



机器学习

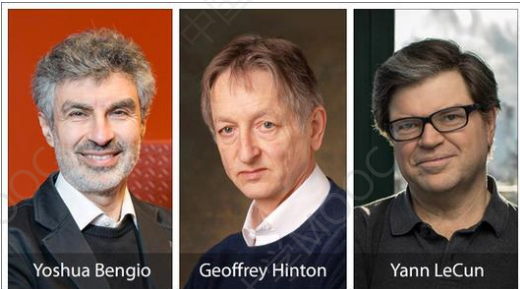
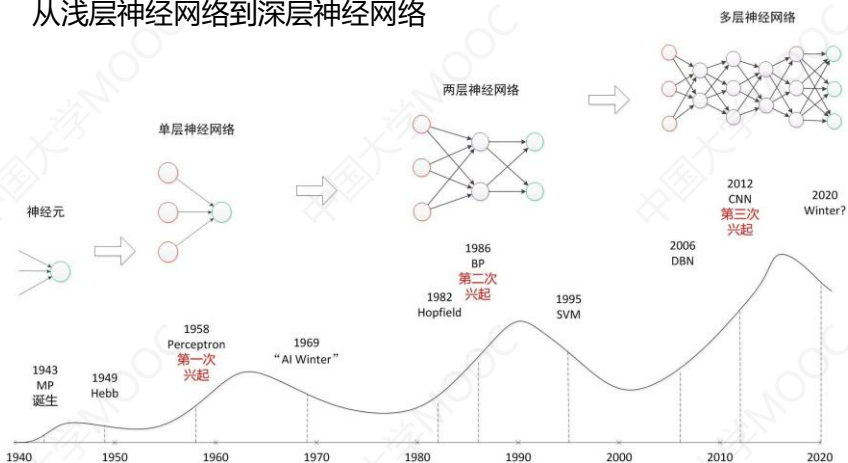
深度学习在人工智能中的应用

复旦大学 赵卫东

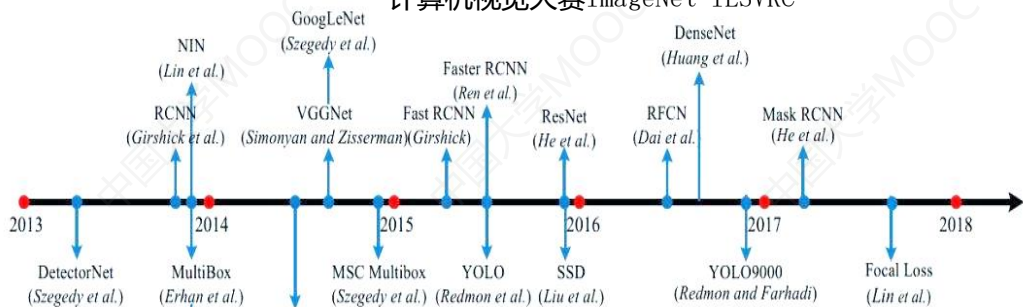
wzdhao@fudan.edu.cn

深度学习发展

从浅层神经网络到深层神经网络



计算机视觉大赛ImageNet ILSVRC



- Convolutional Neural Network
- 图像领域应用非常成功，人脸识别超99.5%
- 全连接 → 局部连接，权值共享



特征数量
卷积核大小

一种典型卷积神经网络结构是LeNet-5，用来识别数字的卷积神经网络。结构图如下（来自Yann LeCun的论文）

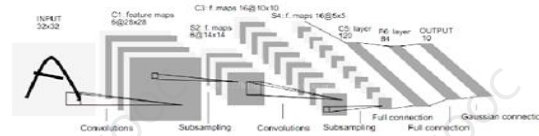


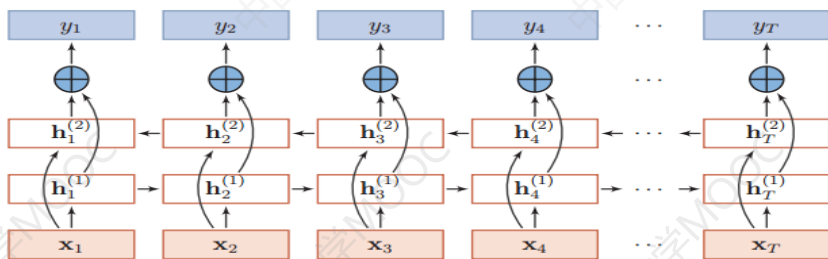
Fig. 9. Architecture of LeNet-5, a Convolutional Neural Network, here for digit recognition. Each plane is a feature map (in a set of n where n varies) represented by the identical.

- 图像识别、OCR、语音识别

深度学习发展



- 语音识别、NLP
- Bidirectional RNNs、Deep RNNs、GRU RNN



LSTM - 长短期记忆网络

- Long Short-Term Memory Neural Network
- RNN时间上传递的神经网络，可能“梯度消失”
- 通过门的开关实现时间上记忆功能
- 遗忘门
- 输入门
- 输出门



RNN的展开结构



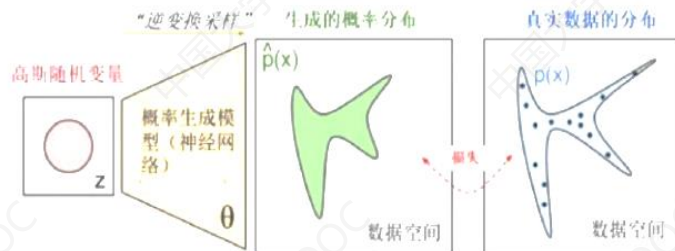
LSTM的展开结构

- Seq2Seq机器翻译
- Attention Model对话



GAN-生成性对抗生成网络

- Generative Adversarial Networks
- 它有两个模型：一个生成器，一个判别器
- 没有损失函数，优化过程是“二元极小极大博”



MakeGirls.moe Home About Items Tools Official Blog Github



Generate

Like

Share on Twitter

Options

Hair Color

White

Blush

Off

Random

On

Hair

Off

Random

On

Nose

Random

Fixed

Hair Style

Long Hair

Smile

Off

Random

On

Robber

Off

Random

On

Current Noise

import

export

Eye Color

Blue

Open Mouth

Off

Random

On

Clashes

Off

Random

On

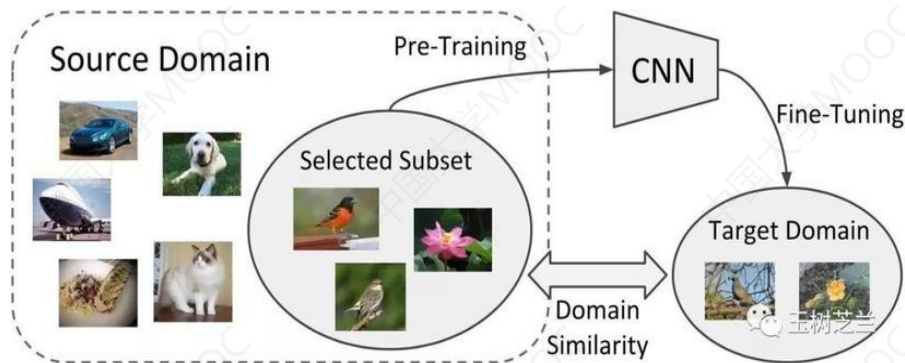
Noise Import/Export

import

export



迁移学习



深度强化学习



深度学习算法地图

SIGAI深度学习算法地图



关注SIGAI公众号
阅读原创技术文章
观看最新论文讲解

感知器

logistic回归

MLP



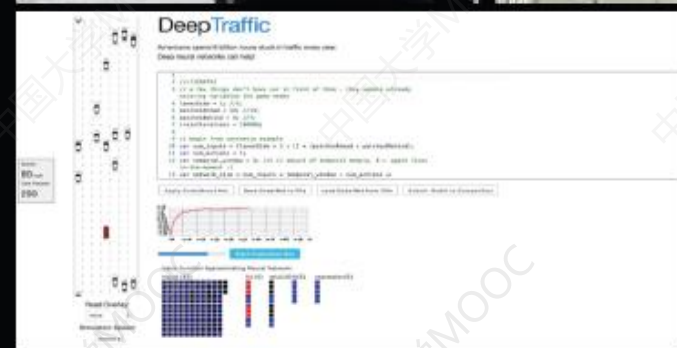
人工智能应用(Computer Vision)



人工智能应用(Autonomous Vehicle)



| | Miles | Diseng | Miles/D | Road type |
|--------------|---------|--------|---------|--------------------------|
| BMW | 638 | 1 | 638.0 | Likely Highway |
| Bosch | 983 | 1442 | 0.7 | Interstates/Freeways |
| GM/Cruise | 9 776 | 181 | 54.0 | Urban |
| Delphi | 3 125 | 178 | 17.6 | Highway/Urban/Suburban |
| Ford | 590 | 3 | 196.7 | Highway |
| Google/Waymo | 635 868 | 124 | 5128.0 | Mostly suburban |
| Mercedes | 673 | 336 | 2.0 | Urban |
| Nissan | 4 099 | 28 | 146.4 | Highway/Urban/Suburban |
| Tesla | 550 | 182 | 3.0 | Highway/Suburban/Unknown |



ALVINN, Dean Pomerleau, 1989, CMU

人工智能应用(Recommendation System)



人工智能应用(Natural Language Processing)



Hi, I'm Cortana.



Alexa

"Hey 'Puter"

Hello, sir. I've heated up your lobster thermidor in the microwave.

"Hey 'Puter"

Welcome home, sir. I have your rom coms queued up, sorted by decade.

"Hey 'Puter"

tap to edit

Welcome home, sir. FYI, Robin is trying on costumes in the Batcave again. He's doing some pirouettes in Batryshnikov.



讯飞语音云3.0

IPIN

自然人机交互



Google Now



Apple Siri



Amazon Alexa



KW Xiao Cui



Question Answering (QA) systems in industries and academics

- 人机交互方式将更加自然，对话式交互取代关键词搜索成为主流交互方式
- 一切皆可问答：图片问答、新闻问答、百科问答

深层关系发现 / 推理



Why baoqiang select Qizhun Zhang as his lawyer?

Why A invests B?

隐式关系发现、深层关系推理将成为智能的主要体现之一

人工智能应用(Assistant or Killer?)

Story #1

► Denny's Corporation on Monday reported first-quarter profit of 8.5 million dollars. The Spartanburg, South Carolina-based company said it had profit of 10 cents per share. The results beat Wall Street expectations. The average estimate of four analysts surveyed by Zacks Investment Research was for earnings of 9 cents per share. The restaurant operator posted revenue of \$120.2 million in the period, also beating Street forecasts. Three analysts surveyed by Zacks expected \$117.1 million. Denny's shares have risen nearly 6 percent since the beginning of the year. In the final minutes of trading on Monday, shares hit \$10.90, a climb of 61 percent in the last 12 months.

Story #2

► Denny's Corporation notched a grand slam of its own in the first quarter, earning a better-than-expected ten cents a share, as restaurant sales jumped by more than 7-percent. Operating revenues topped \$120 million. Adjusted net income jumped 36 percent to \$8.7 million. Denny's is one of the nation's largest full-service restaurant chains. The growth in sales suggests consumers are opening their pocketbooks for pancakes, eggs, and hash browns. Earnings were also helped by lower costs for raw materials. Denny's results were also helped by the re-opening of the high-volume location inside the Las Vegas Casino Royale restaurant. After sales grew faster than expected in the first three months of the year, managers raised their sales forecast for the remainder of 2015.



VISABOT



Deloitte.

Machine Intelligence

人工智能应用(Finance)

MEDALLION APP
TRADING SYSTEM

Make **\$35,000** every week from home
with James Simons's **RISK FREE App!**



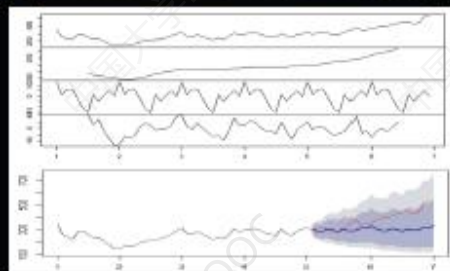
James Simons



个性化保险政策



信用卡反欺诈



Google股价预测

| |
|-----------------------------------------------------------------------|
| Oct. 3, 2008 — Rachel Getting Married opens: BRKA up .44% |
| Jan. 5, 2009 — Bride Wars opens: BRKA up 2.61% |
| Feb. 8, 2010 — Valentine's Day opens: BRKA up 1.01% |
| March 5, 2010 — Alice in Wonderland opens: BRKA up .74% |
| Nov. 24, 2010 — Love and Other Drugs opens: BRKA up 1.62% |
| Nov. 29, 2010 — Anne announced as co-host of the Oscars: BRKA up .25% |

Anne Hathaway / 机器交易

人工智能应用(Art): When Program becomes Programmer



Leon A. Gatys, Alexander S. Ecker, Matthias Bethge



秋雁

一声秋雁连天远，
万里归帆隔水遥。
惆怅旧游零落处，
白头萧瑟满江桥。

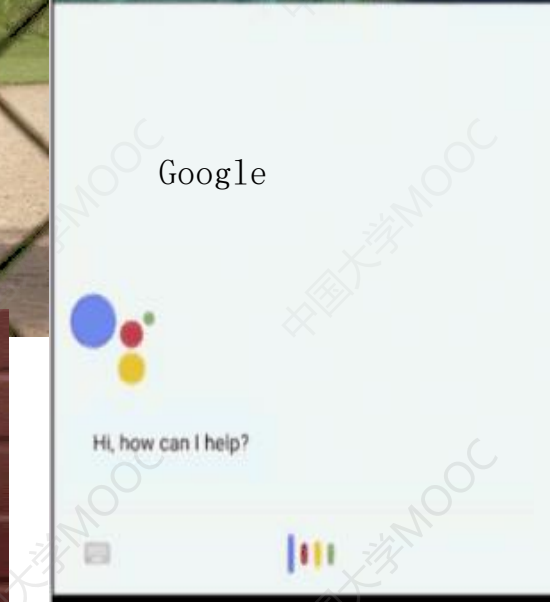
Xiaoyuan Yi & Ruoyu Li & Mao

人工智能应用(Robot)

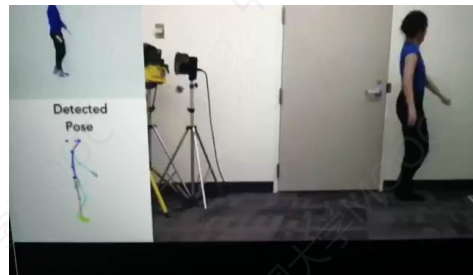


斯坦福无人直升机



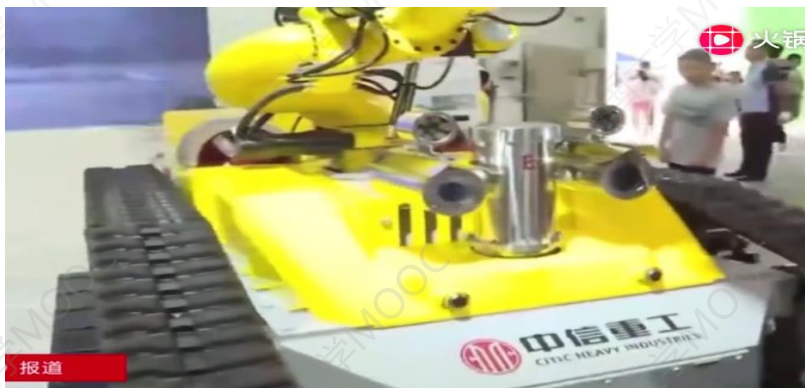


黑白照片上色



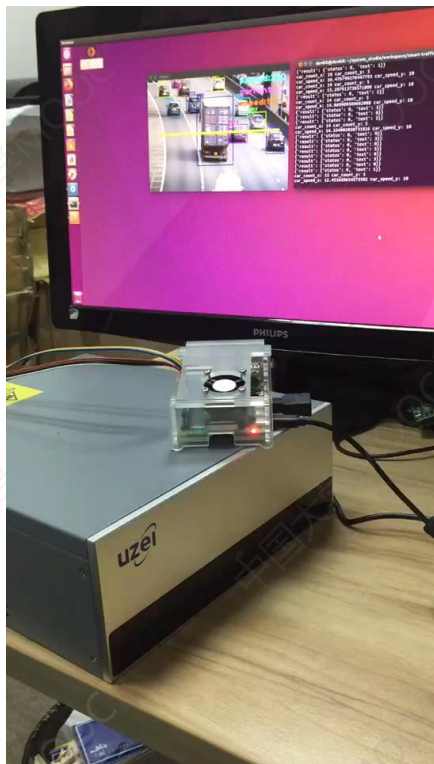
生成对抗网络

工业机器人

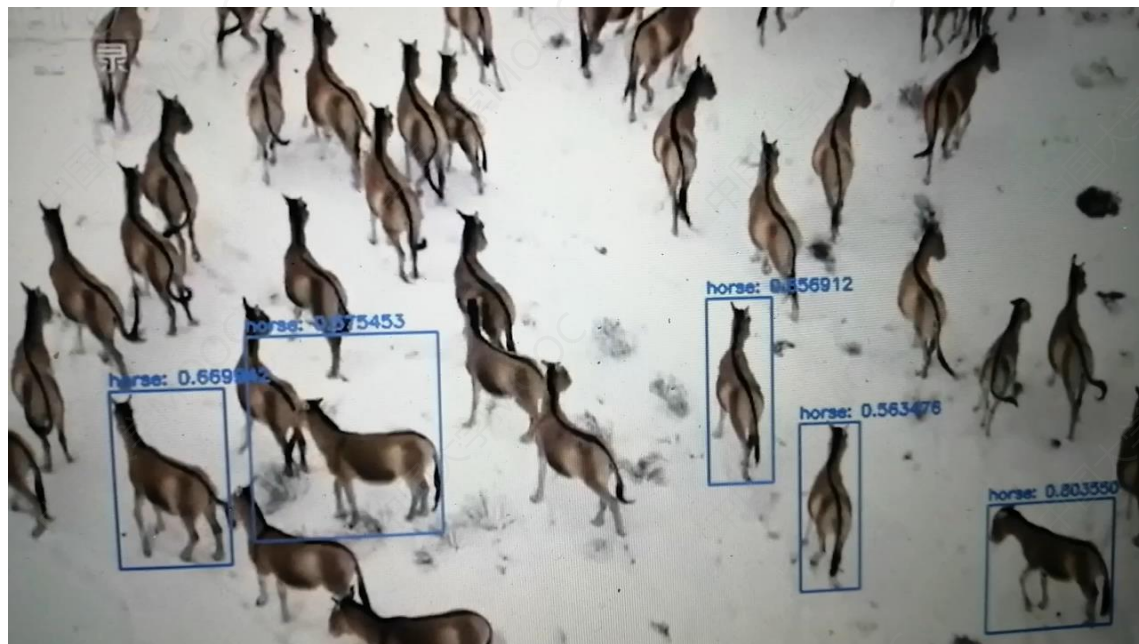


机械化换人、自动化减人、智能化无人

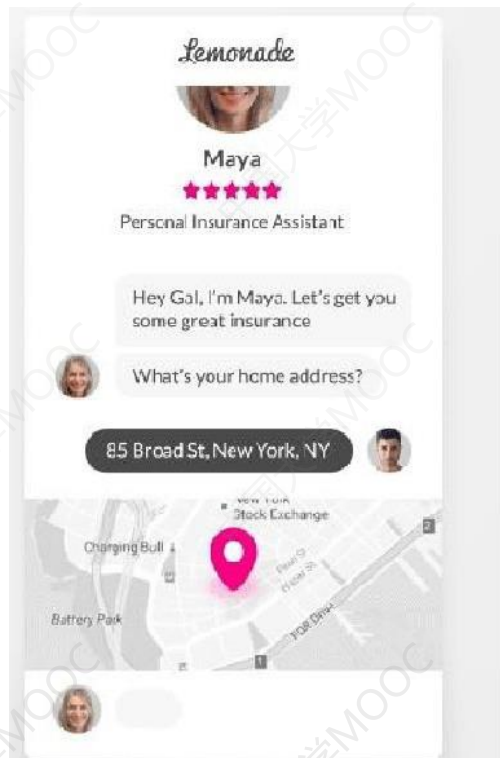
目标检测



智能交通灯控制



卖保险机器人



美国卖保险的机器人 — Lemonade

红杉资本有史以来最大规模种子轮融资，金额高达1300万美元，相比之下，Uber只有20万美元，Airbnb也不过60万美元。红杉资本曾经培植出苹果、谷歌、雅虎、甲骨文、领英等众多顶尖创新型企业

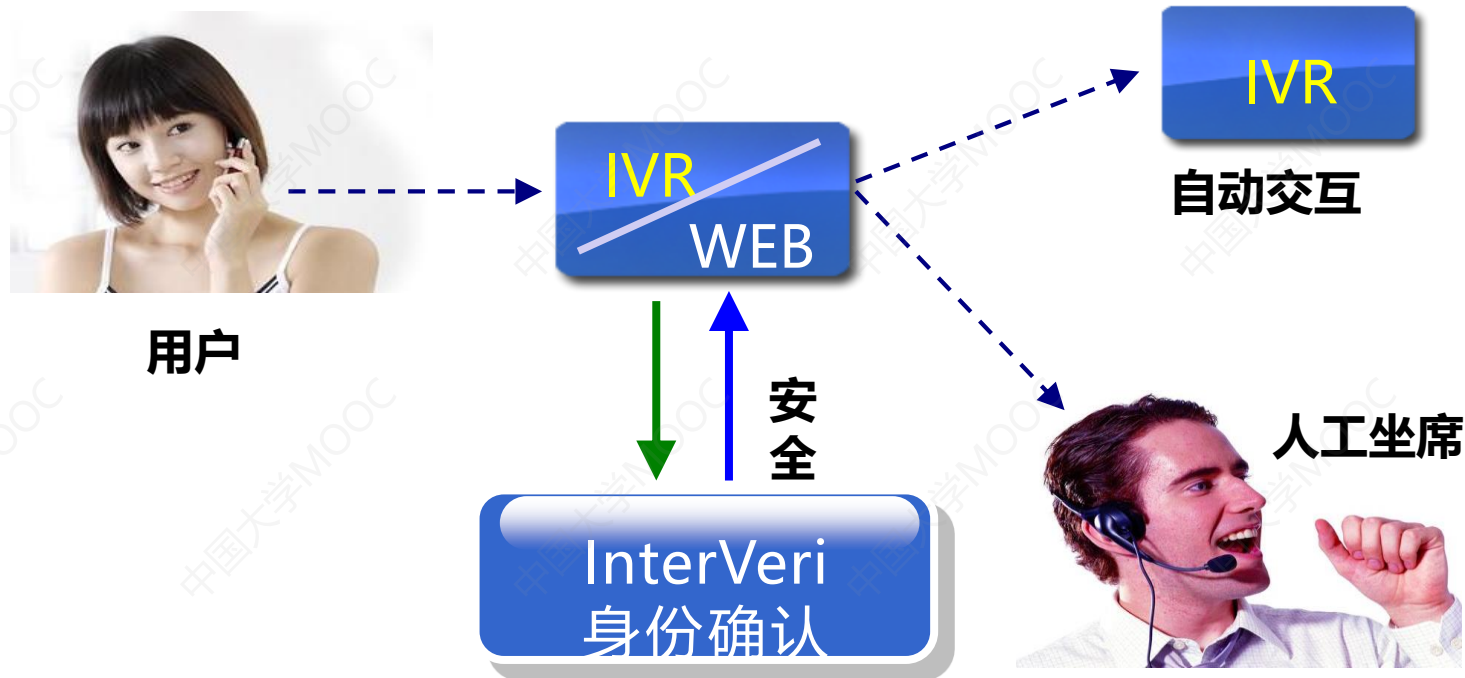
- ▶ 机器人进行承保&理赔
- ▶ 用户问答5个问题就可以完成参保

大厨机器人

FUNC



声纹识别文本无关确认



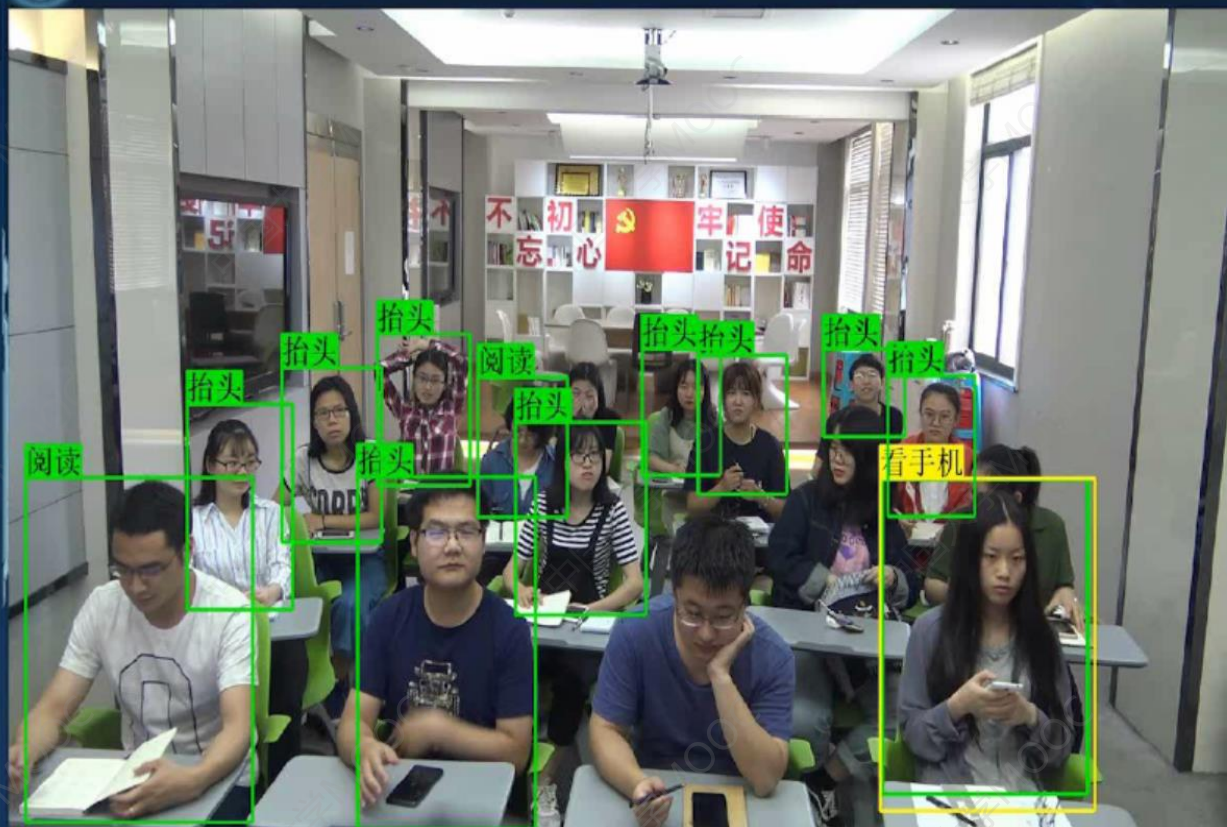
声纹验证时有效语音长度8-60s之间，最低可支持15s有效语音，以上数据可以根据需要进行配置，与语音无关，内容和注册也无关

100%
抬头10人5%
玩手机1人40%
读写2人0%
睡觉0人

深瞳系统

周四 16:48

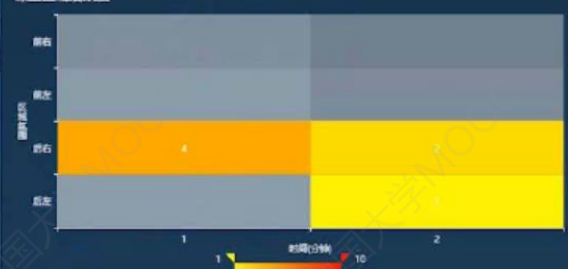
2018/06/14



课堂专注度



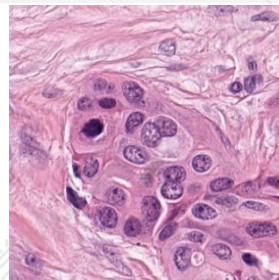
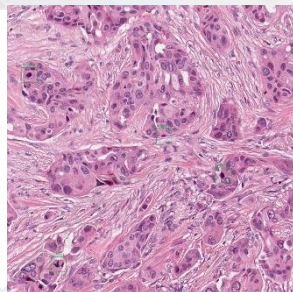
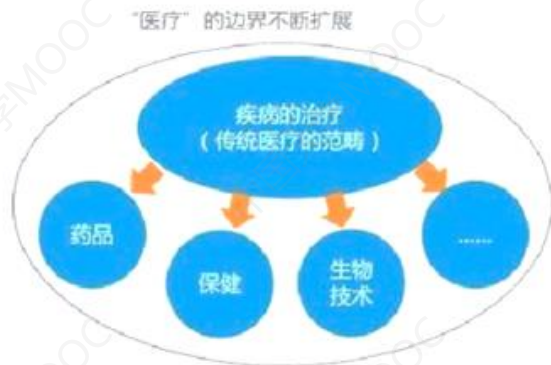
课堂区域活跃度



课堂情绪水平



人工智能与医疗



癌细胞识别 (肿瘤扩散评估)

人工智能与农业



龙井茶自动化采摘

提高茶叶嫩芽分割的准确率



(a1) 原始图像



(a2) Bud-SegNet 分割结果



(a3) 单嫩芽区域判断结果



(a4) 嫩芽区域信息描述结果



(b1) 原始图像



(b2) Bud-SegNet 分割结果

