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# REU WEEK 10 PRESENTATION

#### CFR Dataset

- 15 gesture classes in total
  - 40 examples of each gesture
    - 10 from me, 10 from Jon
    - 10 in the lab, 10 in a study area

- The KT test set
  - 10 examples of each gesture
    - 5 in the lab, 5 in a different study area

# Results CFR

### Trained on odd examples, tested on even

|               | Z    | S    | FS   | BS   | Р    | V    | St   | Tw   | R    | Ci   | Lsb  | Rsb  | Inf  | Ca   | Tri  |     |
|---------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| Zorro         | 0.85 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0.05 | 0    | 0.05 | 0.05 | 0    | 0    |     |
| S             | 0    | 0.7  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0.05 | 0.05 | 0.1  | 0    | 0.1  |     |
| Forward_Slash | 0    | 0    | 0.75 | 0.1  | 0    | 0    | 0.05 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     |
| Back_Slash    | 0    | 0    | 0    | 0.55 | 0    | 0    | 0.2  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     |
| Pigtail       | 0    | 0    | 0    | 0.05 | 0.7  | 0    | 0    | 0    | 0    | 0    | 0.1  | 0    | 0    | 0.15 | 0    |     |
| V             | 0    | 0    | 0    | 0.15 | 0.1  | 0.6  | 0    | 0    | 0    | 0    | 0    | 0.05 | 0    | 0.1  | 0    |     |
| Stab          | 0    | 0    | 0    | 0.05 | 0    | 0.05 | 0.65 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     |
| Twist         | 0    | 0    | 0.05 | 0    | 0    | 0    | 0.05 | 0.7  | 0    | 0    | 0    | 0    | 0    | 0.2  | 0    |     |
| Rectangle     | 0.05 | 0    | 0    | 0    | 0    | 0.05 | 0    | 0    | 0.7  | 0    | 0    | 0    | 0.2  | 0    | 0    |     |
| Circle        | 0.05 | 0.05 | 0    | 0    | 0    | 0.05 | 0    | 0    | 0    | 0.6  | 0    | 0.1  | 0.05 | 0    | 0.1  |     |
| Left SB       | 0.05 | 0.05 | 0    | 0    | 0.05 | 0.05 | 0    | 0.05 | 0    | 0    | 0.6  | 0.05 | 0    | 0.05 | 0.05 |     |
| Right SB      | 0.2  | 0    | 0    | 0    | 0.15 | 0.05 | 0    | 0.05 | 0    | 0    | 0    | 0.45 | 0.05 | 0    | 0.05 |     |
| Infinity      | 0.2  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0.05 | 0    | 0    | 0    | 0.7  | 0    | 0.05 |     |
| Caret         | 0    | 0    | 0    | 0    | 0.25 | 0.05 | 0    | 0.05 | 0    | 0    | 0.05 | 0    | 0    | 0.6  | 0    |     |
| Triangle      | 0    | 0    | 0    | 0    | 0    | 0.05 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0.95 |     |
|               |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 0.7 |

## Results CFR

- Trained on odd examples, tested on even
  - With the modification

|               | Z   | S    | FS   | BS   | Р    | ٧    | St   | Tw   | R    | Ci   | Lsb  | Rsb | Inf | Ca   | Tri  |          |
|---------------|-----|------|------|------|------|------|------|------|------|------|------|-----|-----|------|------|----------|
| Zorro         | 0.8 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0.05 | 0    | 0.2 | 0   | 0    | 0    |          |
| S             | 0   | 0.85 | 0    | 0    | 0    | 0    | 0.05 | 0    | 0    | 0    | 0    | 0.1 | 0   | 0    | 0.05 |          |
| Forward_Slash | 0   | 0    | 8.0  | 0.2  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0   | 0   | 0    | 0    |          |
| Back_Slash    | 0   | 0    | 0.05 | 0.8  | 0    | 0    | 0    | 0.1  | 0    | 0    | 0    | 0   | 0   | 0.05 | 0    |          |
| Pigtail       | 0   | 0    | 0.1  | 0.05 | 0.6  | 0    | 0    | 0    | 0    | 0    | 0    | 0   | 0   | 0.25 | 0    |          |
| V             | 0   | 0    | 0.1  | 0.15 | 0    | 0.65 | 0    | 0    | 0    | 0    | 0    | 0   | 0   | 0    | 0.1  |          |
| Stab          | 0   | 0    | 0    | 0.05 | 0    | 0    | 0.95 | 0    | 0    | 0    | 0    | 0   | 0   | 0    | 0    |          |
| Twist         | 0   | 0    | 0    | 0.05 | 0    | 0    | 0.1  | 0.85 | 0    | 0    | 0    | 0   | 0   | 0    | 0    |          |
| Rectangle     | 0   | 0    | 0    | 0    | 0.05 | 0.05 | 0    | 0    | 8.0  | 0    | 0    | 0   | 0   | 0    | 0.1  |          |
| Circle        | 0   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0.85 | 0    | 0.1 | 0   | 0.05 | 0.05 |          |
| Left SB       | 0   | 0    | 0    | 0    | 0.05 | 0    | 0.15 | 0    | 0    | 0    | 8.0  | 0   | 0   | 0    | 0    |          |
| Right SB      | 0   | 0    | 0.05 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0.9 | 0   | 0    | 0.05 |          |
| Infinity      | 0   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0.05 | 0.05 | 0   | 0.9 | 0    | 0    |          |
| Caret         | 0   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0   | 0   | 1    | 0    |          |
| Triangle      | 0   | 0.05 | 0    | 0    | 0    | 0.05 | 0    | 0    | 0.05 | 0    | 0    | 0   | 0   | 0    | 0.85 |          |
|               |     |      |      |      |      |      |      |      |      |      |      |     |     |      |      | 0.826667 |

# Results KT

### Trained on all of CFR, tested on all KT

|               | Z   | S   | FS  | BS  | Р   | >   | St | Tw | R   | Ci  | Lsb | Rsb | Inf | Ca  | Tri |             |
|---------------|-----|-----|-----|-----|-----|-----|----|----|-----|-----|-----|-----|-----|-----|-----|-------------|
| Zorro         | 0.5 | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0   | 0.2 | 0   | 0   | 0.3 | 0   | 0   |             |
| S             | 0   | 1   | 0   | 0   | 0   | 0   | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |             |
| Forward_Slash | 0   | 0.7 | 0.1 | 0   | 0   | 0   | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |             |
| Back_Slash    | 0.1 | 0   | 0.1 | 0.1 | 9   | 0   | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0.7 | 0   |             |
| Pigtail       | 0.1 | 0   | 0   | 0   | 0.1 | 0   | 0  | 0  | 0   | 0.2 | 0   | 0   | 0.3 | 0.3 | 0   |             |
| V             | 0   | 0   | 0.1 | 0   |     | 0.4 | 0  | 0  | 0   | 0.4 | 0   | 0   | 0   | 0   | 0.1 |             |
| Stab          | 0   | 0   | 0   | 0   | 0   | 0   | 1  | Q  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |             |
| Twist         | 0   | 0   | 0   | 0   | 0   | 0   | d  | 1  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |             |
| Rectangle     | 0   | 0.1 | 0   | 0   | 0   | 0   | 0  | O  | 0.9 | 0   | 0   | 0   | 0   | 0   | 0   |             |
| Circle        | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0   | 0.9 | 0   | 0   | 0.1 | 0   | 0   |             |
| Left SB       | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0   | 0   | 1   | 0   | 0   | 0   | 0   |             |
| Right SB      | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0   | 0   | 0   | 1   | 0   | 0   | 0   |             |
| Infinity      | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0   | 0   | 0   | 0   | 1   | 0   | 0   |             |
| Caret         | 0   | 0   | 0   | 0   | 0.4 | 0   | 0  | 0  | 0   | 0   | 0.1 | 0   | 0   | 0.5 | 0   |             |
| Triangle      | 0   | 0.1 | 0   | 0   | 0   | 0   | 0  | 0  | 0.4 | 0   | 0   | 0   | 0   | 0   | 0.5 |             |
|               |     |     |     |     |     |     |    |    |     |     |     |     |     |     |     | 0.666666667 |

# Summary

- Finished the gesture classifier
  - Sliding window is done, and is fast

Tweaked the features

Tweaked the algorithm

Obtained results!

### The future

- New features
  - Third time's a charm

Improve results

Real-time demo

Prove antipodal technique mathematically

# Questions?

