CHENG KANG (康成)

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PROFILE

I am a PhD student at the Analysis and Interpretation of Biomedical Data Group, Department of Cybernetics, Czech Technical University in Prague, and I am supervised by doc. Ing. Daniel Novák, Ph.D. My research now on **Artificial Intelligence and Biocybernetics** is supported by Research Center for Informatics (RCI)and Student Grants in Czech Technical University in Prague. I was included in two main projects: (1) Detecting Depression and Scoring Depressive Severity Under Brain Computer Interface (BCI) and (2) Psychotherapy Chatbot On Language Models. During the Master's study, I was recruited as a research assistant in Li Ka Shing Faculty of Medicine, the University of Hong Kong, where I worked with Prof. Yong Hu who is the Director of Neural Eng. and Clin Electrophysiology Laboratory. I also visited the Knowledge Discovery and Machine Learning Lab, University of Leicester, where I was supervised by Prof. Yudong Zhang and Prof. Huiyu Zhou.

EDUCATION

PhD, Czech Technical University   Prague, Czech Republic 📍   📅 Sep 2020 ▸ Now
Department of Cybernetics, Faculty of Elektrotechnická,
Major: Artificial Intelligence and Biocybernetics
Courses: (1) Practical Data Mining Problems (Score B); (2) Statistical Method in Natural Language Processing (Score C); (3) Deep Learning (Score C); (4) Bioinformatics (Score B); (5) Introduction to Computer Vision (Score B).

Visiting Study, University of Leicester   Leicester, United Kingdom   📅 Sep 2018 ▸ Sep 2019
School of Computing and Mathematic Sciences,
Major: Medical Image Processing and AI
Courses: (1) Distributed System (Pass); (2) Big Data and Predictive Analytics (Pass).

Visiting Study, University of Hong Kong   Hong Kong   📅 Aug 2016 ▸ Aug 2017
Li Ka Shing Faculty of Medicine,
Major: Biomedical Signal Processing and Machine Learning

MSc. Shenzhen University   Shenzhen, China   📅 Sep 2013 ▸ Jun 2016
Control Engineering and Cybernetics
Major in Engineering

B.S. Weifang University of Science and Technology   Weifang, China   📅 Sep 2009 ▸ Jun 2013
Electrical Engineering and Automatization
Major in Engineering

SKILLS

</> Program Language	🖥 Knowledge	🖥 Open Libraries	⑂ Software	🈯 Language
Python ▭	Deep Learning ▭	Pytorch ▭	Pycharm ▭	Chinese ▭
C/C++ ▭	NLP and LLM ▭	SciPy ▭	VS C++ ▭	English ▭
MATLAB ▭	Machine Learning ▭	NumPy ▭	CMake ▭	Czech ▭
SQL ▭	Computer Vision ▭	TensorFlow ▭	Eclipse ▭	
Java ▭	Statistics ▭	...	...	

▭ Beginner ▭ Average ▭ Pro ▭ Master ▭ Contributor

Researcher
Czech Technical University · Prague 📍   📅 Sep 2020 ▸ Now
♣ Psychotherapy Chatbot based on LLMs:

- Prepare, clean and format text data, as well as data analysis;

- Fine-tune, compress and deploy large language models to online servers;

- Develop generative language models to interact with users;

- Build strong relationships with psychologists and manage product expectations;

Highlights: We proposed a BCI system based on particular ANNs to detect depression and grade the severity of depressive disorders). We also proposed a Psychotherapy Chatbot relying on advanced Assistant Instrcution using GPT-4, Inhibition Adaption and Controller Correction tuning methods on LLMs (e.g., Llama2, Vicuna, Falcon, ChatGLM2, MPT, WizardLM...).

Algorithm and System Engineer
Shenzhen Dymind Biotechnology Co, · Shenzhen, China   📅 Sep 2019 ▸ Sep 2020
Hematology Analyzer (blood cells counting + CRP + SAA):

- Algorithm maintaining and developing;

- Solve bugs according to clinical data and regularly upgrade software system with a new algorithm version;

- Deploying and maintaning data system.

Algorithm Engineer
Wuhan Zoncare Bio-medical Electronics Co., Ltd., · Wuhan, China   📅 Sep 2017 ▸ Sep 2018
Help cardiologists to diagnose heart diseases by 12-lead electrocardiograms and AI:

- Clean 12-ECG dataset, design algorithm to detect features of ECGs;

- Do advanced research on automatic disgnosis.

Research Assistant
Li Ka Shing Faculty of Medicine in University of Hong Kong, · Hong Kong   📅 Aug 2016 ▸ Aug 2019
Develop an automatic system which can evaluate the injury level of spinal cords:

- Surgery assistance and setting electrodes to collect somatosensory evoked potentials,

- Clean data, extract features and construct/train deep neural networks.

OTHER PROJECTS

♣ Detect Depression Using BCI and AI
Li Ka Shing Faculty of Medicine in University of Hong Kong, · Hong Kong   📅 Aug 2016 ▸ Aug 2019
Develop a automatic system to detect depression using Brain Computer Interface and AI:

- Analyze EEG data, construct and cluster functional brain networks;

- Statistic analysis of EEG data, such as t-test, ANOVA, PCA, correlation analysis and multivariate autoregressive;

- Use artificial neural networks to detect depression and the severity;

Highlights: We developed an automatic system to detect depression and the depressive severity using BCI.

♣ Control Artificial Neural Networks

Czech Technical University · Prague 📍   🗓 Nov 2022 ▸ Now

Analyze the control system of commmon ANNs (such as CNNs, GANs, VAEs, Transformer-based LMs and so on) and control them:

- Analyze and get the control system function of ANNs,

- Simulate the systematic response of ANNs on various hyperparameters,

- Develop better Optimizer (Controller, compared to SGD, SGDM, AdaM and PID) and Training system according to the control systematic response;

Highlights: We propose (1) a new standard to analyze the convergence, stability and robustness of ANNs; (2) a better optimizer (e.g., Fuzzy PID optimizer) to optimize the training process of CNNs and FFNN; (3) better training systems to generate samples using GANs, CycelGANs, BiGANs.

MAIN PUBLICATIONS

Classifying and Scoring Major Depressive Disorders by Residual Neural Networks on Specific Frequencies and Brain Regions. **Cheng Kang**; Daniel Novak; Xujing Yao; Jiayong Xie; Yong Hu. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2023.   Code; PDF

Brain Networks of Maintenance, Inhibition and Disinhibition During Working Memory. **Cheng Kang**; Yuezhi Li; Daniel Novak; Yudong Zhang; Qinghua Zhou and Yong Hu. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2020.   Code; PDF

InA: Inhibition Adaption On Pre-trained Language Models. **Cheng Kang**; Jindich Prokop; Lei Tong; Huiyu Zhou; Yong Hu; Daneil Novak. Under Review, 2023.

Quantized Embedding for Controllable Diffusion Language Models. **Cheng Kang**; Yong Hu; Daneil Novak. Under Review, 2023.

Domain-Specific Assistant-Instruction on Psychotherapy. **Cheng Kang**; Yong Hu; Daneil Novak. Under Review, 2023.

We Need To Control Artificla Neural Networks. **Cheng Kang**; Xujing Yao. Under Review, 2023.

Please find more publications from my website.

APPS

AdiQuit. An interactive mobile app to help people quit smoking.   🗓 Dec 2022

RunningRabbit. An interactive mobile game using head or body movement to control the rabbit to collect coins.   🗓 Mar 2022

TECHNICAL BLOGS

Embedding Neural Networks into Devices.   🗓 Mar 2023

Fine-Tune Language Models: Instruction Tuning;   🗓 Sep 2022

Medical Conversation and Diagnosis Chatbot: Conversation (A);   🗓 Mar 2022

Medical Conversation and Diagnosis Chatbot: Diagnosis (B);   🗓 Mar 2022

Basic Deep Learning Knowledge;   🗓 Nov 2021

HRV for Sleep Scoring and Pressure Evaluating;   🗓 Dec 2018