

SHU ZHAO

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EDUCATION

The Pennsylvania State University–University Park
Ph.D. in Computer Science

Aug. 2022 - Jun. 2027 (expected)
Pennsylvania, USA

University of Chinese Academy of Sciences
M.E. in Computer Technology

Sep. 2018 - Jun. 2021
Beijing, China

Anhui University
B.E. in Information Security

Sep. 2013 - Jun. 2017
Anhui, China

RESEARCH INTERESTS

My research interests include Vision & Language, Perception & Cognition, and Embodied AI. Currently, I am focusing on abstracting structural information from vision to improve understanding and reasoning abilities by involving the commonsense knowledge from language.

PUBLICATIONS

- Rescuing Deep Hashing from Dead Bits Problem.**
International Joint Conference on Artificial Intelligence (IJCAI), 2021.
Shu Zhao, Dayan Wu, Yucan Zhou, Bo Li, Weiping Wang.
- Asymmetric Deep Hashing for Efficient Hash Code Compression.**
ACM International Conference on Multimedia (ACM MM), 2020. **(Oral)**
Shu Zhao, Dayan Wu, Wanqian Zhang, Yu Zhou, Bo Li, Weiping Wang.
- Technical Report for EPIC-KITCHENS-100 2021 Multi-Instance Retrieval Challenge.**
Workshop on EPIC-Kitchens Challenges, in conjunction with CVPR (CVPR Workshop 2021). **(Ranked 1st)**
Xiaoshuai Hao, Wanqian Zhang, Dejie Yang, **Shu Zhao**, Dayan Wu, Bo Li, Weiping Wang.

RESEARCH EXPERIENCE

PromptHashing: Learning to Prompt for Few-shot Deep Hashing
Advised by Dr. Tan Yu

Baidu Research, Beijing
Apr. 2022 - Jul. 2022

- Proposed a prompt-learning paradigm for few-shot deep hashing.
- Devised Multi-Modal Discrete Cyclic Coordinate Descent (MMDDC) method for effectively utilizing language information because simply adopted the CLIP model for the deep hashing task achieved poor performance.
- Designed Distillation-based Fine-Tuning (DFT) approach because fine-tuning the CLIP model is easy to overfit.
- Extensive experiments on three public demonstrated the excellent effectiveness and efficiency of the proposed PromptHashing.

Research on Key Technologies of Pretrained Model of Large-Scale Image Retrieval IIE, CAS, Beijing
Advised by Prof. Dayan Wu and Prof. Bo Li

Jun. 2020 - Mar. 2021

- Formalized the problem existing in image retrieval pre-trained model: the cross-entropy loss can not match the retrieval task, leading to the decrease of generalization ability.
- Leveraged metric learning loss to pre-train model on large-scale dataset and adopted RDH module to improve retrieval performance.
- Theoretically analyzed the challenge in large-scale metric learning and employed balanced sampling method and semi-hard negative mining strategy to alleviate it.
- Developed a large-scale image retrieval system. Conducted several experiments and demonstrated the effectiveness of the system.

- The work is formed as the master thesis.

Rescuing Deep Hashing from Dead Bits Problem

Advised by Prof. Dayan Wu and Prof. Bo Li

IIE, CAS, Beijing
Nov. 2020 - Feb. 2021

- Firstly formalized “Dead Bits Problem” (DBP): the saturated area of activation function and existing quantization loss will “kill” more and more hash bits. The problem widely existed in a large number of hashing methods.
- Proposed a gradient amplifier that detects the dead bits and amplifies their gradients to rescue them. Devised an error-aware quantization loss, which will further alleviate the DBP. The proposed gradient amplifier and error-aware quantization loss can be compatible with various deep hashing methods.
- Experimentally observed that our method can alleviate the DBP effectively and efficiently.
- The work is summarized in a paper and accepted to IJCAI 2021.

Asymmetric Deep Hashing for Efficient Hash Code Compression

Advised by Prof. Dayan Wu and Prof. Bo Li

IIE, CAS, Beijing
Oct. 2019 - Jun. 2020

- Devised an efficient and practical deep hashing framework to compress the existing hash codes in databases for saving storage space while keeping the retrieval accuracy.
- Leveraged VAE, instead of one branch of CNN in the siamese network, to compress database hash codes, and built the asymmetric architecture, which can reduce the time consumption and improve the retrieval performance simultaneously.
- Proposed a novel code compression-oriented hashing loss to guide the optimization of the CNN model with both labeled and unlabeled data.
- Improved the compression time largely on different datasets (100,000x) with almost no loss on retrieval accuracy.
- The work is summarized in a paper and accepted to ACM MM 2020.

SELECTED PROJECTS

Drone Recognition System

- Developed a drone recognition system for detection, tracking, and re-identification (ReID) of vehicles.
- Adopted YOLO-v4 as the detector, and fit it into DeepSort tracking algorithm to build the multiple object tracking module. Implemented vehicle ReID by combining vehicles ReID algorithm and color matching algorithm.
- Achieved real-time detection and tracking as well as cross-camera, cross-height, and cross-time ReID of vehicles on low-power drone platform.

Intelligent Recognition System for Person Entities

- Developed a cross-platform deep learning system to identify information such as job title, room, gender, etc., of person ID photos in databases.
- Encapsulated all the code into docker and provided Restful API for conveniently deploying to Linux, Windows, and Mac OS.

HONORS & AWARDS

1st in Multi-Instance Retrieval Track of EPIC-KITCHENS Challenges, CVPR Workshop	2021
Pacemaker to Merit Student, University of Chinese Academy of Sciences	2021
IIE Presidential Scholarship, Institute of Information Engineering	2020
Merit Student, University of Chinese Academy of Sciences	2019

REVIEW SERVICES

Annual Conference on Neural Information Processing Systems (NeurIPS)
ACM International Conference on Multimedia (ACM MM)