Tianning YUAN

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EDUCATION

University of Chinese Academy of Sciences (UCAS), Beijing, China *Sep. 2019 - Present*
Master Candidate in Electronic and Communication Engineering
Supervisor: Prof. Qixiang Ye
Core Courses: Fundamentals of Pattern Recognition, Machine Learning Methods and Applications

Tsinghua University (THU), Beijing, China *Sep. 2015 - Jul. 2019*
Bachelor of Engineering in Electronic Information Science and Technology
Core Courses: Discrete Mathematics, Probability and Stochastic Processes, Computer Program Design, Advanced Matlab Programming and Application, Data and Algorithm, Digital Image Processing

RESEARCH INTERESTS

Computer Vision	Object Detection, Image Classification
Machine Learning	Active Learning, Semi-/Weakly supervised Learning, Feature Learning

EXPERIENCE

Huawei Technologies Co., Ltd., Shenzhen, China *Jun. 2021 - Dec. 2021*
Intern in Noah's Ark Lab
Mentor: Songcen Xu
Object Detection Based on Weakly Supervised Learning:
For video classification, it is required to achieve higher performance with limited samples to reduce the cost of labeling. Because of the rich information in a single video and the large number of video classes, directly applying the active learning algorithm that have been tested on object detection and image classification to video classification will result in low performance. By adjusting the settings such as the number of cycles, the initial size and the increment of the labeled set and other hyper-parameters, introducing self-supervised learning to solve the cold start problem, 93.4% (top-1 accuracy) / 97.9% (top-5 accuracy) of the fully-supervised performance can be achieved using only 50% of the data on HMDB51 dataset.

University of Chinese Academy of Sciences, Beijing, China *Jul. 2019 - Present*
Researcher in Pattern Recognition and Intelligent System Development Laboratory
Supervisor: Prof. Qixiang Ye
Object Detection Based on Weakly Supervised Learning:
For object detection, there is a lack of instance-level active learning method, and the large background in the image will interfere with sample selection. The uncertainty of the samples can be defined as the prediction discrepancy between the two classification heads of the detector. But after maximizing and minimizing the discrepancy, it will only improve the performance on image classification. In order to make the detector suppress the background noisy instances and focus more on the discrepancy on the foreground instances, a multiple instance learning classifier is introduced to re-weight each instances. Finally, 93.5% of the fully-supervised performance (mAP) can be achieved with only 20% data on PASCAL VOC dataset.

Tsinghua University, Beijing, China *Oct. 2018 - Jul. 2019*
Research Assistant in 3D Image Lab
Supervisor: Prof. Huimin Ma
Algorithm Design of Zero-shot Learning in Occlusion Image Recognition:
For occlusion image recognition, the diversity of combinations of various occlusion objects and occlusion ranges makes it difficult to find images similar to the training set in the test set. With semantic information introduced from zero-shot learning, and the mapping between the visual space, the semantic description space and the class space can be established by a conditional variational autoencoder. After verification on common benchmark datasets such as CUB (the ratio of seen classes and unseen classes is 3:1, and the accuracy is 52.2%), the relationship of the extracted visual features and semantic information of the occluded objects can be learned in the custom occlusion dataset, and the autoencoder can recognize occluded objects.

IEIT in Tianjin, Tsinghua University, Tianjin, China *Jun. 2018 - Aug. 2018*
Intern in Huaqing Ruishi (Tianjin) Technology Co., Ltd.
Mentor: Congxin Liu
Leision (Optic Disc) Segmentation of Fundus Photos:
For semantic segmentation on medical images, because of the high cost of labeling on each image, it is required to detect the optic disc using only dozens of high-resolution fundus photos. To improve the model generalization ability, it is needed to use data augmentation such as cropping, flipping and rotation on the existing fundus photos. In order to balance the ratio of positives and negatives, it is required to remove a large number of negatives with large backgrounds. Multi-level features can be integrated through the down-sampling and up-sampling of the U-Net. Dilation and erosion post-processing in morphology of digital image processing can fix inaccurately segmented areas, and the IoU can reach 75% on the validation set.

PUBLICATIONS AND PATENTS (GOOGLE SCHOLAR)

[1] Multiple Instance Active Learning for Object Detection (*CVPR '21*)
[2] Nearest Neighbor Classifier Embedded Network for Active Learning (*AAAI '21*)
[3] Agreement-Discrepancy-Selection:Active Learning with Progressive Distribution Alignment (*AAAI '21*)
[4] A Multiple Instance Active Learning Method for Object Detection (*Invention Patent*)

PROJECTS

Object Tracking Based on Infrared Images *May. 2018 - Jun. 2018*
For object tracking on infrared images, given a pedestrian tracking box in a frame of a street video from a fixed camera, it is required to find the pedestrian in other frames. To avoid the loss of detailed features of the frame during denoising, it is needed to detect the impulse noise first, including gray scale range and local difference detection. After selectively median filtering, the inter-frame difference is binarized and re-filtered. With the center of the new tracking box placed at the center of gravity of all maximum pixels, the histogram similarity (Bhattacharyya distance) of the pedestrian tracking boxes between frames is 74.8%.

Human-computer Interaction System Based on Kinect Equipment and SDK Tools *Mar. 2018 - Jun. 2018*
The goal is to build a somatosensory control system using Kinect devices and SDK tools. Specifically, it is to establish a mapping between key operations and character poses in the fighting game, human actions and the coordinate logic between human key points in the real world. We use lock variables to distinguish between instant and continuous operation and use the depth coordinate to enhance immersion and substitution. It will re-calibrate when the depth distance between the human and device changes greatly.

Face Detection Based on Color Histogram *Jun. 2017 - Sep. 2017*
For face detection, it is required to extract and train standard feature from the face samples, and then calculate the distances between the features of the test samples and the face standard in a certain area. To compromise between the accuracy and robustness after spatial processing, it is needed to adjust the number of color bits with the regional feature as color frequency. For test samples whose hue and lightness differs greatly from the training samples or that have been enhanced in the frequency domain, it is needed to respectively select and train various training samples of multiple races under multiple illuminations.

TECHNICAL SKILLS AND CERTIFICATES

Programming Languages	Python, MATLAB, C/C++
Deep Learning Frameworks	PyTorch, TensorFlow, Keras
Tools	LaTeX, MS Office, Linux, Pycharm, NumPy, Matplotlib, Visual Studio
Certificates	CET-6, NCRE in Level 2 (MS Office Advanced Application, C Language / C++ Language / Access Database Programming)

AWARDS

National Scholarship *2021*
Merit Student of University of Chinese Academy of Sciences *2021, 2020*
The Second Prize Scholarship of University of Chinese Academy of Sciences *2021, 2020, 2019*
The Third Prize of the 9th and 8th Chinese Mathematics Competition (Non-mathematics) *2017, 2016*
The Third Prize of the 33rd Chinese College Student Physics Competition (Non-physics) *2016*