Hello, ML Alchemist

Jiaxun Yang

introduce oneself to

- My name is Yang Jiaxun, ranking 1 / 404 (top 0.2%) in the comprehensive grade of Software Engineering Department of Nanchang University in 2017
- GPA: 3.67 / 4.0, with a total of more than 90 points in 26 courses, including 96 points for advanced mathematics, 93 points for academic English, and 97 points for C language programming.
- Cet-6:481.

- ## Jiangxi smart city key laboratory.

- **My undergraduate research experience is the direction of small target detection;**
- I have had a deep research in this field.

- We have used mmdetection toolbox, followed some one-stage, two stage; anchor based, anchor free models.

Outline

- 学习成绩
- 科研经历与兴趣
- 竞赛获奖
- 兴趣爱好
- 未来工作计划

Chapter

- 学习成绩

academic record

- 1. The programming courses are 92 points, familiar with Python and C + +.

- 2. Good basic mathematics skills, 96 points for advanced mathematics; 91 points for English courses.

- 3. In leetcode and POJ, more than 500 questions are written, and blogs are often written; programming and ability are better.

百练200题总结

原创 置顶 ModestYjx   2020-03-15 20:00:27   ⊙ 87   ☆ 收藏 1   编辑 展开

百练200题总结

1. 有趣的跳跃 = 充分利用数组下标+再进行排序遍历

题目描述

PTA200题总结

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PTA200题总结

1. A+B Format

题目描述

排序专项_快排_合并排序

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排序专项_快排_合并排序

1. 合并两个有序链表

题目描述

DFS、BFS专项

原创 私密 ModestYjx   2020-05-12 12:35:00   ⊙ 1   ☆ 收藏   编辑 展开

DFS、BFS专项

1. 二叉树的最大深度(思路应该没问题，语法好像有错误)

题目描述

Chapter

- 科研经历与兴趣

Progress

Two stage：

R-CNN

Fast R-CNN

Faster R-CNN

FPN

SNIP

SNIPER

TridentNet

ATSS

FSAF

Stitcher

RepPoints

YOLO

RetinaNet

CornerNet

YOLO4

One stage：

2014　　2015　　2016　　2017　　2018　　2019　　2020

recent
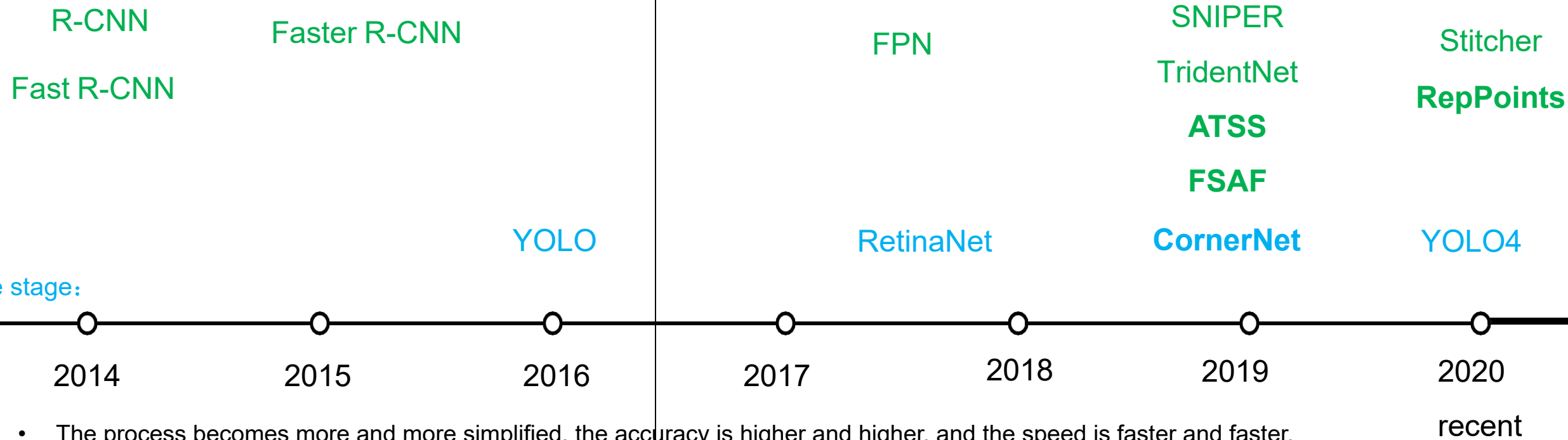
- The process becomes more and more simplified, the accuracy is higher and higher, and the speed is faster and faster.
- At present, generally speaking, the accuracy of anchor based is higher, and anchor free may be the future trend.
- It is necessary to solve the problem of imbalance in target detection, such as imbalance of positive and negative samples, imbalance of IOU distribution, and imbalance of object scale.

Unbalanced summary of target detection

- There are many kinds of imbalances in target detection, which will affect the final detection accuracy. The summary is as follows:

category	sketch
Imbalance of positive and negative samples	The foreground and background are unbalanced, and the number of different types of input bounding boxes in the foreground is unbalanced.
Scale imbalance	The scale of input image and bounding box is unbalanced, and the contribution of different feature layers to the final result is unbalanced.
Spatial imbalance	The distribution of IOU is unbalanced, and the contribution of different samples to regression loss is unbalanced.
Imbalance of objective function	The contribution of different tasks (such as regression and classification) to global loss is unbalanced.

Improvement based on Anchor Based

angle	paper	mAP	Job description
Data level	Stitcher	41.3(Res-101-FPN)	Sticcher = use the threshold value of loss of small and medium-sized targets in a single picture to convert the large and medium-sized targets into small and medium-sized targets, and then re join the training.(equivalent to data expansion)
Network level	FPN	36.2	**The multi-scale feature fusion (before convolution operation in the current layer, add the sampling on the feature map of the previous layer and the feature map of the current layer, that is, by fusing the sampling on the feature map of the previous layer and the features of the shallow layer to get the deep features) is adopted for prediction.**
	RetinaNet	**40.8**(ResNeXt-101-FPN)	**In order to solve the problem of class imbalance, the cross entropy loss criterion is reshaped. By reducing the weight of samples that are easy to classify, this function makes the model focus more on the samples that are difficult to classify during training, so as to improve the class imbalance of samples and the optimization direction of the model.**
	TridentNet	48.4(ResNet-101-Deformable)	For the same object, different sizes of receptive fields are used to achieve data augmentation + sharing of weight parameters to bring adaptability to various scales.
	Adaptive Training Sample Selection	50.7((Multi-scale testing)	ATSs = adaptive sample selection (adjust the IOU threshold dynamically according to the adaptive threshold TG = Mg + VG).

Improvement based on anchor free

angle	paper	mAP	Job description
Corner (false free)	Cornernet (ancestor)	44.6	Cornernet = replace the bounding box with a set of points in the upper left corner and the lower right corner + a new pooling method, cornernet pooling.
Center point (false free)	Centernet (cornernet improvement)	47.0(Hourglass -104)	On the basis of cornernet, a center point prediction is added. The requirement to form an object is not only that two vertices can match, but also that the center of the frame defined by these two vertices should have corresponding center points.
Key points (true free)	Reppoints (propose using keys to represent objects)	46.5	**Directly predict 9 representative points (these vertices have no clear semantics), and then find the tightest frame surrounding the 9 points and calculate the loss with GT.Then loss only returns the points that contribute to the generation of the box.**
Feature layer selection (false free)	Adaptive Training Sample Selection	42.1	Retinanet + fsaf = online selection of feature graph based on loss calculation of anchor free branch + anchor based and anchor free joint training can significantly improve performance.

Anchorfitted: feedback driven target detection anchor arbiter

	min range	max range
Small	0×0	32×32
Medium	32×32	96×96
Large	96×96	∞×∞

Conjecture experiment

- 1. In the coco data set, we found that: there are many small targets (41.43%), but the distribution is very uneven, nearly 50% of the images have no small targets.

- 2. On average, small objects can only match one anchor, while large objects can match 2.54 anchors; the average IOU of small large objects is 0.66.

- 3. Even if the target is inside the anchor, because the IOU is too low, the anchor will still be misjudged as false positive, and i

	Object Count	Images	Average matching anchors	Average max loU
small	**41.43%**	**51.82%**	**1.00**	**0.29**
medium	34.32%	**70.07%**	1.03	0.57
large	24.24%	**82.28%**	2.54	0.66

GT in red;
The green box is anchor;
Even if the GT is inside the anchor, because the IOU is too low,
This anchor will still be misjudged as false positive.

Motivation

- Apsmall is more than twice lower than aplarge - > small object learning is not enough - > it needs to strengthen the learning of small objects.

- By introducing a feedback driven anchor arbiter, the recursive function can dynamically adjust the size of the anchor frame and close the gap between the anchor and the small target by gradually reducing the gap between the anchor and the small target, thus providing more excellent positive samples (to solve the problems 1 and 3 in the conjecture experiment).

- Then, a groupiou balance sampling strategy is used to ensure sufficient number of positive and negative samples with balanced proportion to participate in model training at each scale, so as to avoid small gradients generated by simple samples being submerged by large gradients generated by difficult samples (to solve conjecture experiment problem 2).

主要框架

- 1. Through the anchored module (red box), the anchor without the assigned label is more suitable for the small target, so as to solve the problem that the IOU is too small and the proposal is lost due to the improper anchor.

- 2. Groupiou balance sampling (green box) can avoid small gradients generated by simple samples being submerged by large gradients generated by difficult samples, so that the classifier will obtain balanced training samples of different sizes.

Group IoU Balance sampling module

Gt in Anchor & GT never assign label?

N

Group IoU Balance sampling

Anchorfitted module

Anchorfitted arbiter

Gt in Anchor?

Y

Y

N
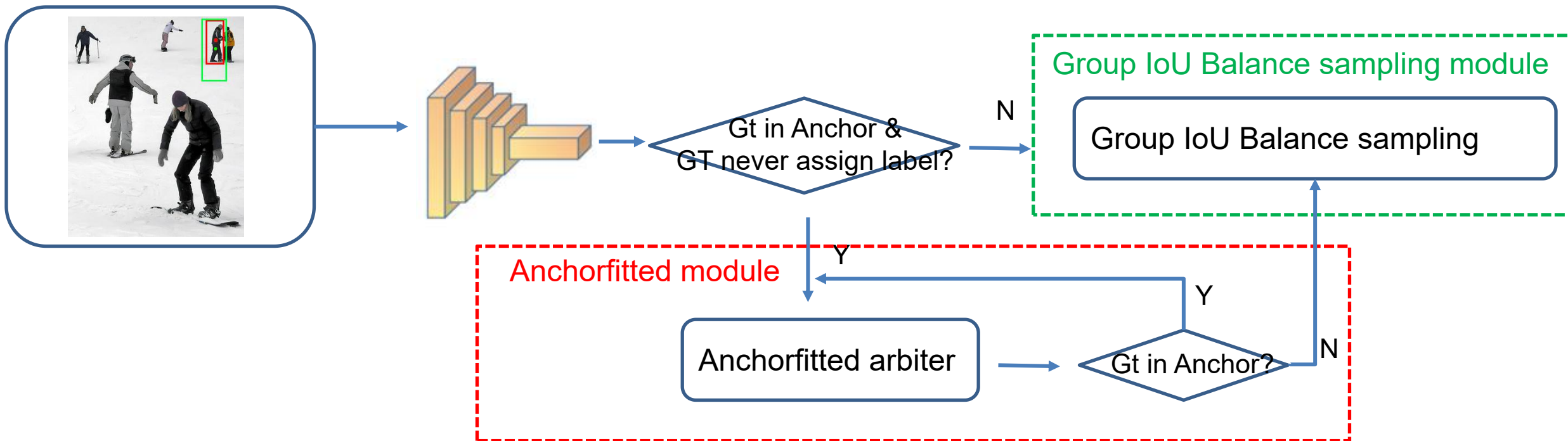
Anchorfitted module

- 1. Introduce a consensus mechanism: if 1) GT is given a positive label for the first time; 2) GT is inside the anchor, the anchor uses the anchored module.

- 2. Recursively scale the length and width of the anchor to 4 / 5, until the anchor no longer contains GT, and get the final anchor.
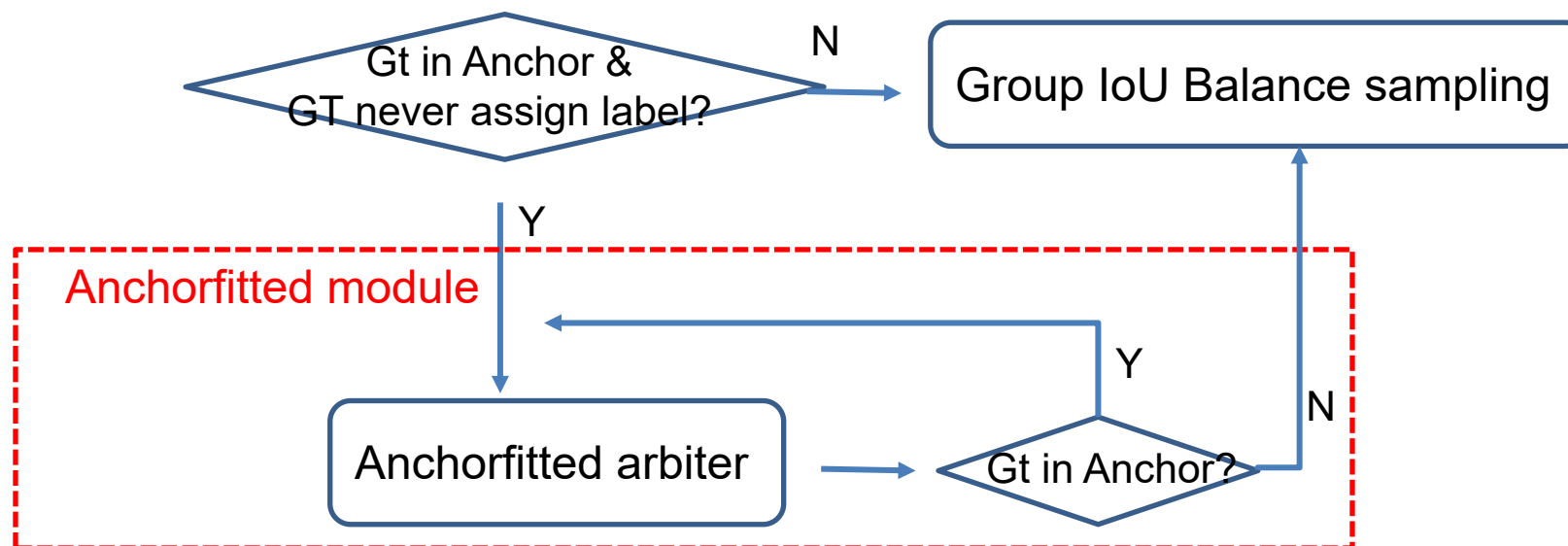
Group IoU Balance sampling

- 1. Divide all anchors into several groups according to their scales.

- 2. For each group, keep the proportion of positive and negative samples at 3:1, and then divide the value of IOU into k intervals.

- 3. N negative samples are sampled in each interval, and the number of candidate samples in each interval is Mk. The specific sampling formula is as follows:

$$p_k = \frac{N}{K} * \frac{1}{M_k}, \quad k \in [0, K)$$ For each scale, the larger the IOU value in the interval, the smaller the probability

- 4. Through the uniform sampling on the IOU, the hard negative is evenly distributed on the IOU.

实验

- 1. Taking resnet-50 FPN faster r-cnn as the baseline, groupiou balance sampling improved by 0.9 AP points, proving the effectiveness of groupiou balance sampling.

Group IoU-balanced Sampling	AP	AP_S	APm	APl
	35.9	21.2	39.5	46.4
A kind of	**36.8(+0.9)**	**22.3(+1.1)**	40.3(+0.8)	46.7(+0.3)

实验

- 1. With res-50-fpn as the backbone, the lifting on small objects is larger, 1.5 AP higher than fast r-cnn, and 0.9 AP higher than fast r-cnn.

- 2. Taking res-101-fpn as the backbone, the APS on small objects is 1.7 higher than that on retinaet.

baseline	backbone	AP	APs	APm	APl
Faster R-CNN(baseline)	Res-50-FPN	36.7	21.1	39.9	48.1
Anchorfitted		**37.5(+0.9)**	**22.6(+1.5)**	40.2(+0.3)	48.7(+0.6)

baseline	backbone	AP	APs	AP_m	APl
RetinaNet(baseline)	Res-101-FPN	39.1	22.6	42.9	51.4
Anchorfitted		**40.2(+1.1)**	**24.3(+1.7)**	43.2(+0.3)	51.7(+0.3)

- Based on energy welfare function
- Energy saving routing algorithm based on WSN

Energy saving routing algorithm of sensor network based on energy welfare function

- An energy-saving routing algorithm based on energy welfare function is proposed.The threshold value is optimized when selecting the temporary cluster head, and the energy cost formula is used to determine the cluster members and the final cluster head.

- In the stage of inter cluster routing, a combination of single hop and multi hop is used to select relay nodes.
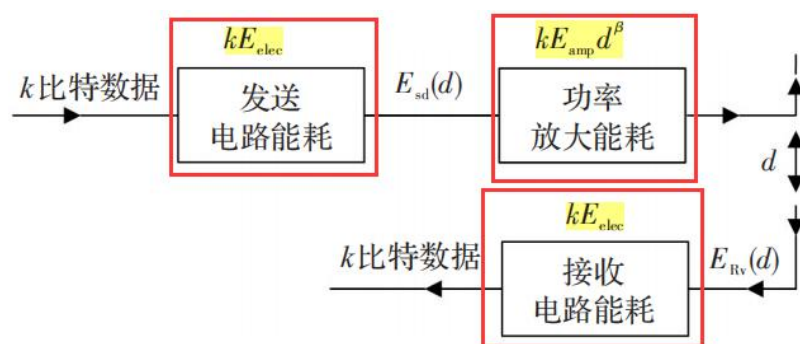
Radio energy consumption model

Single hop

Multi hop
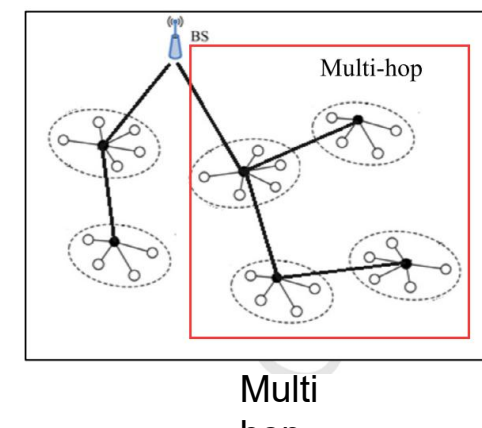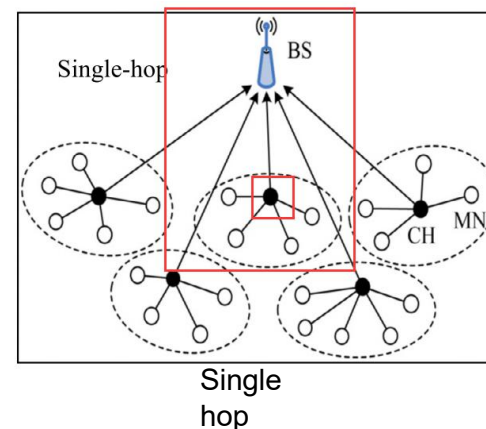
Chapter

- 文章获奖竞赛

Scientific research achievements

- **IEEE Systems Journal: the second author of a novel WSNs based on energy well function (teacher first)**

- **National innovation and entrepreneurship training program for college students: voicecare -- the first person in charge of speech rehabilitation training platform for deaf and mute children based on Artificial Intelligence**

- **National patent: core member of speech quality assessment method for deaf mute children using syllable multidimensional analysis**

- **Software copyright: the first person in charge of speech rehabilitation training system for deaf and mute children based on Artificial Intelligence**

honor

- 2017-2018:

- **National inspirational Scholarship (award rate: 2%)**
- **Special scholarship of Nanchang University (award rate: 1.5%)**
- Three good student pacesetters of Nanchang University (award rate: 2%)

- Three good students of Nanchang University (award rate: 5%)

- 2018-2019:

- **National Endeavor Fellowship**

- **Special scholarship of Nanchang University**

- Student cadres of Nanchang University

Competition Award

- Second prize of China's "Ai +" innovation and Entrepreneurship Competition (ranking first, award rate: 1%)

- National second prize of national open source software technology innovation competition for college students (ranking second, award rate: 2%)

- Second prize of national software and information technology competition of Blue Bridge Cup (ranking first, award rate: 7%)

- Third prize of China Computer Design Competition (ranking first, award rate: 7%)

- National computer technology and software professional software designer

- Apmcm Asia Pacific University Mathematical Modeling Competition international second prize (ranking first, award rate: 10%)

Chapter

- 兴趣爱好

hobby
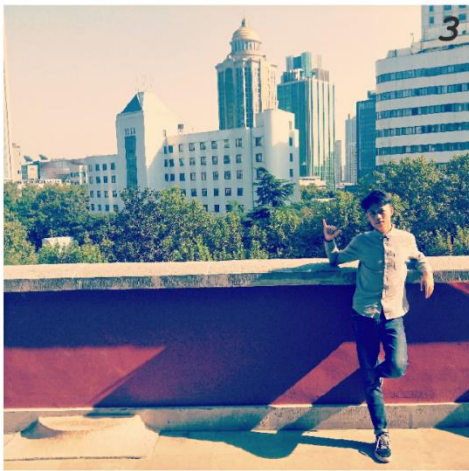
- Play basketball and keep fit every week;

- Set goals and make plans for yourself;

- I was obsessed with reading literature and doing experiments; I had the experience of sudden imagination in the middle of the night, getting up and running the next morning.

Chapter

- 未来工作计划

Future work plan

- 1. Work in machine learning and data mining.

- 2. I know that my ability is still lacking, but my heart of learning is urgent and powerful!

- 3. NJU is my ideal place for further study!I hope I can get the teacher's guidance, learn more and publish a really valuable article during my graduate study!

Graduate stage arrangement

- 1. Learning: I will seriously study professional courses and improve my knowledge structure.

- 2. English: will not relax English learning, professional literature reading, foreign journal reading.

- 3. Scientific research: 1) first of all, we should learn to write standard papers, communicate with teachers and senior brothers and sisters, learn from them, and help teachers to complete scientific research tasks.2) Usually read more literature, work harder in the field of machine learning that you are interested in, actively participate in the research projects of the tutor, try to put forward measures, and strive to publish real valuable articles in top conferences or journals.

Thank you

q & a