

Weihaan Li

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EDUCATION

GPA: 3.74/4.00 (85.18/100)

Zhejiang University

Bachelor of Computer Science And Technology

Hangzhou, China

Expected in Jun, 2020

Eötvös Loránd University

Culture Program in Summer School

Budapest, Hungary

Jul-Aug, 2018

RESEARCH EXPERIENCES

Brain-inspired Neural Network with Active Neuron Memorizing Process

Dec. 2019-present

Step Zero: Inspired by activity-dependent learning, a theory which means neurons adjust themselves according to the historical activation behavior to benefit information processing.

Part One:

Develop a network structure to memorize the activity patterns of neurons in a certain network layer while training.

Process:

- Choose a network layer to serve as the input neurons, usually the last full-connected layer before softmax.
- Binarize the neurons from the selected layer, for example, based on a threshold, .
- Use Hopfield neural network to memorize the activity patterns of different object categories in dataset

Problems:

- The capacity of Hopfield neural network limits the number of memorized object categories.

Possible Solutions:

- Change the learning algorithm:
 - Original: Hebbian learning rule.
 - Current: The Storkey learning rule or a learning rule based on minimum probability flow.

Part Two:

Using the learned activity information to automatically activate or inhibit neurons during the test process.

Process:

- Binarize the neurons from last layer's output.
- Recall the stored activity patterns from Hopfield neural network based on the input.
- Debinarize the output of Hopfield neural network.

Problems:

- The overlap among different activity patterns will affect the accuracy of recalling memory process.
- How to debinarize the output of Hopfield neural network?

Possible Solutions:

- Encourage intra-class compactness and inter-class separability between learned features.
 - Cosface loss function.
 - Large-margin gaussian mixture loss function.
 - L-softmax loss function.
- Store the original value of each neuron before binarization.
 - For reactivate neurons: use the mean value of the original neurons.

Current Result and Further Steps for Publication:

- Achieve good results for noise resistance / no noise situation based on ResNet-18:
 - MNIST and CIFAR10 dataset.
- Still need to improve when it comes to larger dataset, such as CIFAR100 and ImageNet.
 - The accuracy of recalling process is not high enough due to the overlap of different activity patterns.
 - An activity pattern should correspond to only one object category in the dataset.
- Change the way to binarize neurons, because currently it will lost information.

PROJECT

VR application	May. – Nov. 2018
• We develop a VR app which is similar to the game “Cities: Skylines”	
Wheeled robot	Mar. – Jun. 2018
• We apply an obstacle avoidance algorithm to our wheeled robot and install a robotic arm on it to do our course task.	
Self-designed Operating System	Sep. -- Dec. 2018
• A simple operating system which includes process management, memory allocation and file system.	
C89 Compiler	Mar. -- Jun. 2019
• A C compiler for C89 standard with LALR parsing and LLVM to generate target code.	
Legged robot: NAO Robot	Sep. – Dec. 2019
• Gait planning and Robot vision.	
fMRI Preprocessing and Decoding	Sep. 2019
• We use afni to preprocess fMRI images and learn some works about fMRI decoding.	

INTERN EXPERIENCE

The Sulfur Group in Los Angeles	Jan.-Feb. 2019
• Web Developer	

HONORS & AWARDS

Outstanding Model Member of the Youth League	2018
The Third-Prize Scholarship in Zhejiang University	2017, 2018, 2019

SKILLS AND QUALIFICATIONS

Language Skills: Chinese, English

Programming Languages: C/C++, Java, Python, MATLAB

Programming Environments: MATLAB, PyTorch, OpenCV, LabVIEW, LLVM