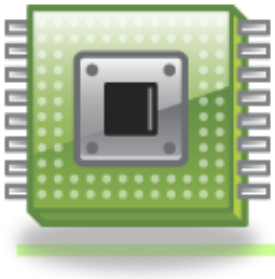


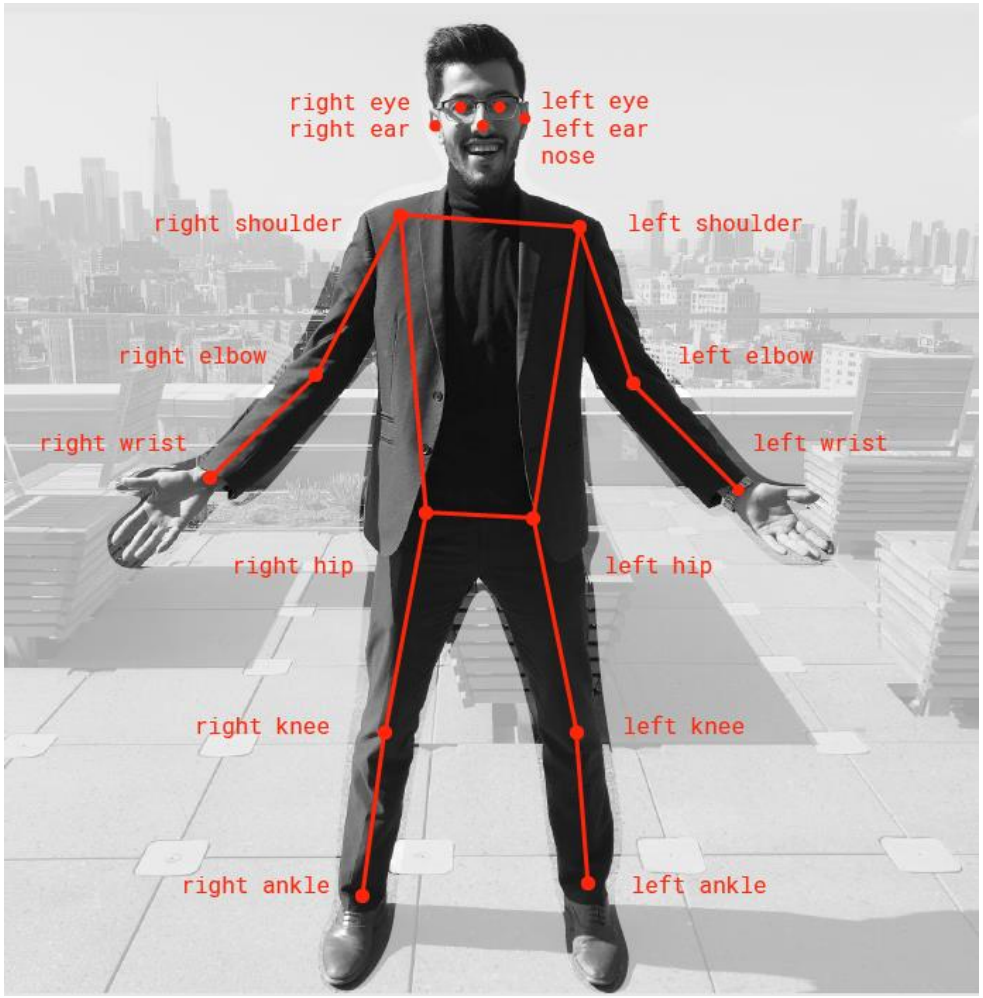
Falling Detection on Raspberrypi

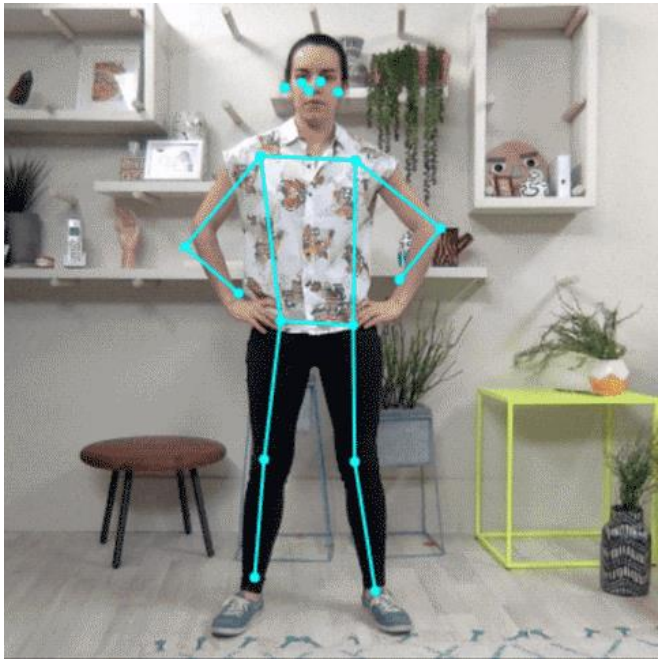
Speaker : Tse-Yu Chen

Advisor : Prof. Tong-Yu Hsieh

TARSD Keep feet on the ground

Human Pose (1/2)





Human Pose (2/2)

0	Nose	9	Left wrist
1	Left eye	10	Right wrist
2	Right eye	11	Left hip
3	Left ear	12	Right hip
4	Right ear	13	Left knee
5	Left shoulder	14	Right knee
6	Right shoulder	15	Left ankle
7	Left elbow	16	Right ankle
8	Right elbow	Total	17

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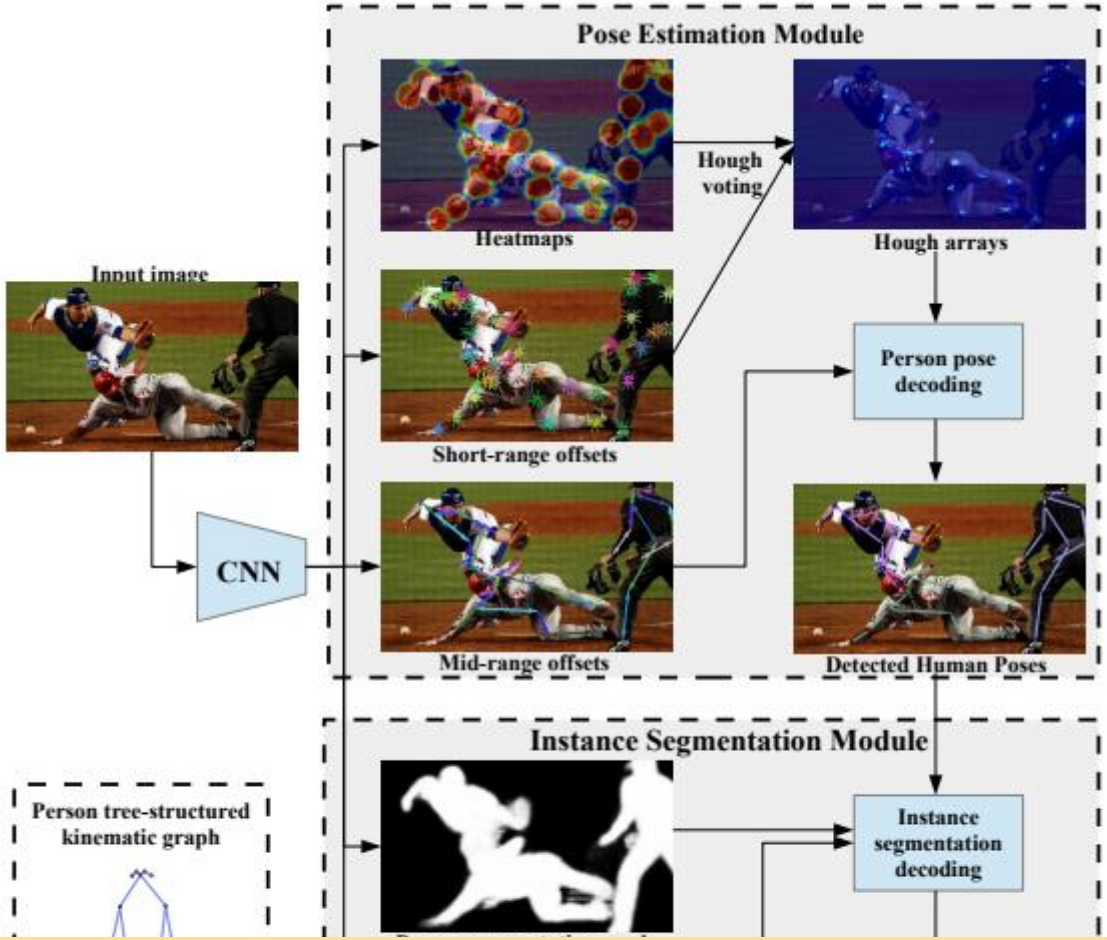
PoseNET (1/5)

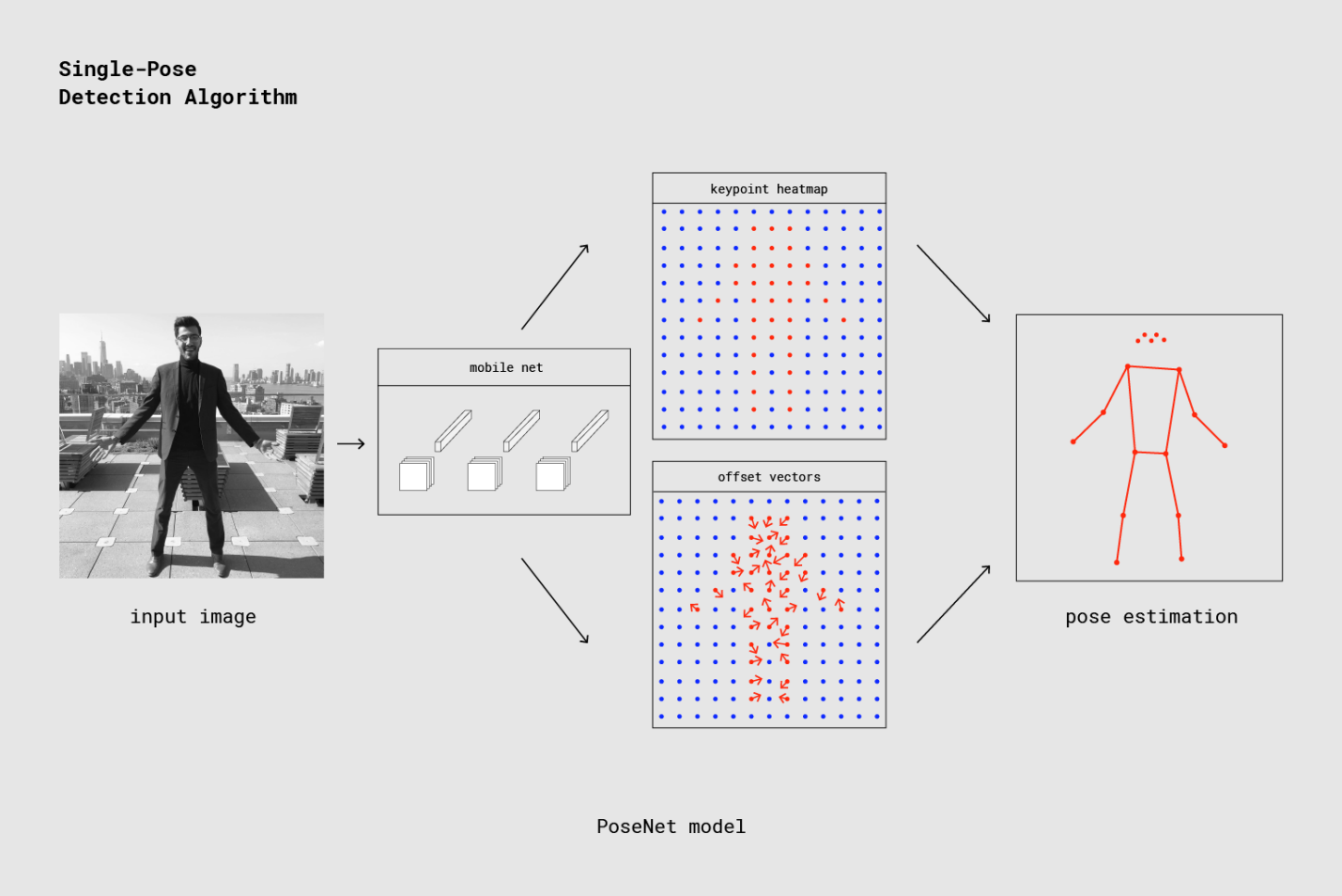


[1] G. Papandreou et al. “Towards Accurate Multi-person Pose Estimation in the Wild,” *2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR),* pp.3711-3719, 2017

[2] G. Papandreou et al. “PersonLab: Person Pose Estimation and Instance Segmentation with a Bottom-Up, Part-Based, Geometric Embedding Model”, *2018 European Conference on Computer Vision(ECCV)*, 2018

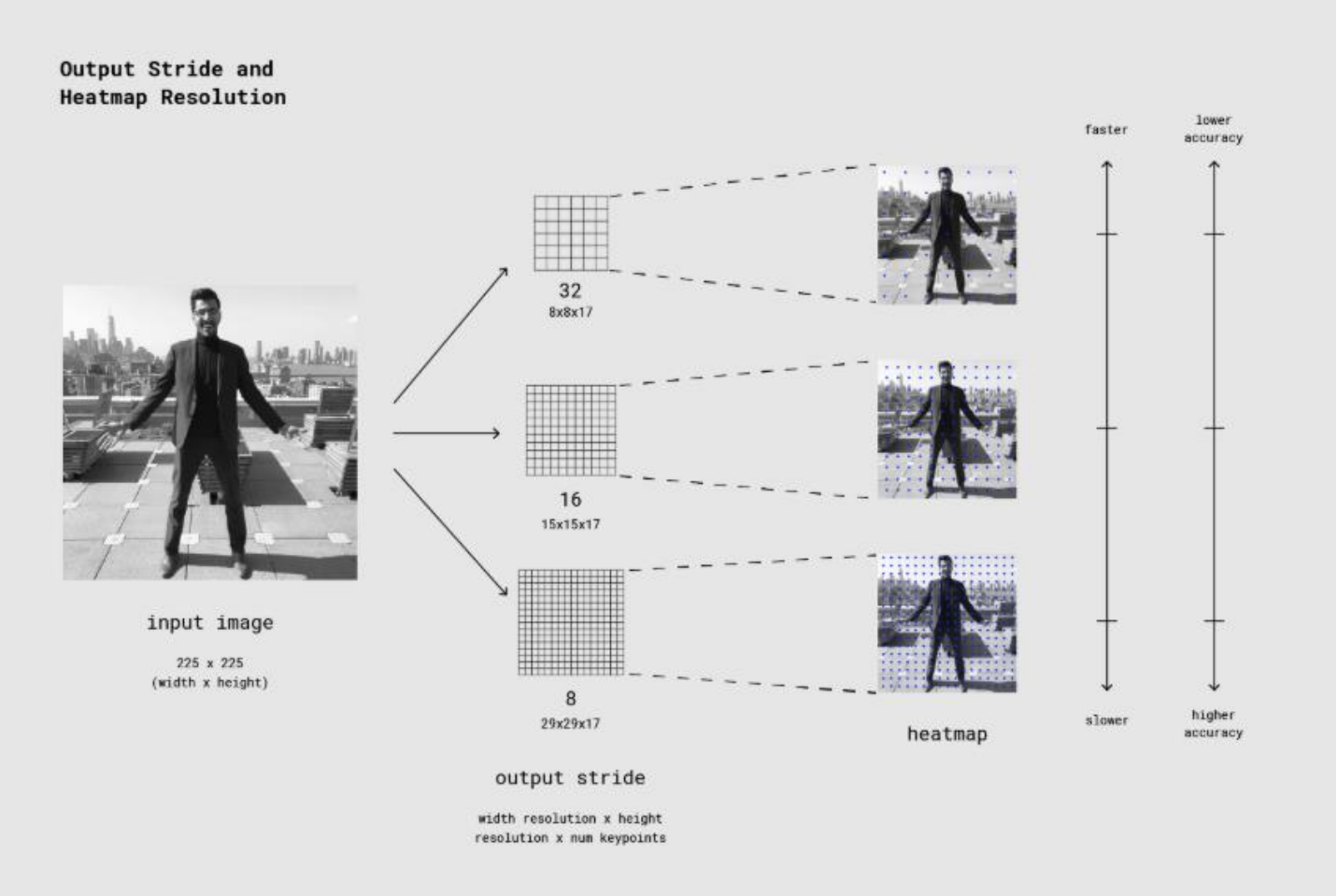
PoseNET (2/5)

- **Keypoint and Vector**



PoseNET (3/5)

- **Stride Num -> accuracy and speed**

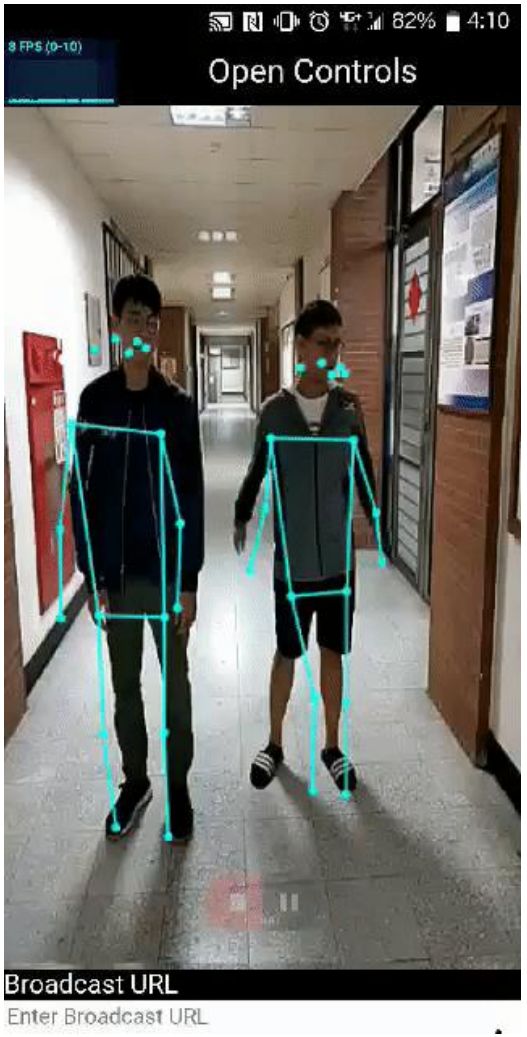


PoseNET (4/5)

- **Try it yourself !**
  - **PoseNet Online (need camera)**
    https://storage.googleapis.com/tfjs-models/demos/posenet/camera.html
  - **Google Play:**
    PoseNet Broadcast

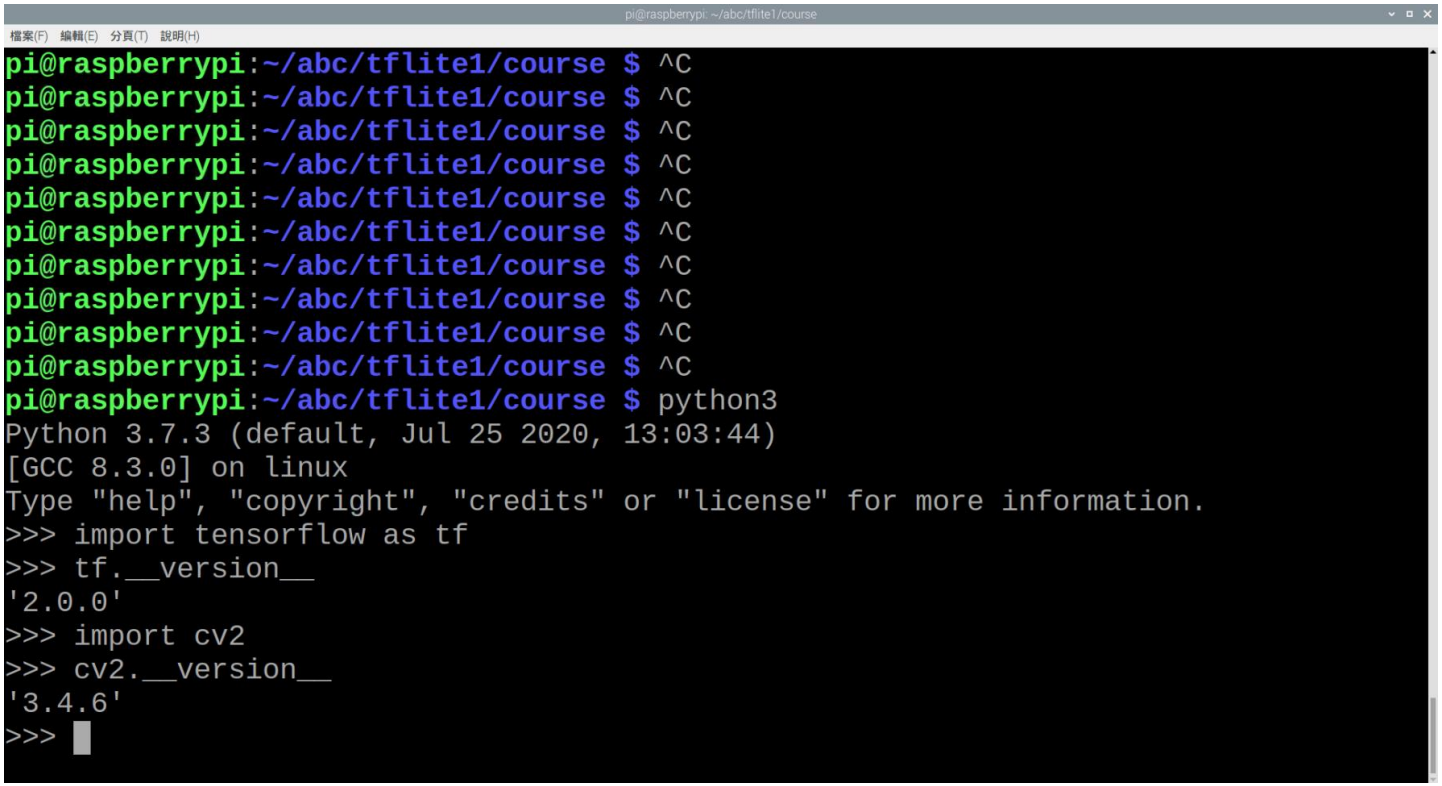
PoseNET (5/5)

- Architecture
  - MobileNetV1 v.s. Resnet50
- Method
  - SinglePose v.s. MultiPose
- Output Stride
  - 8 v.s. 16
- Multiplier (only for MobileNetV1)
  - 1.0, 0.75, 0.5



Check Your Setting

- Check your tensorflow and opencv(cv2) module
  - If you miss any module, do the “dev install” commands in previous handout again.



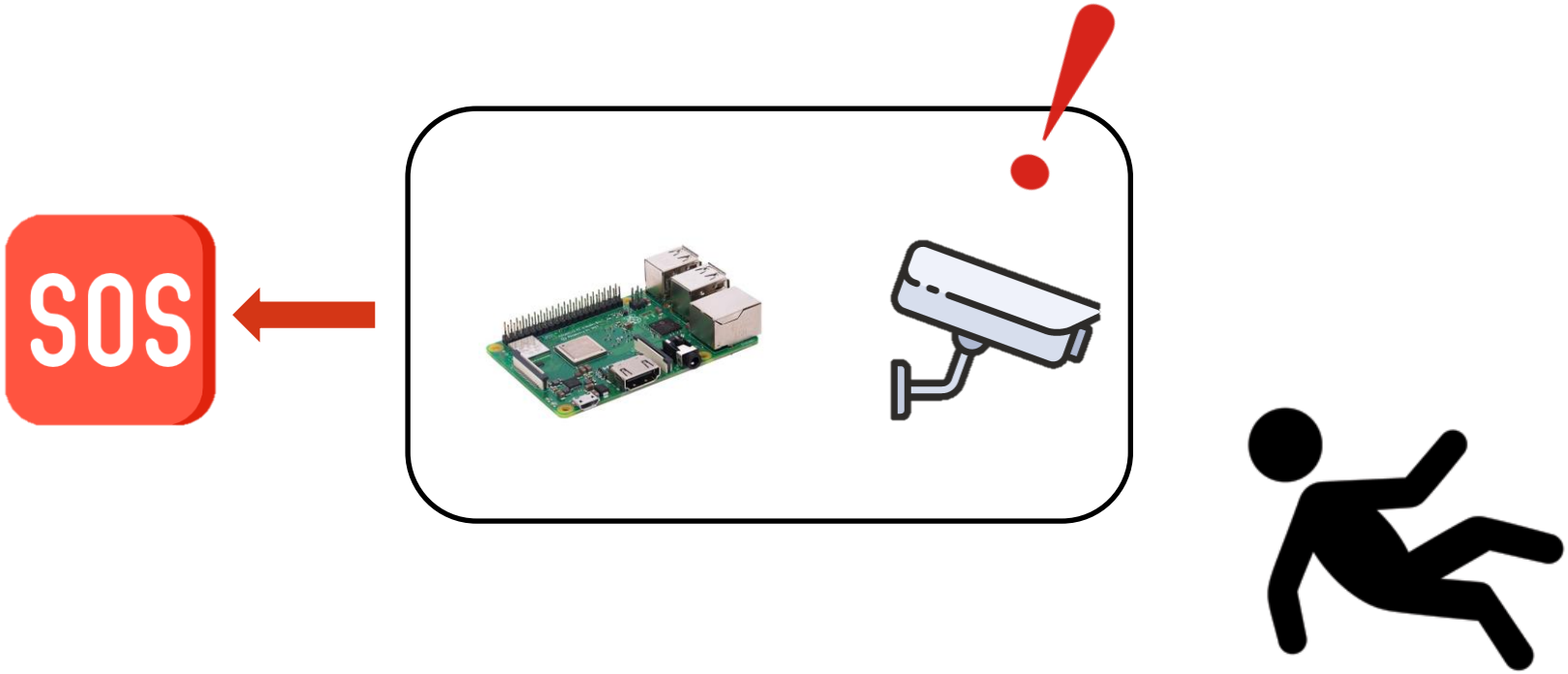
Download Demo Code

1. wget "https://drive.google.com/u/0/uc?id=1o2Sg8t3jQDJzkIai4H_gtI4L1UH_p1Fr&export=download" -O course.zip
2. unzip course.zip

wget “TheLinkYouWantDownloadFrom” -O save_name

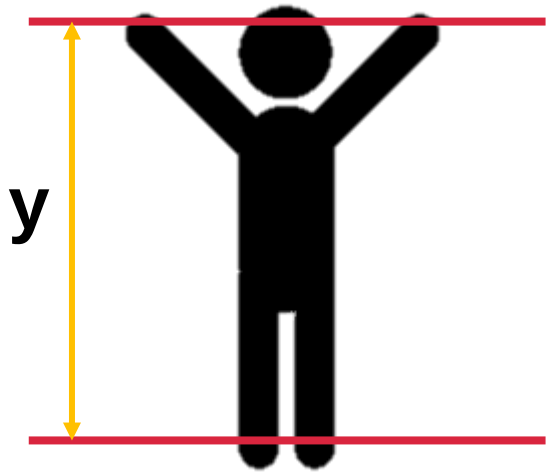
Fall Detection (1/6)

- **Use Case**



Fall Detection (2/6)

- Utilize the variation of different checkpoints to judge whether the “FALL” situation is happening or not.



Fall Detection (3/6)

- The “argparse” library enables user to change your argument by user define command.

```
# Define and parse input arguments
parser = argparse.ArgumentParser()
parser.add_argument('--graph'     , help='Name of the .tflite file, if different than detect.tflite'    ,default='posenet_
parser.add_argument('--threshold', help='Minimum confidence threshold for displaying detected objects',default=0.5)
parser.add_argument('--image'     , help='Name of the single image to perform detection on. To run detection on multiple

#把指令的內容傳送給各個參數
args              = parser.parse_args()
GRAPH_NAME        = args.graph
min_conf_threshold = float(args.threshold)
IM_NAME           = args.image
```

- You can set default case by adding “default=XXX” into the function.

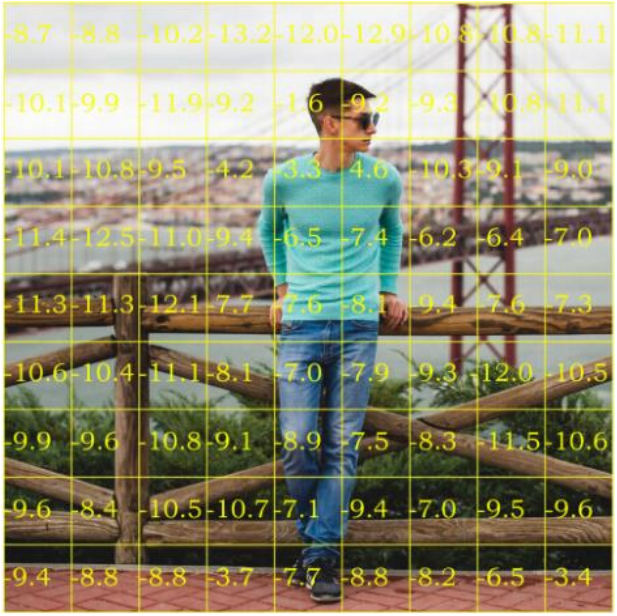
Fall Detection (4/6)

- The “Interpreter” library enables user to load the data from pretrained model (tflite).

```
# Path to .tflite file, which contains the model that is used for object detection
PATH_TO_CKPT  = os.path.join(CWD_PATH,GRAPH_NAME)
interpreter   = Interpreter(model_path=PATH_TO_CKPT)
interpreter.allocate_tensors()
#print(PATH_TO_CKPT)
###############################################################################
# Get model details
input_details  = interpreter.get_input_details()
output_details = interpreter.get_output_details()
height         = input_details[0]['shape'][1]
width          = input_details[0]['shape'][2]
floating_model = (input_details[0]['dtype'] == np.float32)
```

Fall Detection (5/6)

- **Heatmaps (9,9,17)** : probability of each keypoint in the 9x9 coordinate of image
- **Offset vectors (9,9,34)** : used for more exact calculation of the keypoint's position



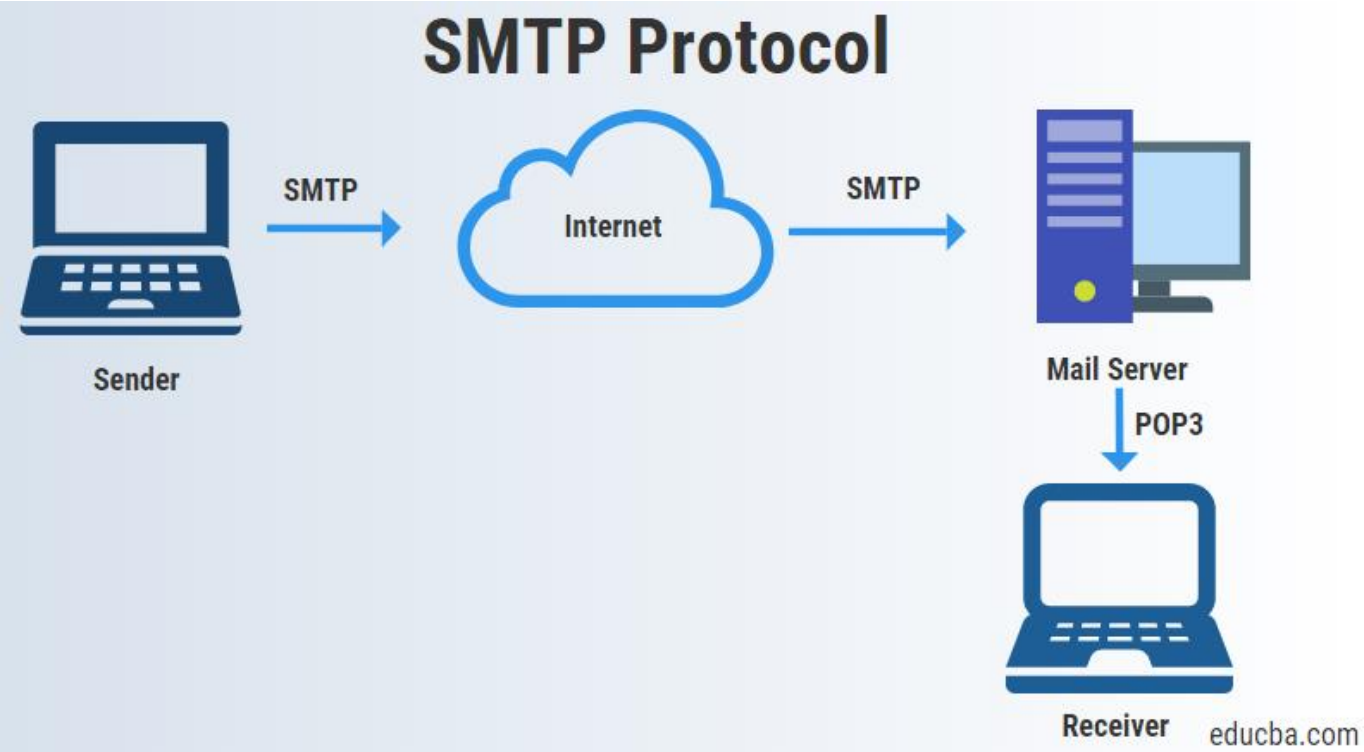
[3] https://medium.com/roonyx/pose-estimation-and-matching-with-tensorflow-lite-posenet-model-ea2e9249abbd

Fall Detection (6/6)

```
pi@raspberrypi:~/abc/new/course $ python3 image.py --image
=testwalk.jpg
INFO: Initialized TensorFlow Lite runtime.
351 367
i= 0     151 93          0.7066974
i= 1     154 89          0.7857652
i= 2     164 90          0.16755359
i= 3     175 89          0.9077129
i= 5     193 123         0.96084285
i= 6     179 122         0.9505185
i= 7     214 165         0.8569784
i= 8     183 167         0.71413594
i= 9     187 203         0.81258196
i= 10    181 201         0.5773627
i= 11    215 184         0.8014803
i= 12    187 190         0.77786845
i= 13    170 253         0.7876316
i= 14    221 251         0.8053379
i= 15    143 311         0.8262238
i= 16    245 311         0.78343534
89
311
ok
```

SMTP (1/3)

- Simple Mail Transfer Protocol (SMTP)
  - Easy connection establish between server and client



[4] https://www.educba.com/smtp-protocol/

SMTP (2/3)

```
import smtplib
from email.mime.text import MIMEText

def waring_message():
    #enter your gmail account and password!!
    gmail_user     = 'Donald J. Trump'
    gmail_password = 'MAGA2020!'

    msg = MIMEText('someone fall !!!')
    msg['Subject'] = 'A mail from MLVD'
    msg['From']    = gmail_user
    msg['To']      = 'YouShouldEnterYourAccountHere@gmail.com'

    server = smtplib.SMTP_SSL('smtp.gmail.com', 465)
    server.ehlo()
    server.login(gmail_user, gmail_password)
    server.send_message(msg)
    server.quit()
    print('Email sent!')
    #允許程式進行存取
    #https://accounts.google.com/DisplayUnlockCaptcha
    #低安全性應用程式存取權
    #https://myaccount.google.com/lesssecureapps
```

CHANGE THESE

CHANGE THIS

TARSD Keep feet on the ground

SMTP (3/3)

← 低安全性應用程式存取權

某些應用程式和裝置採用的登入技術安全性較低，將導致您的帳戶出現安全漏洞。建議您停用這類應用程式的存取權；當然，您也可以選擇啟用存取權，但請瞭解相關風險。如果您並未使用這項設定，Google 會自動關閉該權限。 瞭解詳情

允許低安全性應用程式：已開啟

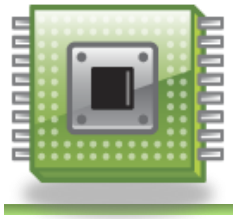
Test 收件匣 × 工作 ×

[redacted]

寄給 [redacted]

this is a letter from python!!!

TARSD Keep feet on the ground



Demo

- **Image Detection**
  - python3 image.py --image=XX.jpg
- **Webcam Detection**
  - python3 detect.py