm of visible light image and shortwave infrared image based on evolutionary algorithm and discrete wavelet transform

- ➢ Calibrated the visible light images and short-wave infrared images based on evolutionary algorithms;
- ➢ Realized image fusion based on discrete wavelet transform;
  Colored fusion image based on RGB channel separation and reconstruction;
- ➢ Wrote paper on the research (ready to sumbit) and applied for the patent.

10/2021-Present Postgraduate Graduation Project: Neural Art Meets Edinburgh

- ➢ Explored the innovative application of machine learning in art creation;
- ➢ Inspired by that human beings can express many scenes in art through NST (neural style transfer), designed the project to use the scenes around the city captured by our mobile phones or cameras to generate artwork.

01/2021-01/2021 Design based on image processing of detecting scarf stripes on conveyor belts

- ➢ Acquired through a series of image preprocessing the completed scarf image; reduced the motion blurring and out-of-focus blurring that may exist in the image acquisition process; detected the defects via image segmentation.

10/2020-06/2021 Undergraduate Graduation Project: Real-time Face Covering detection design based on Deep Learning

- ➢ Conducted real-time detection of the correctness of wearing face masks based on deep learning (YOLO v5s) as the graduation design;
- ➢ Created a custom dataset and divided the detection task into three categories, effectively determining whether the mask wearer was wearing the mask correctly, which has high practical and commercial value.

08/2020-09/2020 Innovative Training Program for Undergraduates of the Chinese Academy of Sciences/Leading researcher

- ➢ Engaged with the project on FPGA-based Machine Learning and Hardware Acceleration
- ➢ Completed a Python-based GUI design, a real-time handwritten digit recognition based on machine learning using Verilog programming, with which users can input data through handwriting and output recognition results via real-time detection.

01/2020-06/2020 Individual Game Project: Abyss

- Completed the embedded doomsday survival game design project with C++ programming on the FRDM-K64 development board, enabling players to control the characters on the development board, get supplies and restore life for final victory;
- Achieved full marks in "Software Engineering", "Testing and De-bugging", "Complexity, Creativity and Functionality", "Version Control, "Documentation".

02/2019-04/2019 Buggy Project/Team leader

- Led a team of four members in designing a remote control car, realizing its intelligent abilities such as obstacle avoidance, tracking and tailing;
- Designed and welded the H Bridge, remote control and power module of the car, and combined the single-chip microcomputer to complete the design of the obstacle avoidance function.

RELATED SKILLS

- Language: native in Chinese and fluent in English.
- Programming package:
  - C, C++, Python, Verilog HDL, Java Script, html, wxml, css, wxss, MATLAB,
  - Open CV