



# Gesture Recognition Based on Magnetometer-Array Wristband

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Related work

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2

Basic idea and challenges

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Implementation and evaluation

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4

Summary and future work

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### Related work

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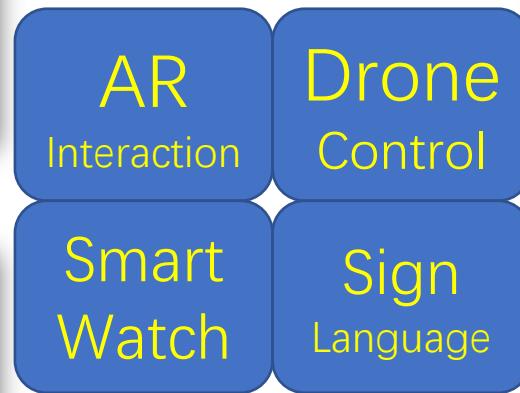
4

### Summary and future work

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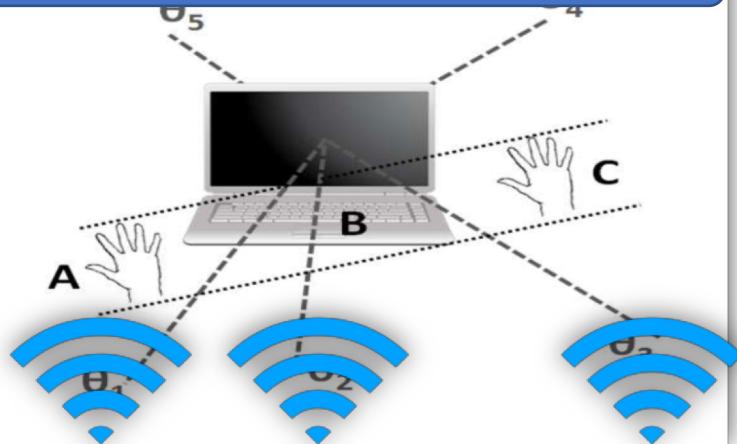
# Gesture Recognition



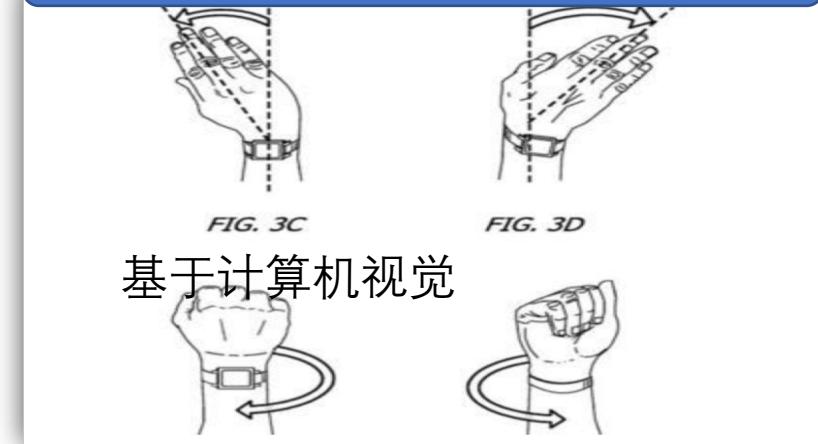


# Related Work

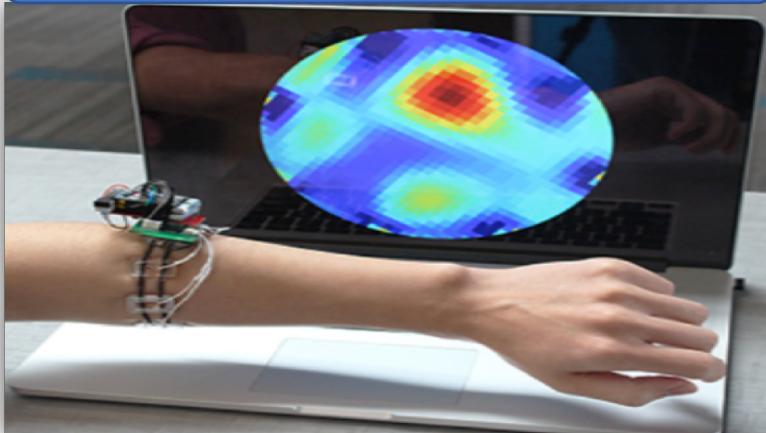
## Based on RF



## Based on Motion Sensor



## Based on Bio-Impedance



## Based on CV



1

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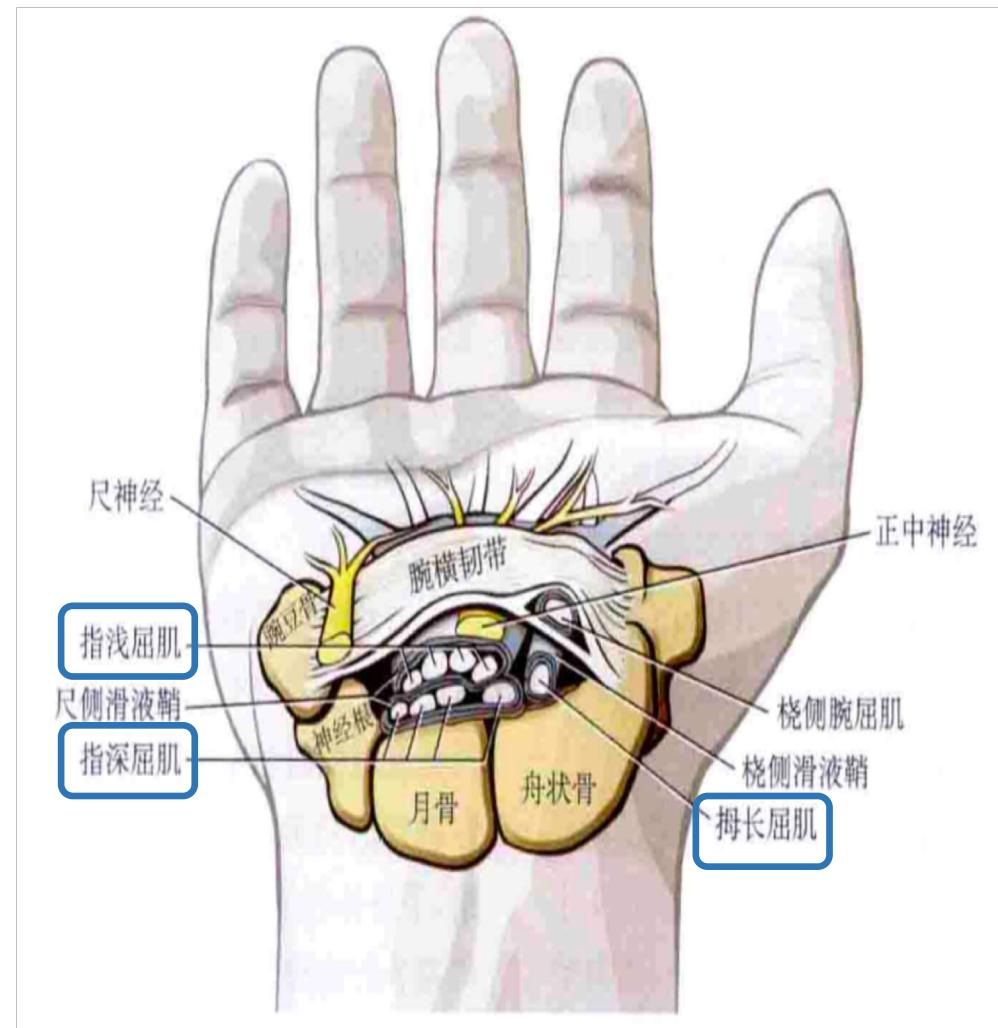
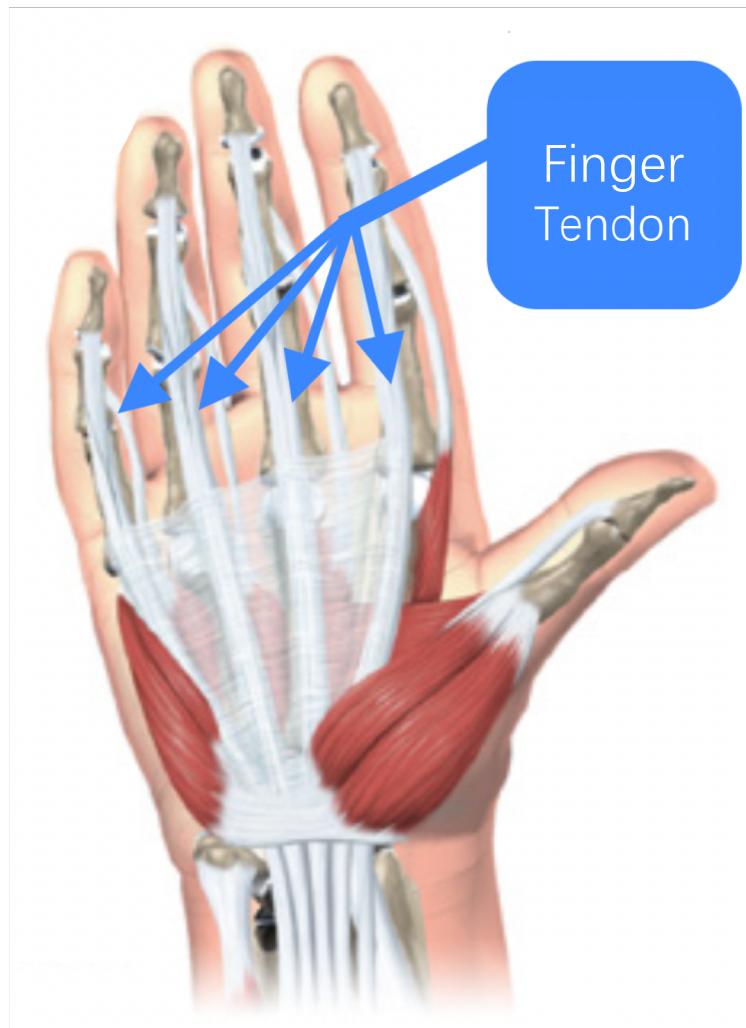
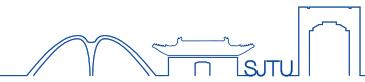
4

### Summary and future work

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# Basic observation





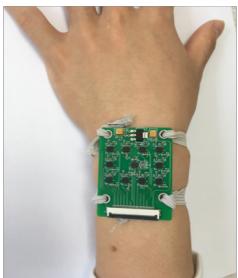
# Basic Idea

→ Training

···→ Authentication

Back

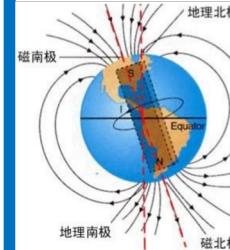
Inner



Catch muscle motion based on magnet

Earth

Devices



Noise Cancellation

Classifier Training



Recognition

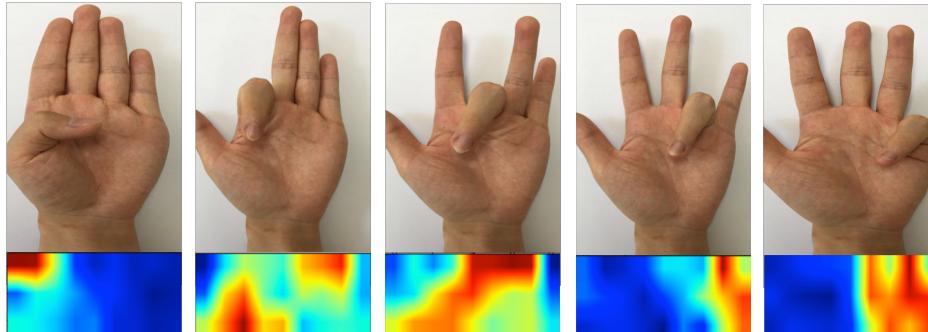


# Challenge 1: Deployment of Magnets

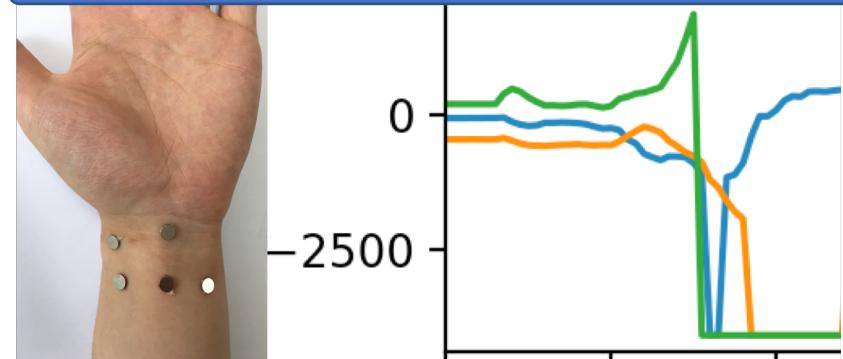
Position ?

Direction ?

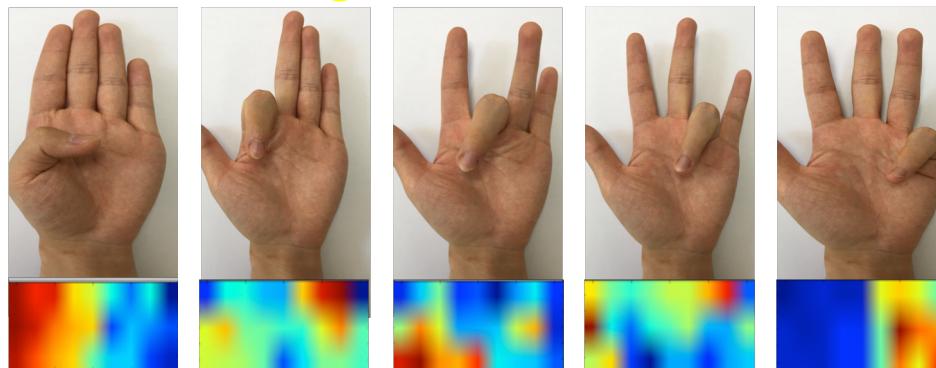
Single volunteer



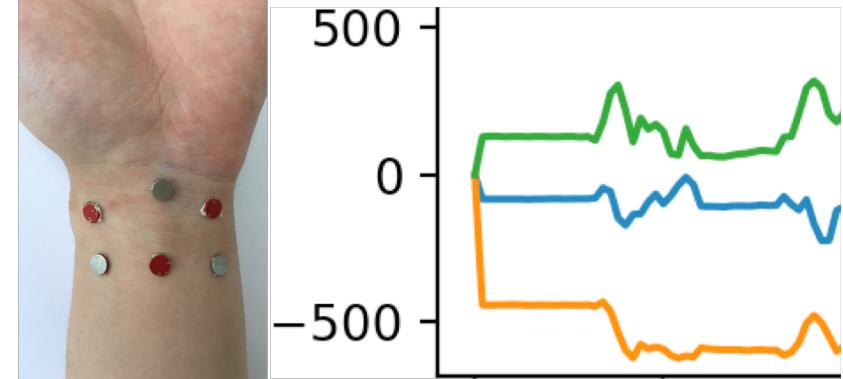
All same direction



Average of 8 volunteers



Cross direction



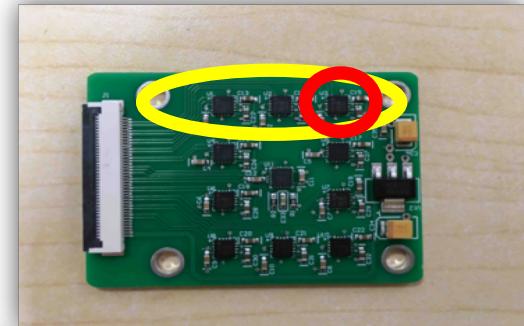
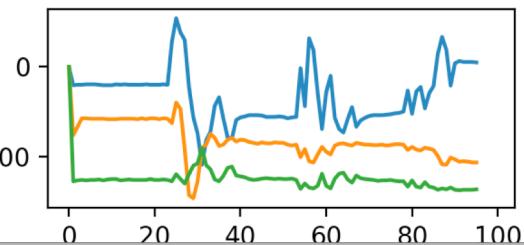
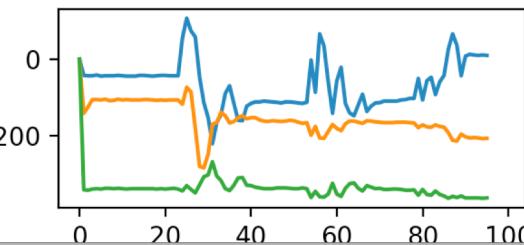
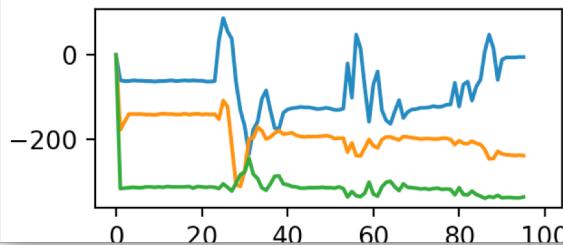


# Challenge 2: Noise Cancellation

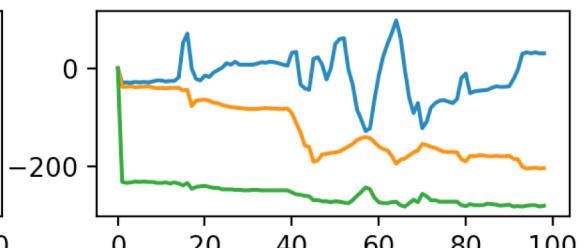
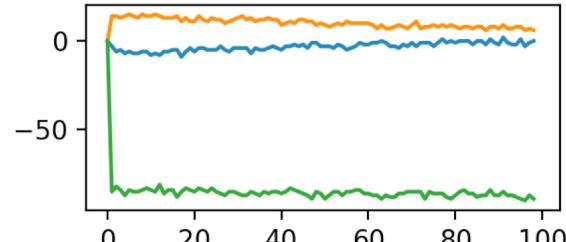
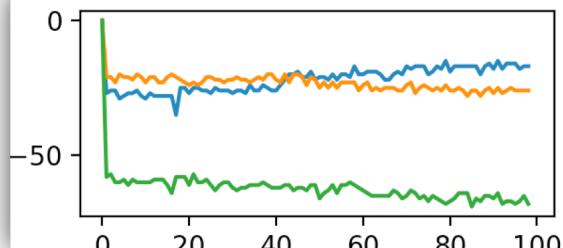


Solution : Choose a pivot,  
calculate relative value

Before



After



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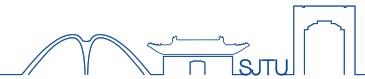
4

### Summary and future work

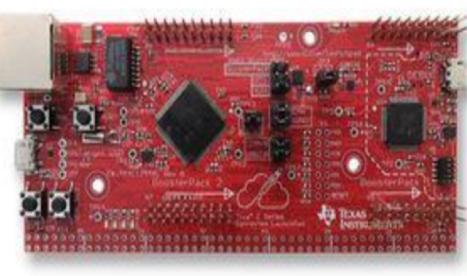
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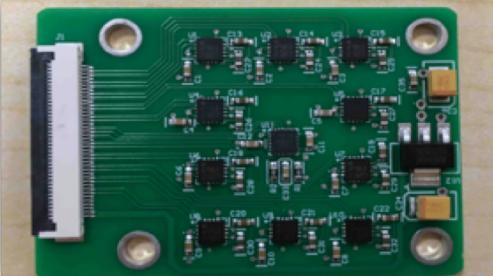
# Prototype Implementation



Cortex-M4  
Embedded B



HMC-5983  
Magnetometer \*10



Deployment

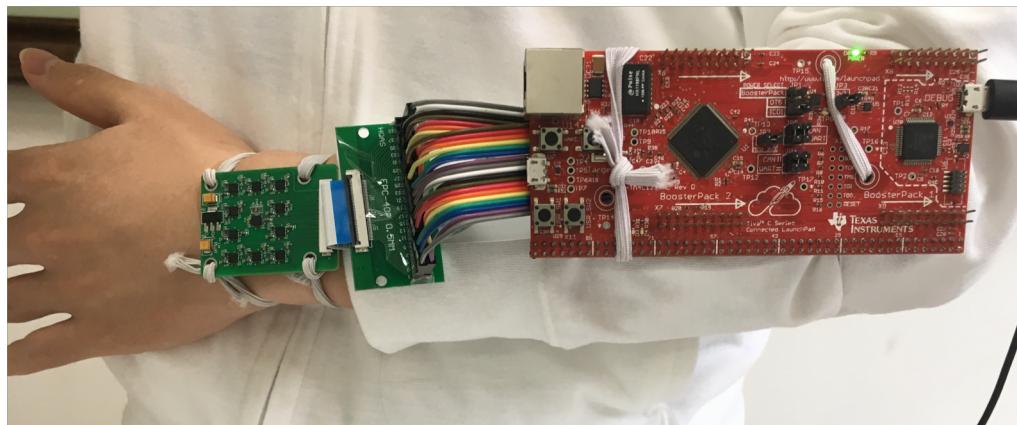


Classifier

SVM

Logistic  
Regression

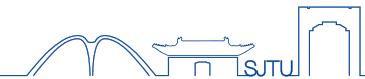
Decision  
Tree



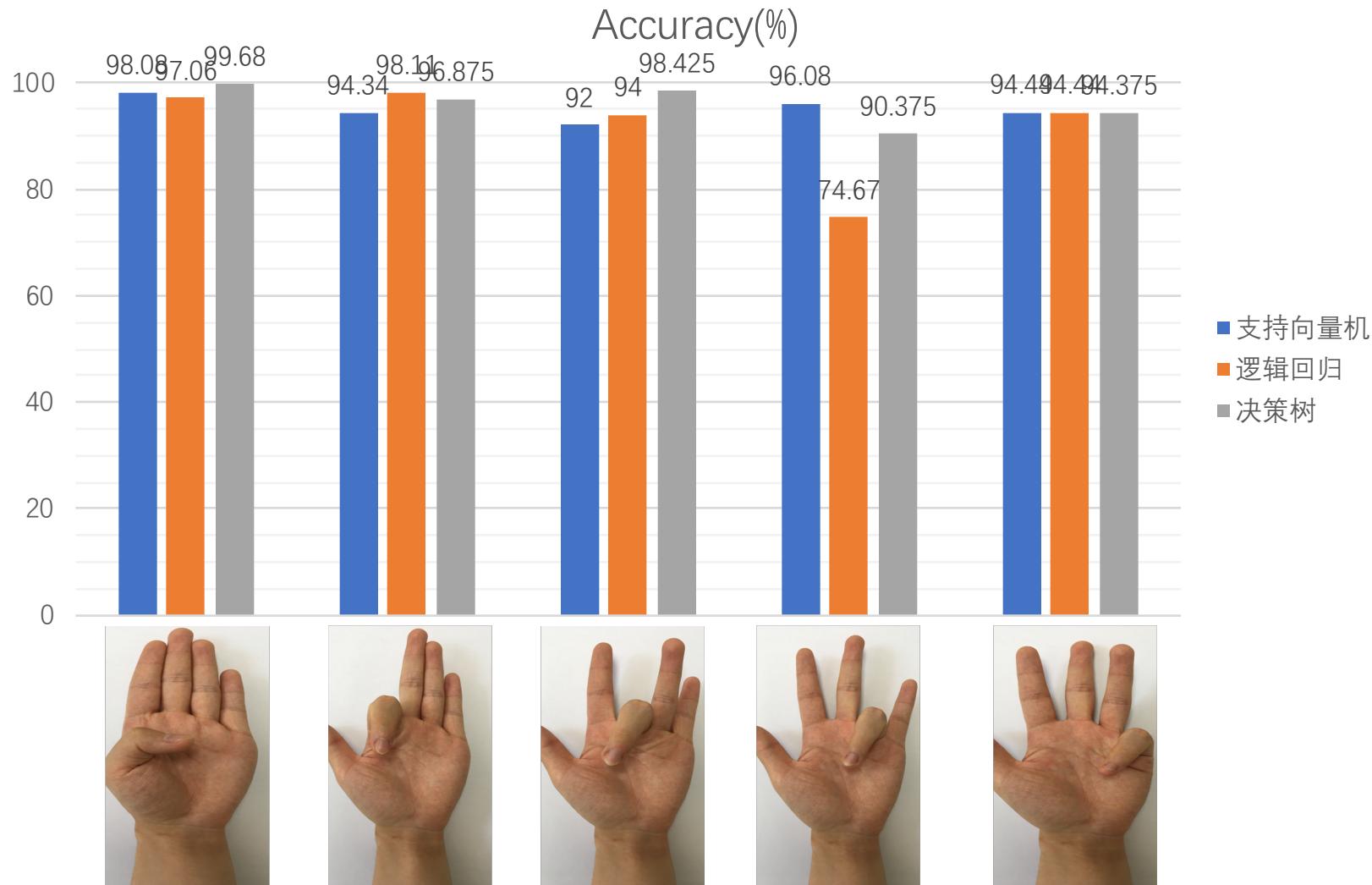


# Experiment

- 8 volunteer, the same pose.
- Training Data :
  - Repeat 3 times in different environment.
  - 5 single-finger gestures & 32 multiple-finger gestures for each time.
  - 10 groups of data for each gesture.
- Criteria : Recognition accuracy

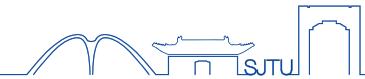


# Evaluation (Single finger)

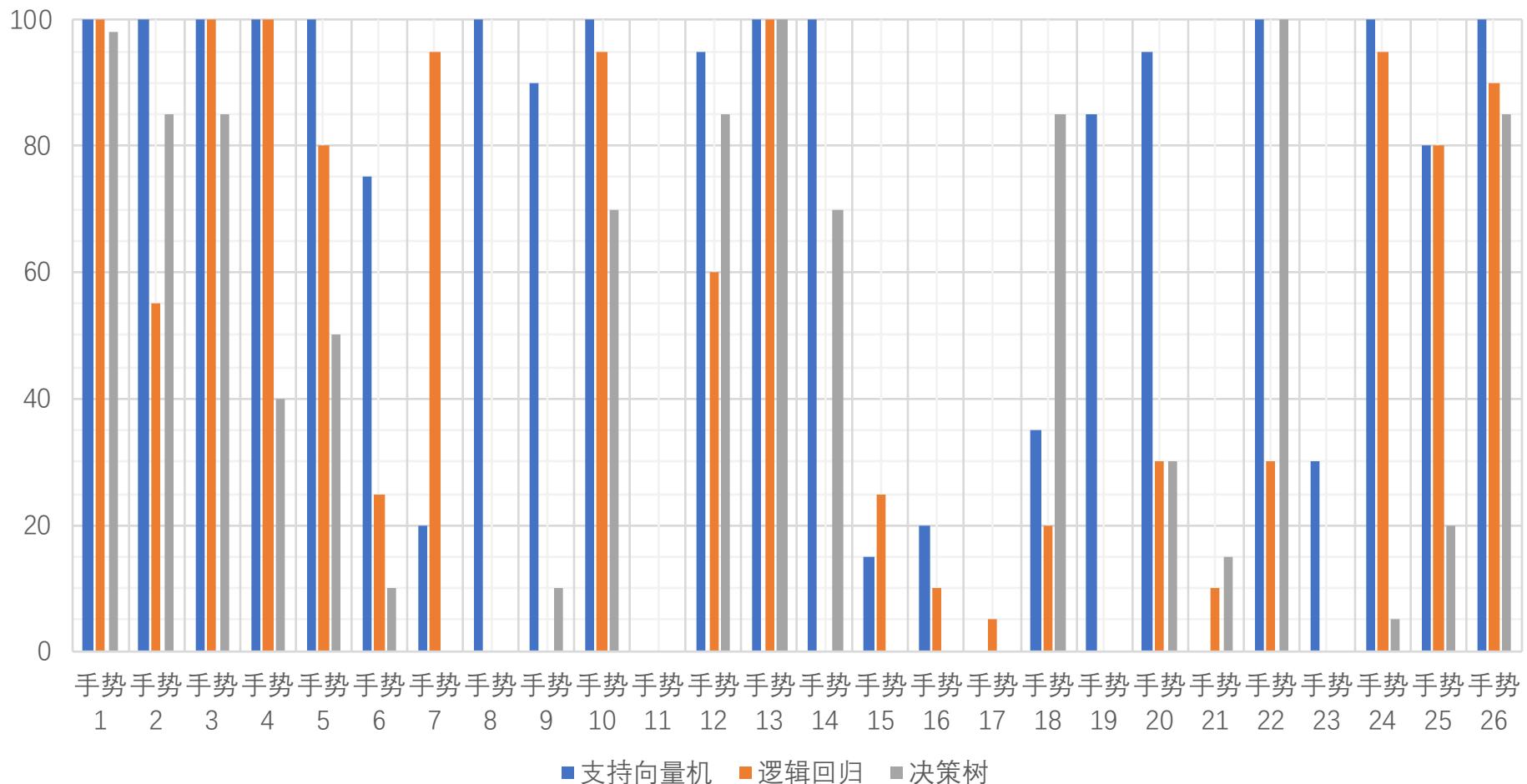




# Evaluation (Multi-Finger)



Accuracy(%)



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# Summary and Future Work



## Finger-level Gesture Recognition

- Advantage
  - Simple hardware, easy to implement
  - Small hardware, easy to integrate
  - Low power consumption, low cost
- Future Work
  - Recognition when different pose
  - Optimize deployment, improve accuracy
  - Compact into smartwatch or wristband

# Thank you!

