

Deep Learning



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AUT, New Zealand**



AUT Briefings

TOP
 1%
UNIVERSITIES
WORLDWIDE

#1 IN NEW ZEALAND
FOR
GLOBAL
RESEARCH
IMPACT

#1 IN NEW ZEALAND
FOR
INTERNATIONAL
OUTLOOK



TOP 40
WORLDWIDE
Young University

 3+3
3 campuses & 3 specialist facilities



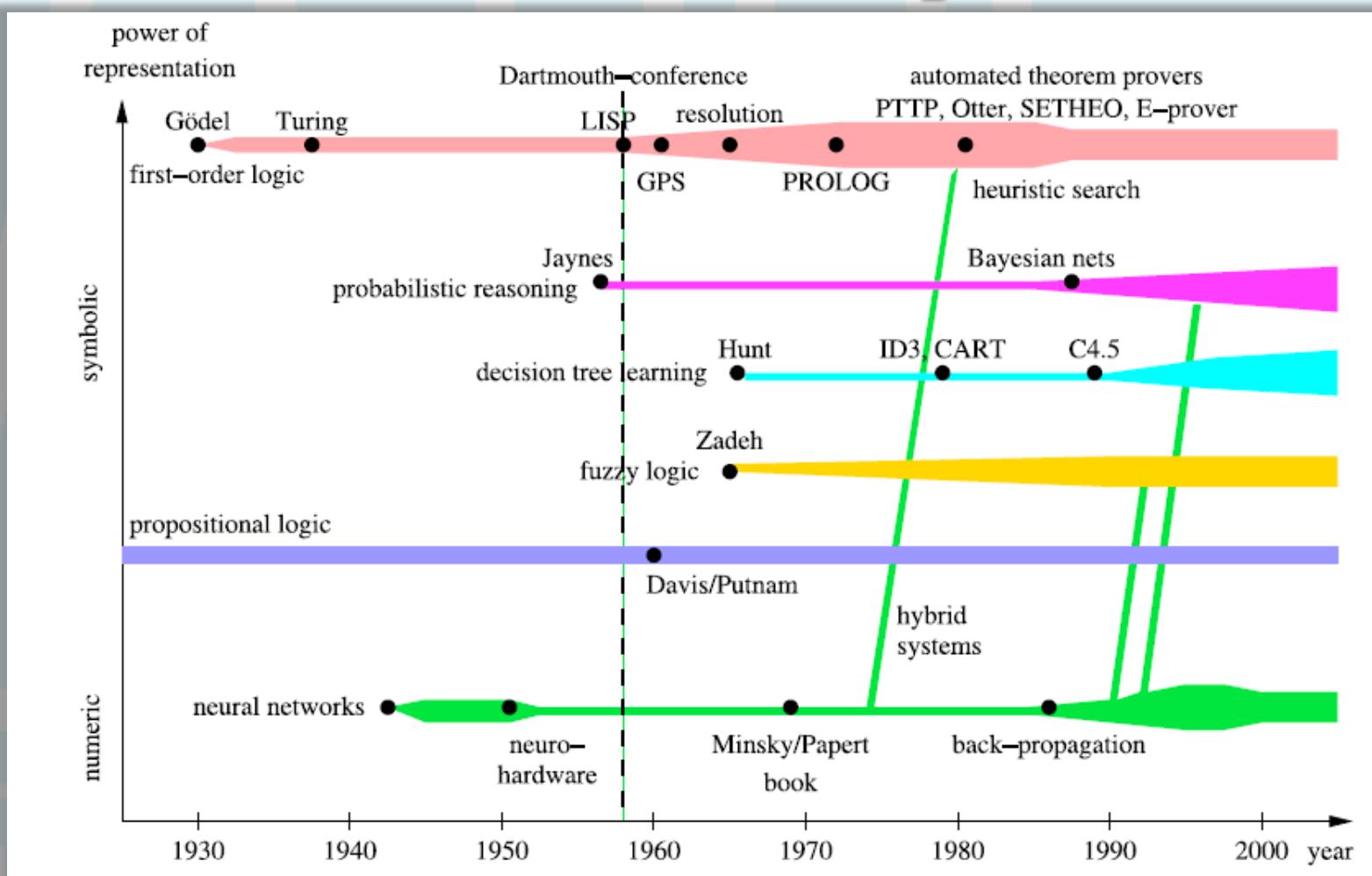
CHOOSE FROM OVER
250
COURSES OF STUDY

 #23
WORLDWIDE
for social impact

90%

9 out of 10 students
would recommend AUT
as a great place to study

AI Roadmap



Deep Learning

- 2023: GPT-4, YOLOv8
- 2022: ChatGPT (GPT-3.5)
- 2021 Vision Transformer (ViT)
- **2019: ACM Turing Award**
- 2018: GPT
- 2017: YOLO9000/YOLOv2, Transformer
- 2016: YOLO (You Only Look Once)
- 2015: SSD (Single Shot MultiBox Detector)
- 2015: Fast / Faster R-CNN
- 2014: GAN (Generative Adversarial Networks)
- 2013: R-CNN (Region-Based CNN)
- 2012: AlexNet (ImageNet)
- 2009: Graph Neural Network (GNN)
- 2006: Deep Belief Networks (DBN)
- 2001: Random Forests
- 1995: Convolutional Neural Networks (CNN)



Deep Learning

- CNN, Fast, Faster R-CNN, YOLO, SSD
- Capsule Network
- RNN (LSTM and GRU, etc.), Transformers, GPT
- Reinforcement Learning
- Manifold Learning and Graph Neural Network (GNN)
- Contrastive Learning (GAN, Siamese Network)
- Deep Random Forest and Decision Tree
- SqueezeNet and ResNets
- Transfer Learning and Ensemble Learning

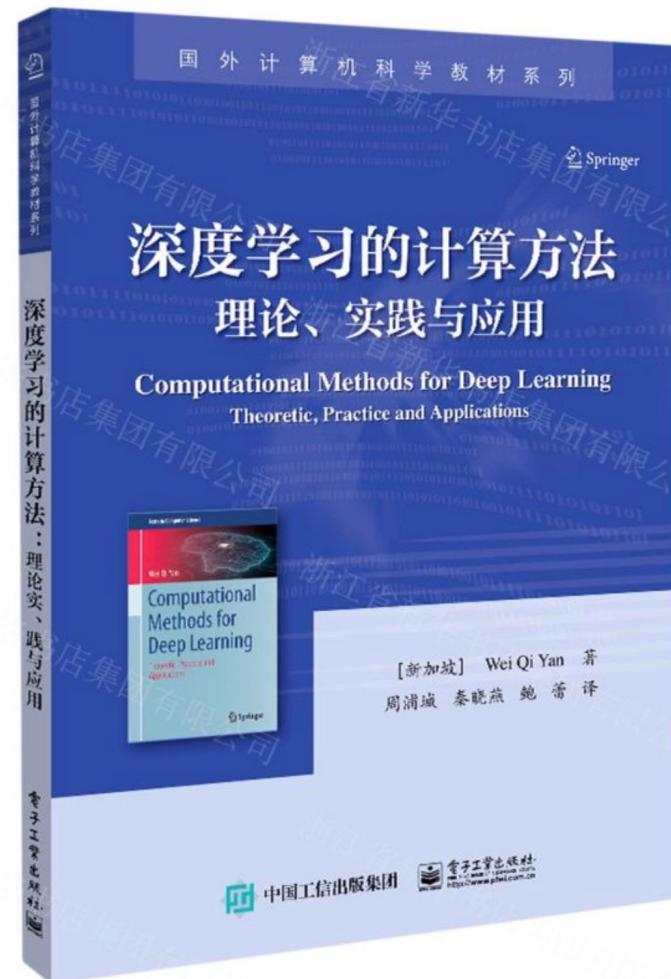
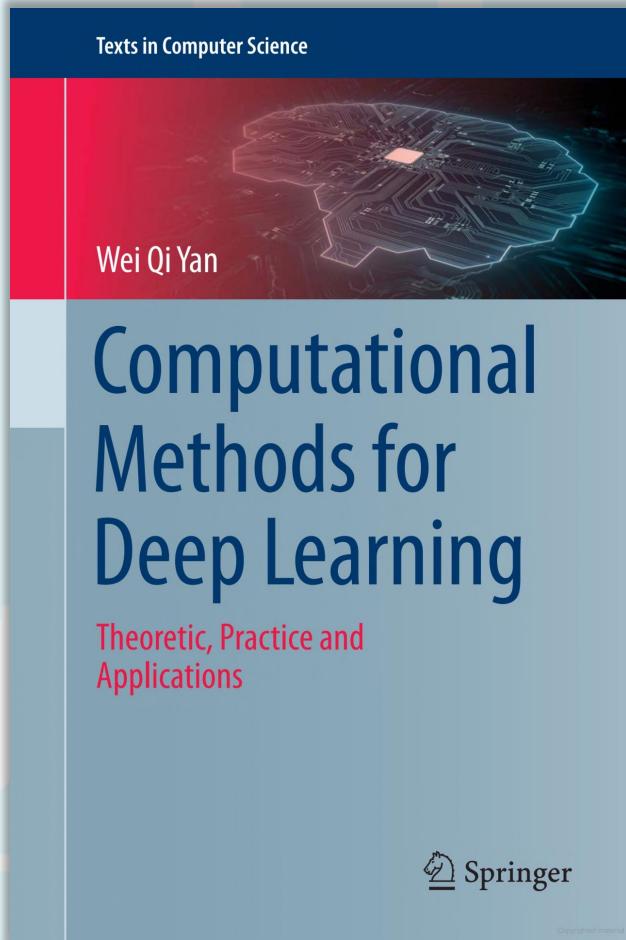


Deep Learning Trends

- Hardware for deep learning beyond GPU
- Neural networks on mobile and low-power devices
- Large-scale distributed training (e.g., cloud, etc.)
- Less supervision and weak supervision
- Self-supervised learning
- Learning predictive and graphical models
- Dynamic and data-dependent networks
- Deep learning with complex data structure
- Optimization and regularization
- Network structure analysis



Deep Learning



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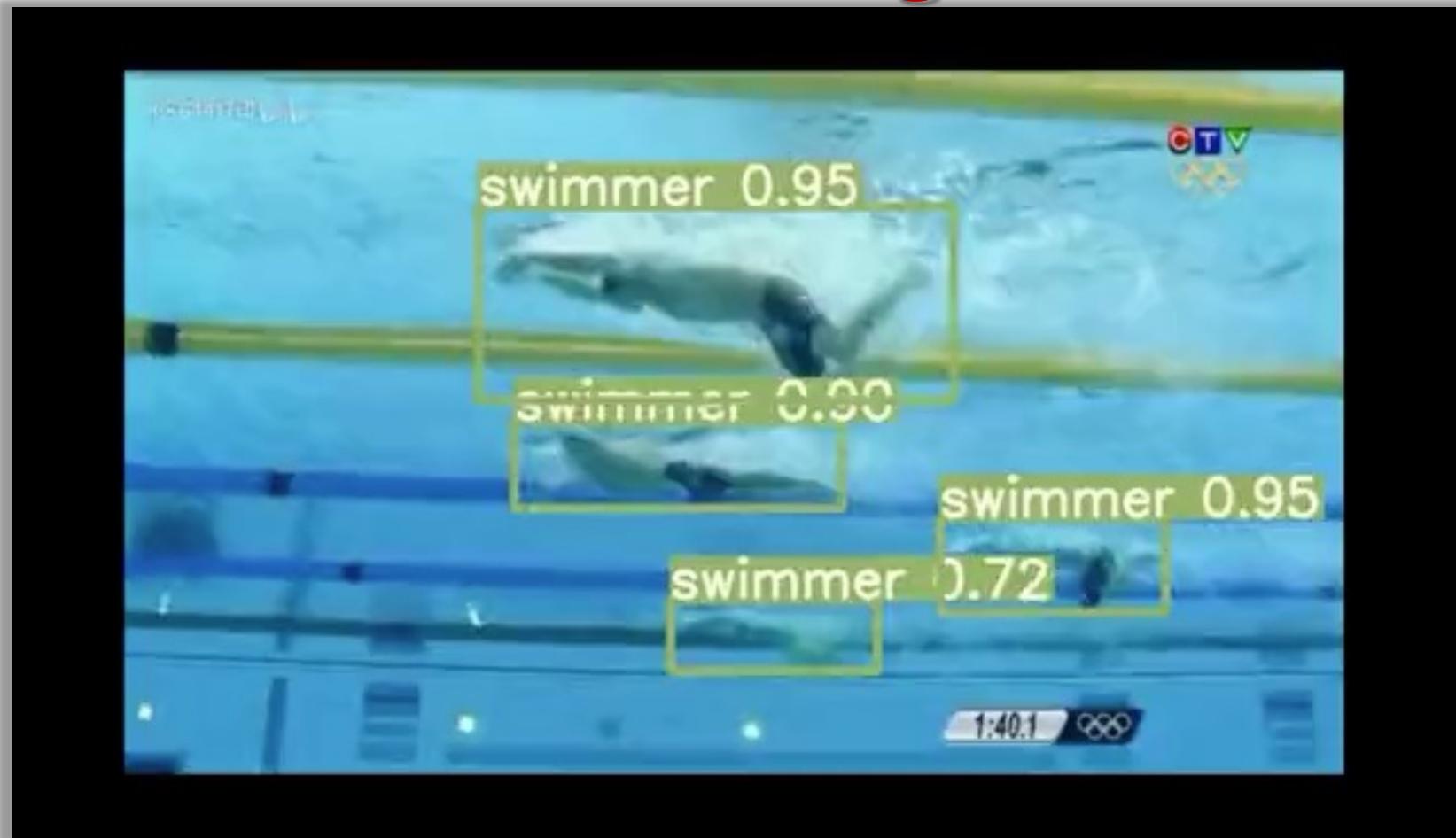
Gait Recognition



C. Liu, et al. 2019

Deep Learning

Swimmer Recognition



X. Cao, et al, 2021

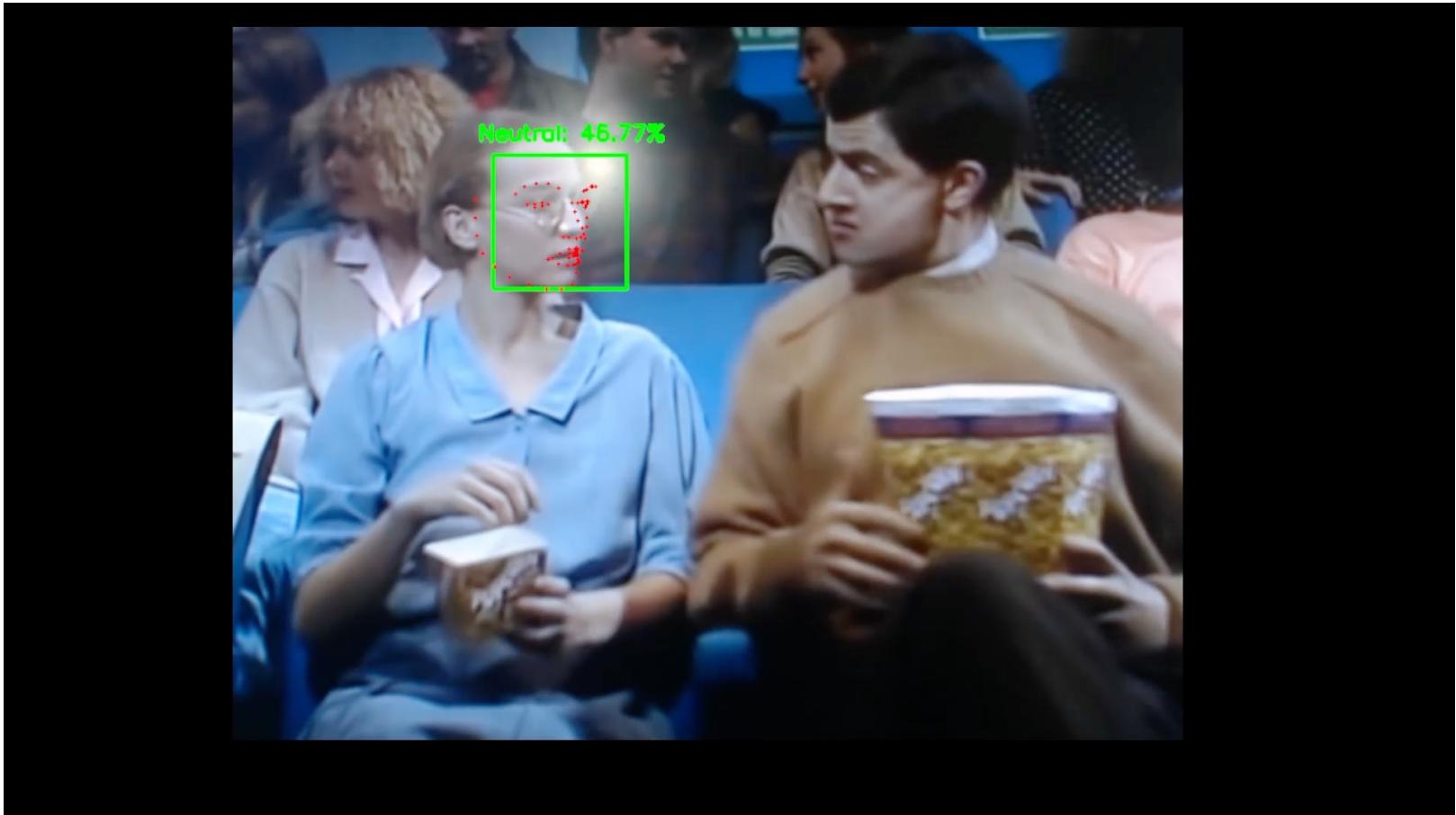
Swimmer Recognition



X. Cao, et al, 2021

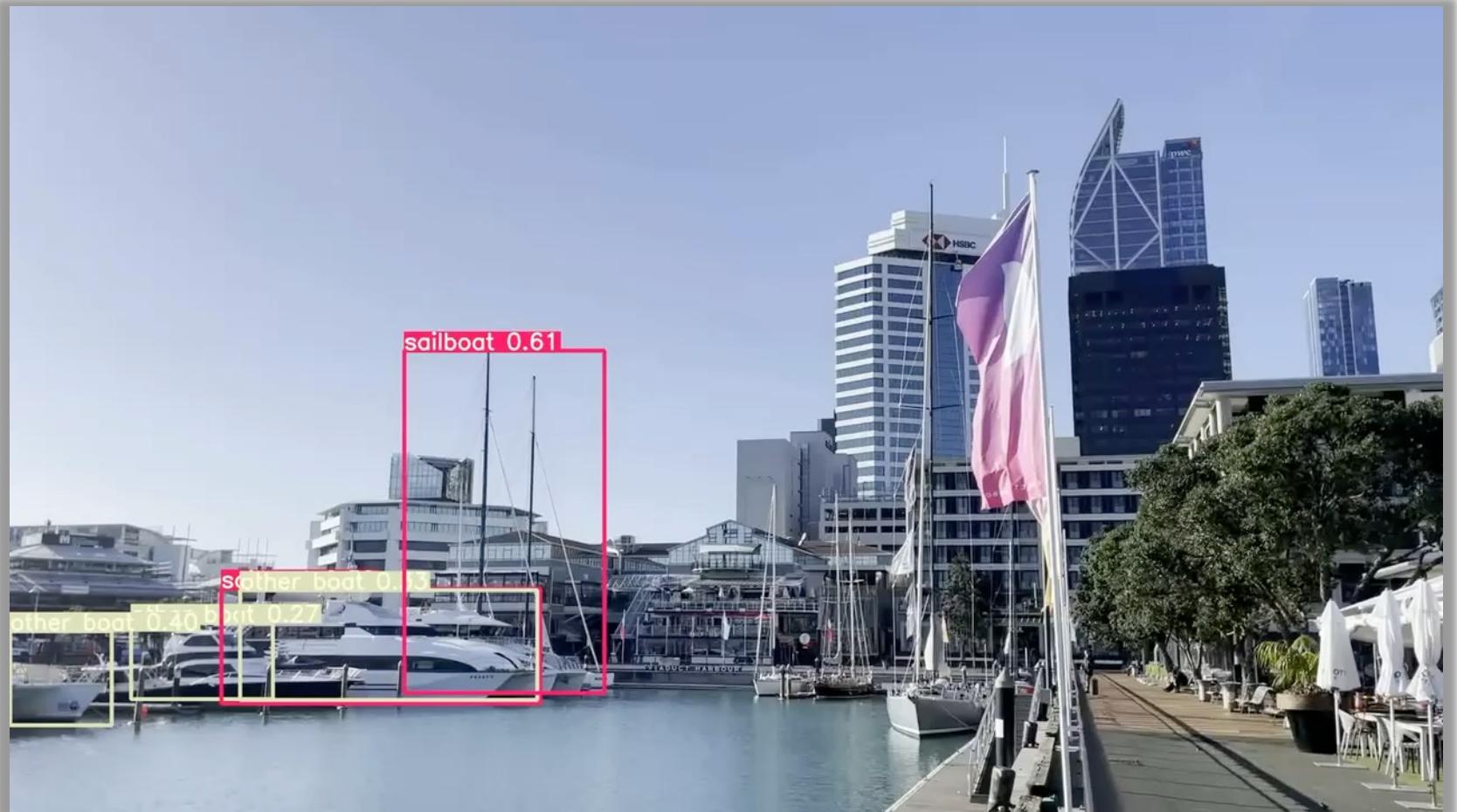
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Human Expression of Emotion Detection



R. Alexandre, 2022

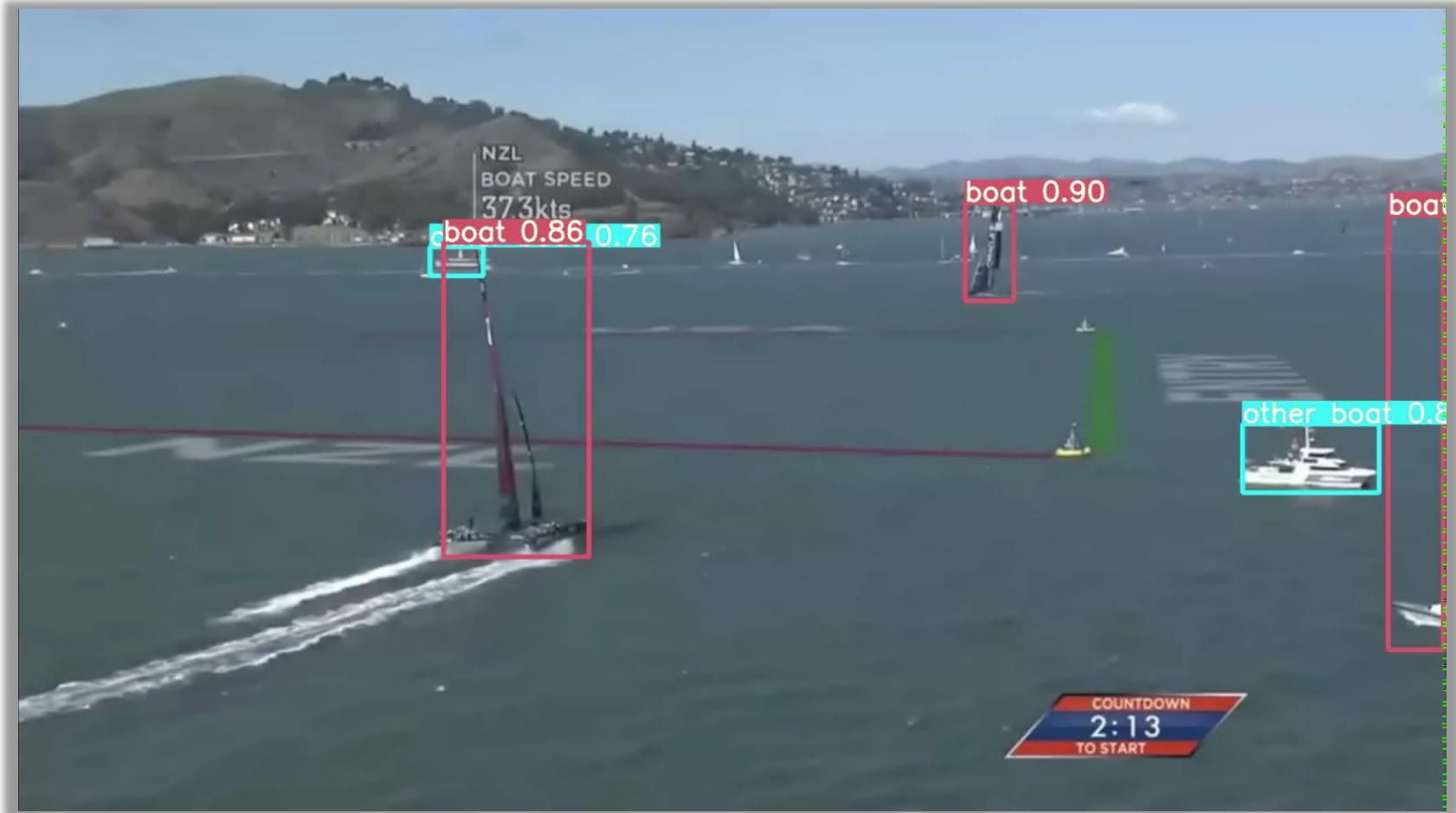
Sailboat Recognition



Z. Luo, et al, 2021

Deep Learning

Sailboat Recognition



Z. Luo, et al, 2021

Deep Learning

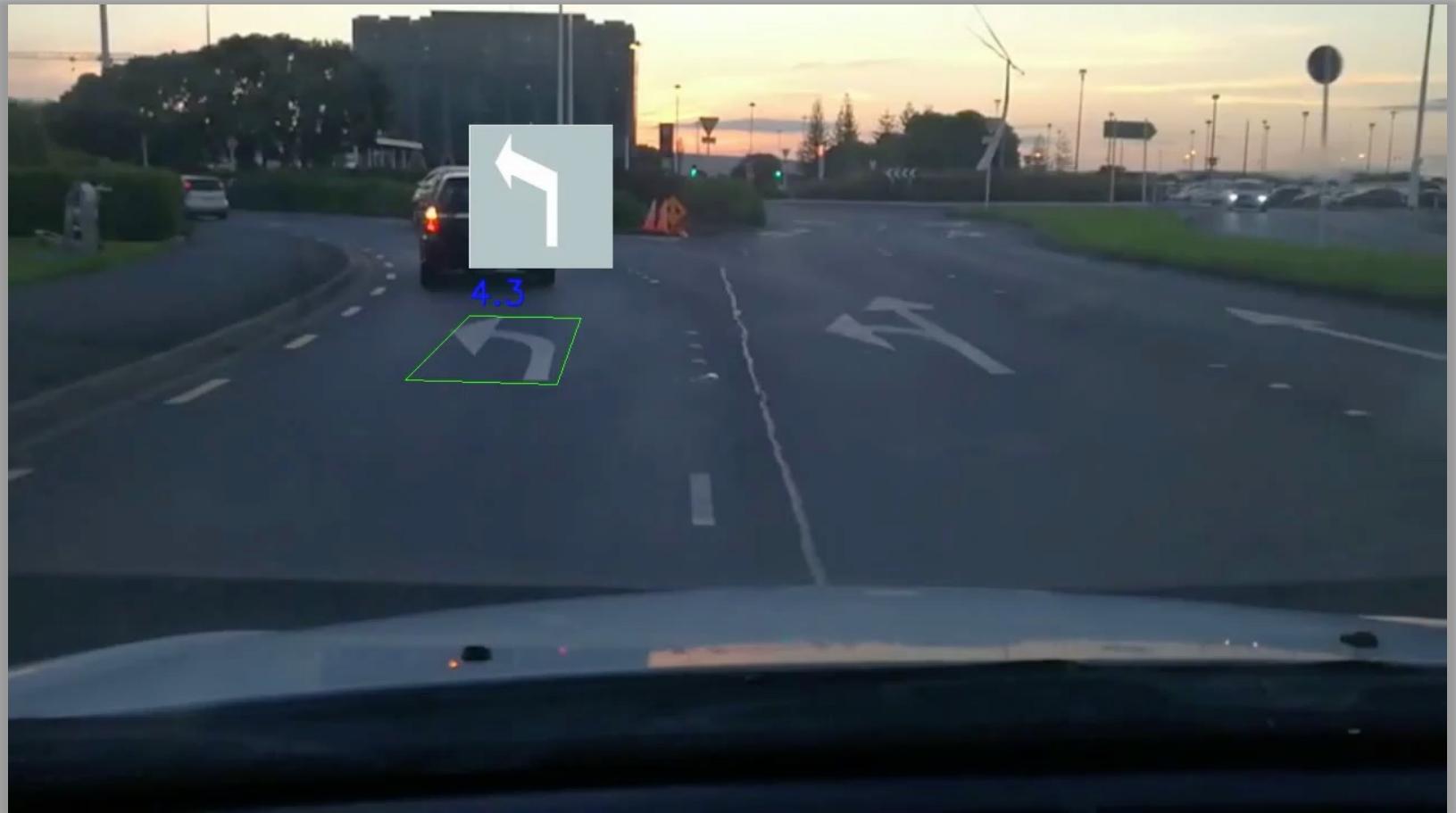
Kayak Recognition



Z. Luo, et al, 2021

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Traffic Sign Recognition



L. Ding, et al, 2018

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Blind Spot Detection

Left Blind Spot: No car



Right Blind Spot: Some cars!



Front Blind Spot: No car



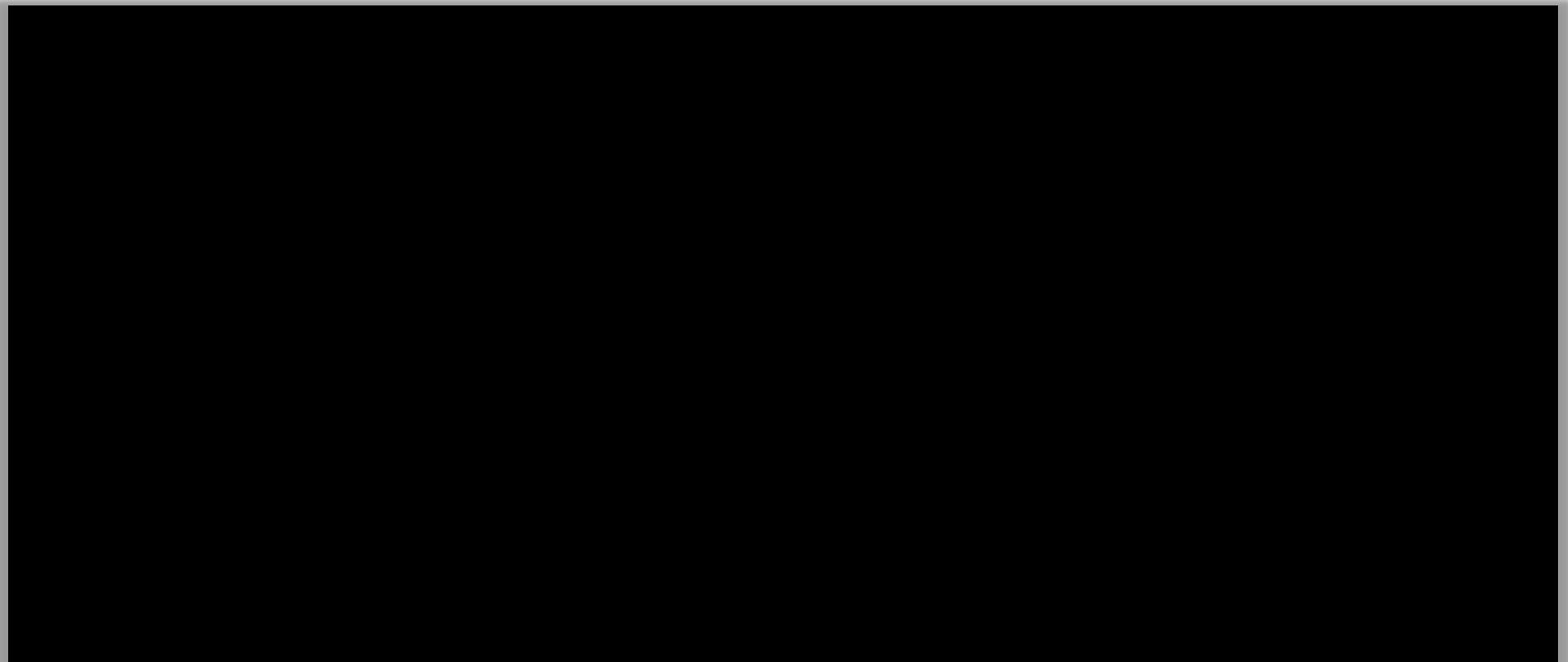
Behind Blind Spot: No car



Y. Shen, et al, 2018

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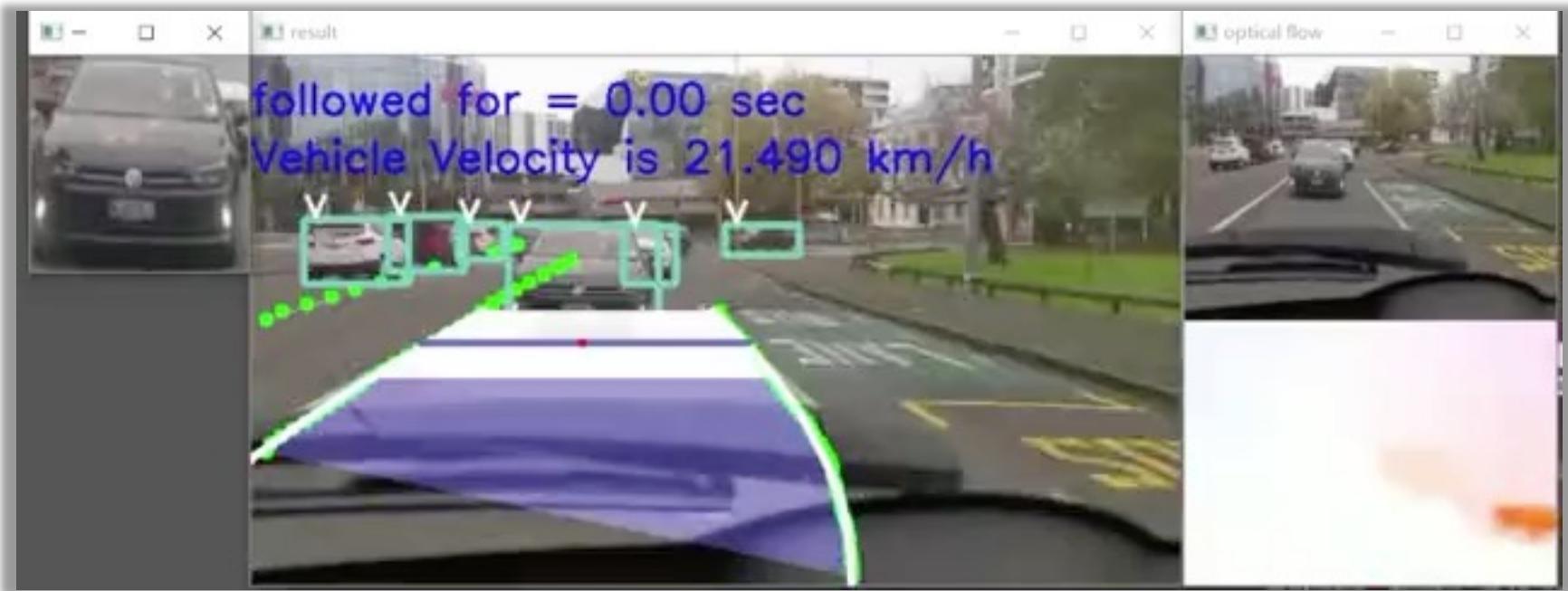
Vehicle Speed Control



M. Mi, et al, 2021

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Vehicle Speed Control



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Flame Recognition



C. Xin, et al, 2018

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Flame Detection



D. Shen, et al, 2017

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Currency Recognition



Q. Zhang, et al. 2018

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Currency Serial Number Recognition



X. Ma, et al. 2020

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Transparent Logo Recognition



D. Tong, et al. 2021

Deep Learning

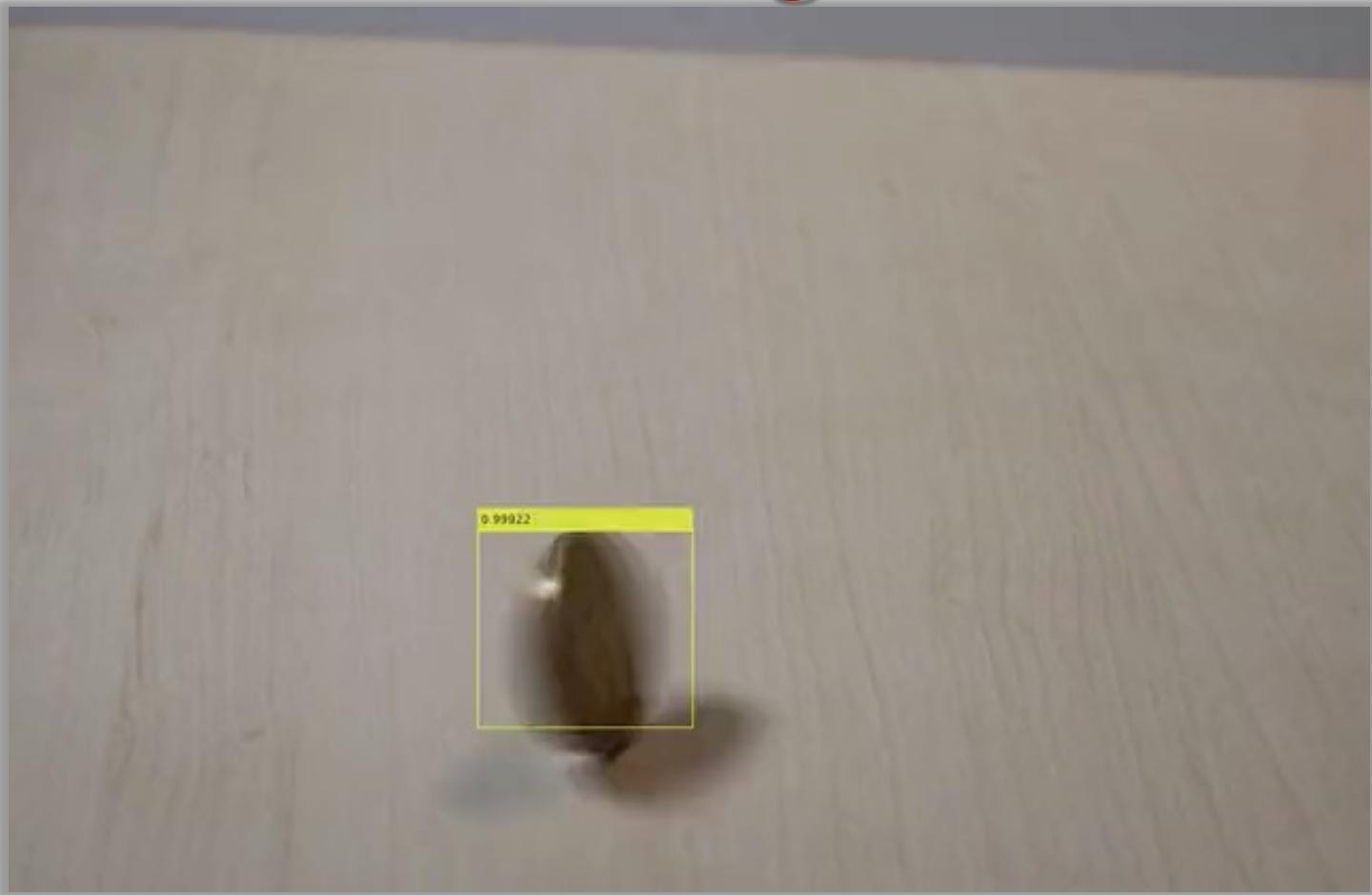
Coin Recognition



Y. Xiang, et al. 2019

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Coin Recognition



Y. Xiang, et al. 2020

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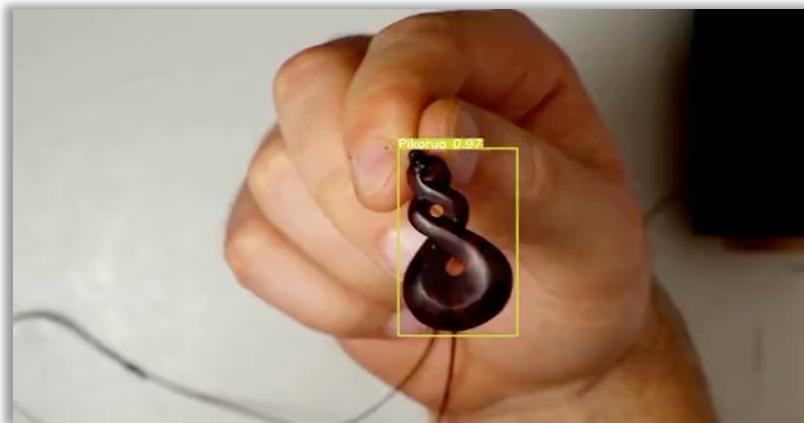
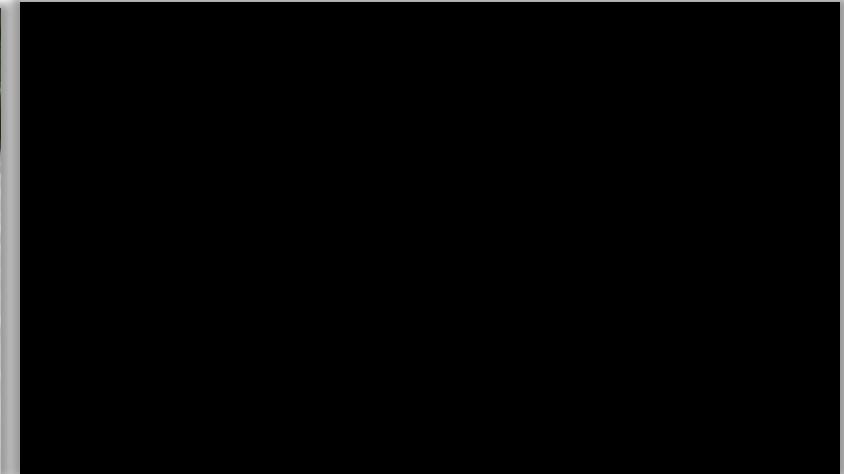
Coin Recognition



Y. Xiang, et al. 2020

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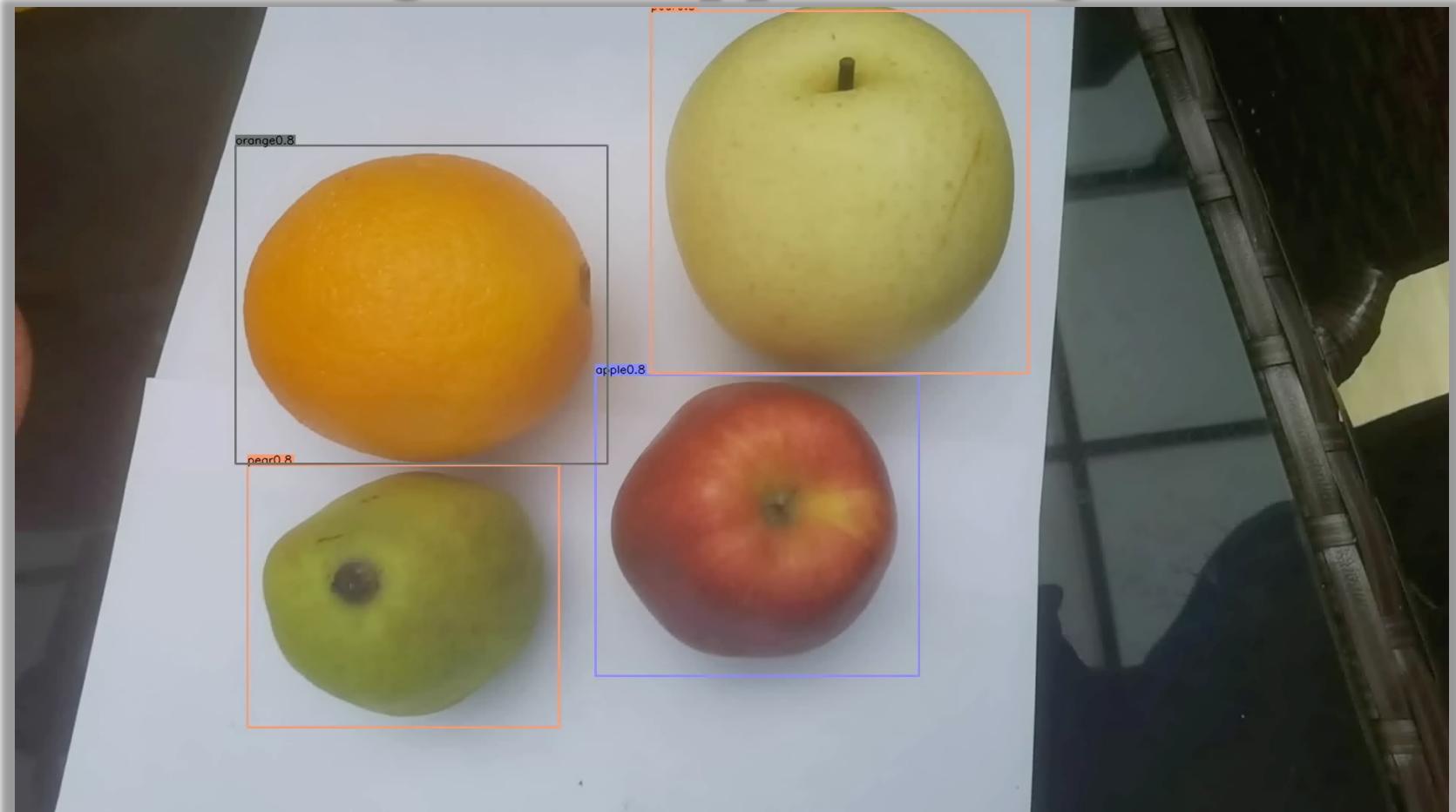
Gifts



C. Li, et al. 2021

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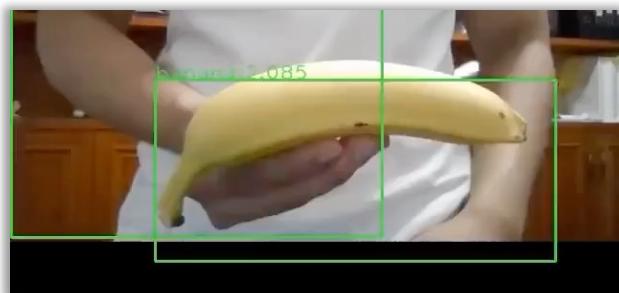
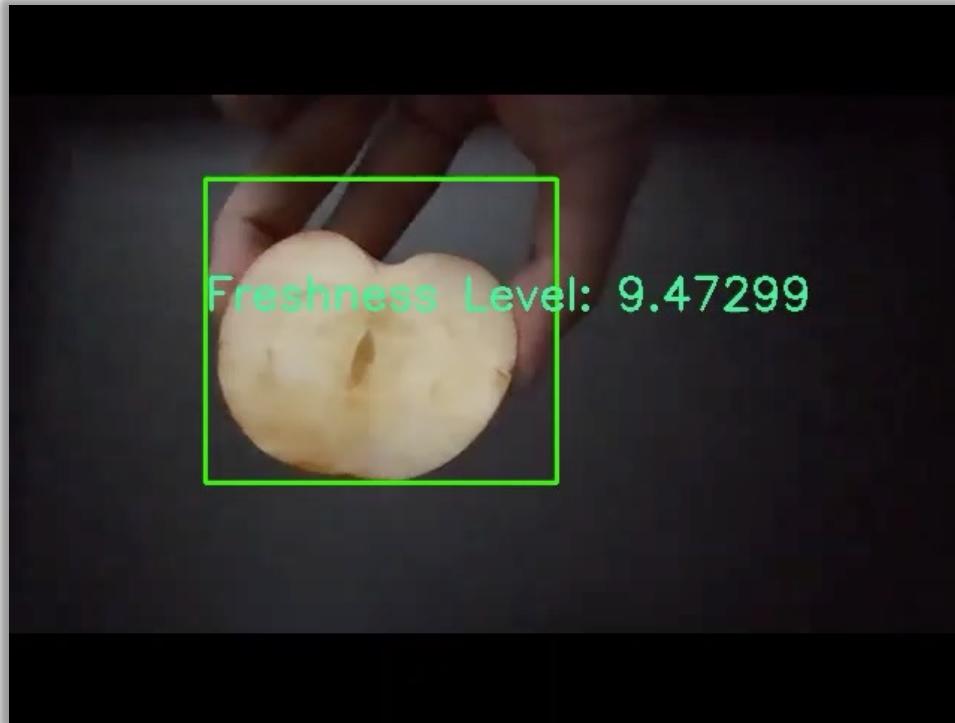
Orange and Apple Recognition



K. Zhao, 2020

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Fruit Freshness and Ripeness



Y. Fu, 2019



B. Xiao, 2019

Deep Learning

Kiwifruit Detection



Y. Xia, 2022

Deep Learning

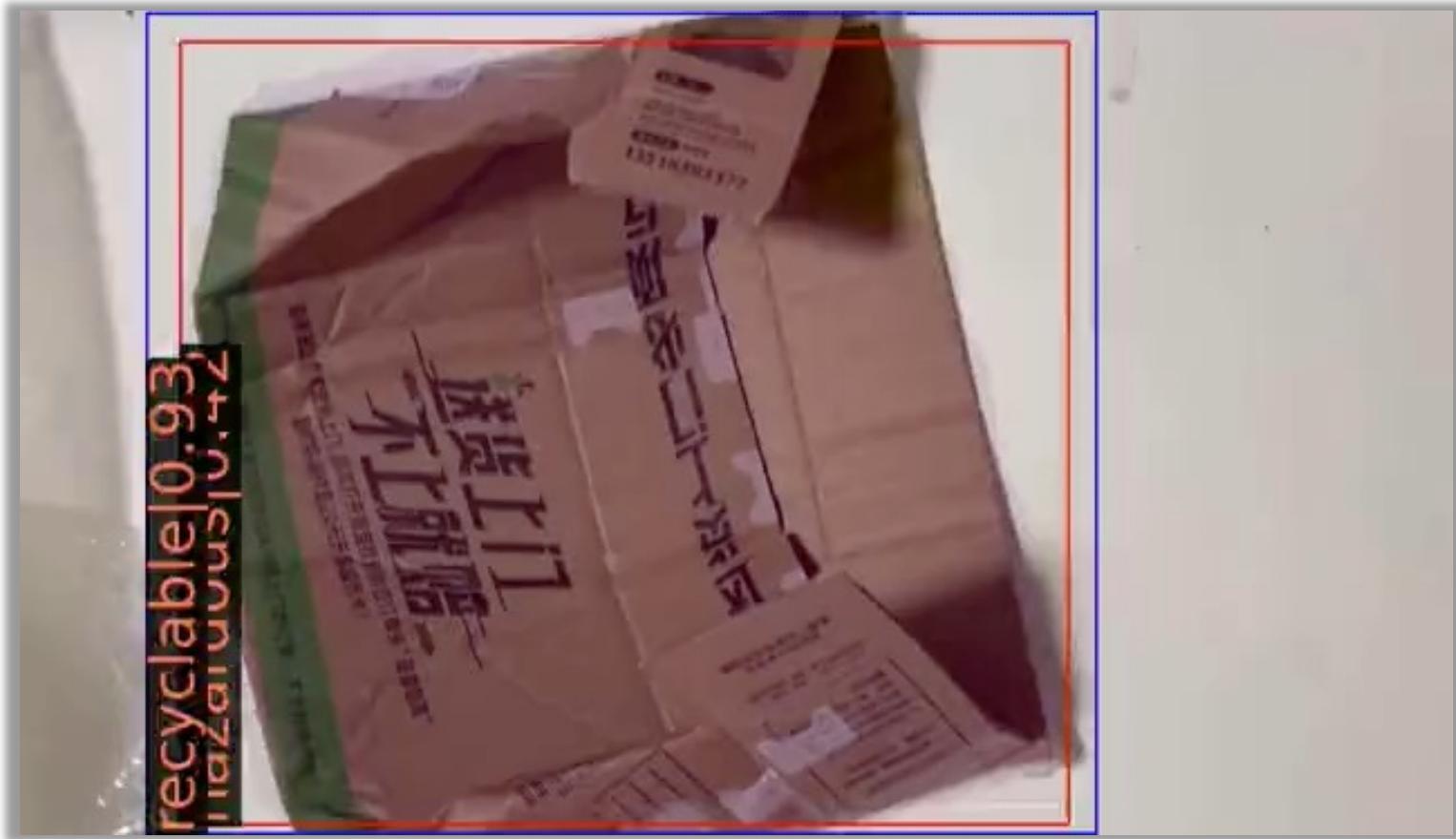
Leave Recognition



W. Liu, 2020

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Garbage Detection



J. Qi, 2022

Thanks to My Colleagues and Supervised Students !



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