CSCE689 Project

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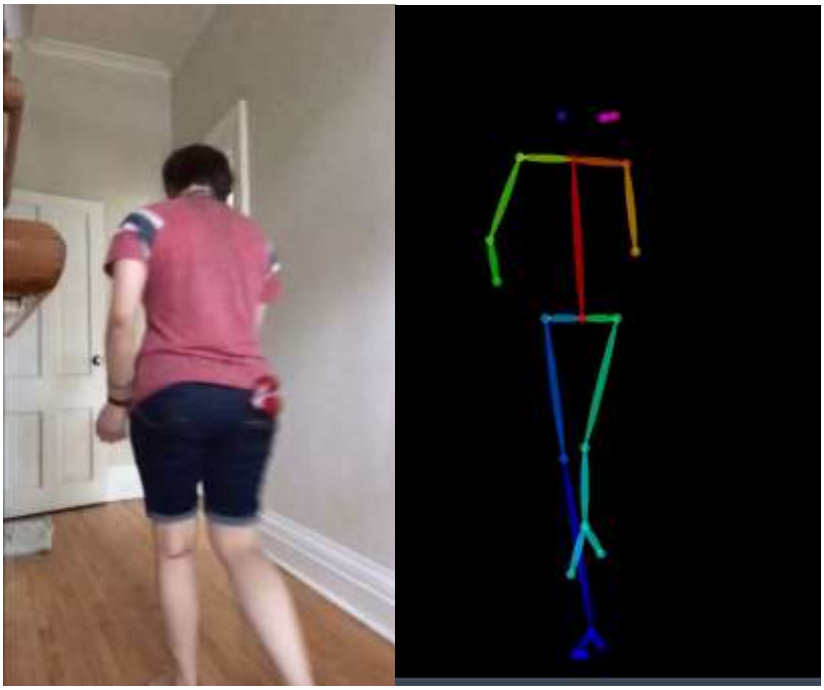
Research Topic:

Detecting foot pacing in videos. Many people will pace when they are stressed. This acts as a pacifier, as all repetitive behaviors do. I will detect such behaviors in the videos.

Dataset:

I am required to detect 3 types foot movement in videos. Because I still do not find videos about Foot Withdrawing and Foot Turning Away, I will start from a Foot Pacing video. The video has 35 seconds and 1032 frames in total. I use the first 700 frames as the training data and the rest as test data.



Precedures:

1. First use tools mark “Body Landmarks” in the videos;
2. Then transform the videos into frames, each frame is an image;
3. After that, annotate each frame as Positive (with pacing) or Negative (without pacing);
4. Split the frames into training data and testing data;
5. Train a CNN model to classify the frames.

Architecture:

```python
class Net(nn.Module):
    def __init__(self):
        super(Net, self).__init__()
        self.conv1 = nn.Conv2d(3, 6, 16)
        self.pool = nn.MaxPool2d(5, 5)
        self.conv2 = nn.Conv2d(6, 16, 16)
        self.fc1 = nn.Linear(16 * 11 * 5, 512)
        self.fc2 = nn.Linear(512, 32)
        self.fc3 = nn.Linear(32, 2)

    def forward(self, x):
        x = self.pool(x)
        x = self.pool(F.relu(self.conv1(x)))
        x = self.pool(F.relu(self.conv2(x)))
        x = x.view(-1, 16 * 11 * 5)
        x = F.relu(self.fc1(x))
        x = F.relu(self.fc2(x))
        x = self.fc3(x)
        return x
```

The main architecture is a 2-layer CNN. One trick I use is to first apply max-pooling in the data, because the images with body landmarks do not need too many details to distinguish the pacing behaviors. Another trick is that I use a 2-layer FNN for the final classification.

Input:

X_train shape is (700, 3,1920,1080), X_test shape is (332, 3,1920,1080)

Output:

y_train shape is (700,), X_test shape is (332,)

Hyperparameters:

Batch_size: 16; Optimization: SGD; Learning Rate: 0.001; Max_epoch: 30

Training and Testing Performance: