

# Xiaodong Yang

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## Research Interests

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Machine Learning, Deep Learning, Pervasive Computing, Healthcare system designing, Human activity recognition, Human Computer Interaction

## Education

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**Institute of Computing Technology, Chinese Academy of Sciences, China** 2013 - Current

Ph.D. Candidate, Computer Application Technology (Expected graduation: Summer 2020)

Supervisor: Yiqiang Chen

**Shandong Normal University, Jinan, China** 2009 - 2013

BBA, Computer Science and Technology

## Publication

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### Journals & Conferences

**Less annotation on active learning using confidence-weighted predictions** 2018

Xiaodong Yang, Yiqiang Chen, Hanchao Yu, et al

Neurocomputing, 2018(275), 1629-1636.

**Multimode heterogeneous collaborative sensing method for Parkinson's Disease** 2017

Xiaodong Yang, Yiqiang Chen, Hanchao Yu, et al. Acta Electronica Sinica, 2017(46):3, 659-664.

**PdAssist: Objective and quantified symptom assessment of Parkinson's Disease** 2017

Yiqiang Chen, Xiaodong Yang, Biao Chen, et al.

International Conference on Bioinformatics and Biomedicine (BIBM) 2017, 939-945.

**Using Motor patterns for stroke detection** 2015

Yiqiang Chen, Hanchao Yu, Chunyan Miao, Biao Chen, Xiaodong Yang, et al.

Science(supplement), 2015, 12-14.

**strDoctor: Indicate stroke for elderly through body sensing game** 2015

Hanchao Yu, Xiaodong Yang, Yiqiang Chen, et al.

International Conference on Ubiquitous Intelligence and Computing (UIC) 2015, 360-363.

**Ultrasonic waves based gesture recognition method for wearable equipment** 2015

Xiaodong Yang, Yiqiang Chen, Hanchao Yu, et al. Computer Science, 2015(42):10,20-24.

**A review on the recognition of mid-air gestures** 2017

Hanchao Yu, Xiaodong Yang, et al. Science & Technology Review, 2017(1):10-18.

**Context-aware information based ultrasonic gesture recognition method** 2018

Xi Zhong, Yiqiang Chen, Hanchao Yu, Xiaodong Yang, et al.

Journal of Computer-Aided & Computer Graphics, 2018(1), 10-18.

**Wearing-independent hand gesture recognition method based on EMG** 2018

Yingwei Zhang, Yiqiang Chen, Hanchao Yu, Xiaodong Yang, et al.

Personal and Ubiquitous Computing, 2018,22(3):511-524.

**Wearable Sensors based Automatic Box and Block Test System** 2019

Yingwei Zhang, Yiqiang Chen, Hanchao Yu, Xiaodong Yang, et al.

International Conference on Ubiquitous Intelligence and Computing (UIC) 2019.

<b>CLuster-based hierarchical weighted learning for imbalance classification</b>	2019
Xiaodong Yang, Yiqiang Chen, Hanchao Yu, et al. (submitted to Pattern Recognition)	
<b>Instance-wise Dynamic Sensor Selection for Human Activity Recognition</b>	2019
Xiaodong Yang, Yiqiang Chen, Hanchao Yu, et al. (submitted to AAAI'2020)	

## Talks

<b>Unsupervised Online Sequential Extreme Learning Machine on Fuzzy Theory</b>	2016
International Conference of Extreme Learning Machine 2016, Singapore	
<b>Drone that flies with hand gesture</b>	2017
2017 International Conference on Ageless Aging (ICAA'17), Beijing, China	

## Patents

<b>A multimode activity recognition method and system.</b>	2017
Yiqiang Chen, Xiaodong Yang, Hanchao Yu. CN201710743558.	
<b>Immersive interactive system</b>	2014
Hanchao Yu, Yiqiang Chen, Junfa Liu, Chen Huang, Long Huang, Xiaodong Yang. 2014100440656. (Approved)	
<b>Ultrasonic gesture recognition method and system</b>	2016
Yiqiang Chen, Hanchao Yu, Xi Zhong, Xiaodong Yang, Ziang Hu. CN2016105761258.	
<b>An EMG-based gesture recognition method and system</b>	2017
Yiqiang Chen, Yingwei Zhang, Hanchao Yu, Xiaodong Yang. CN201710566320.	

## Projects

<b>Research on Key Technologies of Big Data Multimodal Interaction Collaboration</b>	2017
National Key Research and Development Plan	
<b>Research on Multimodal Online Prognosing Method for Parkinson's Disease</b>	2016
National Natural Science Foundation of China	
<b>Research on Wearable Early Warning Evaluation Method for Parkinson's Disease</b>	2016
Beijing Municipal Science & Technology Commission	
<b>Research on Incremental Learning Method for Wearable Activity Recognition</b>	2016
National Natural Science Foundation of China	
<b>Research on Natural Human-Computer Interaction Technology</b>	2015
International S&T Cooperation Program of China	

## Awards

<b>Best Paper Nomination Award</b>	The 13th China Human Computer Interaction Conference	2017
<b>The Second Prize in Microsoft ImagineCup Competition</b>	Microsoft (China)	2015
<b>Excellent Innovation Project Award</b>	The 13th China Human Computer Interaction Conference	2017
<b>National Scholarship for Master Students</b>	University of Chinese Academy of Sciences	2016
<b>Schlumberger Scholarship for Doctoral Students</b>	Institute of Computing Technology	2018
<b>Pacemaker to Merit Student</b>	University of Chinese Academy of Sciences	2014

## Research Experience

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### Study on auxiliary diagnosis for Parkinson's Disease through wearable technology 2015-2018

- Collect behavior data through sensors embedded in a smartphone, e.g., camera, microphone, and accelerometer
- Quantitatively evaluate eight typical motor symptoms by machine learning and deep learning methods with overall accuracy ~90%
- Be Applied in the Xuanwu Hospital, Beijing, China, and help improve clinical diagnosis of PD by ~10%

#### **My role: Team leader**

- Propose a sensor adaptive human activity recognition method, which dynamically selects sensors for each instance and improves accuracy with less consumption
- Propose a distribution adaptive weighted learning method, which weighting the subclusters of the imbalanced data to train an unbiased classifier
- Propose a less annotation active learning method, which uses the predictions to augment the learning for reducing the required annotation
- Develop machine learning models for PD motor symptom assessment, e.g., RF, SVM and CNN
- Design the whole system architecture: core functions, cloud service, database, and interactive interface.
- Design and develop the front-end Android application PdAssist to collect data and interact with patients and clinicians

### Kinect-based Stroke early warning 2015

- Build a Kinect-based game to mimic the clinical Trail-Making-Test (TMT)
- Automatically detect fingertips and collect the finger trace
- Prodiagnose people with potential Stroke by the motor features extracted from the test and their medical history

#### **My role: Core member**

- Design and develop the Kinect-based Trail-making-test on the PC platform
- Design a pipeline for preprocessing the skeleton information
- Extract and select motor features from the fingertip trace

### Mid-air hand gesture recognition for natural human-computer interaction 2013-2015

- Take advantage of the Doppler Effect of ultrasound
- Recognize mid-air hand gestures by using the microphone and the speaker on various platforms including smartphone and PC
- Applied in a safe driving scenario to help the drivers to interact with the vehicle terminals in a secure way

#### **My role: Team leader**

- Analyze the relationship between the Doppler Effect of ultrasound and hand movement
- Propose the pipeline of ultrasound gesture recognition using microphone and speaker
- Design a set including four gestures, i.e., move backward/forward, click, double click
- Propose an ultrasound-based mid-air hand gesture recognition method which uses Hidden Markov Model
- Propose a context-aware hand gesture recognition method which leverages interaction context to understand human's intention in order to improve the accuracy
- Design and develop demos on Android and PC platforms

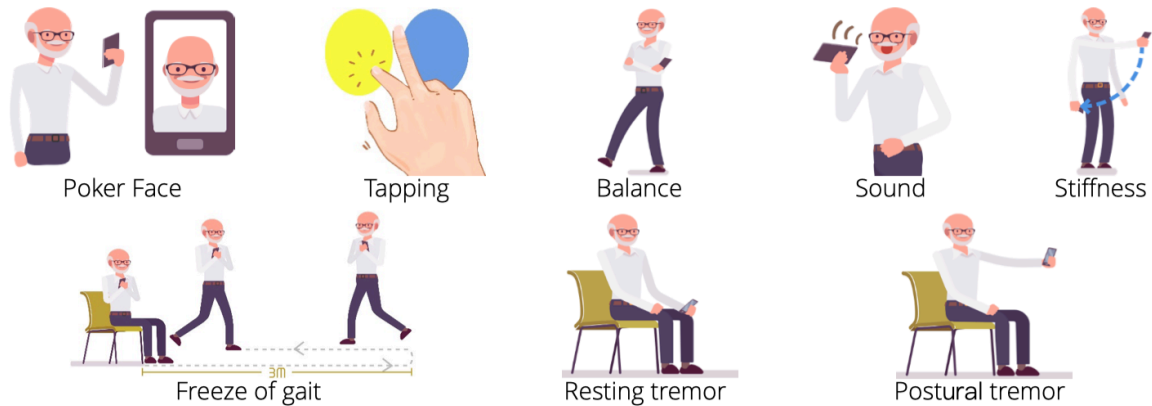
## Demos

**Name:** Parkinson's disease motor symptom assessment system

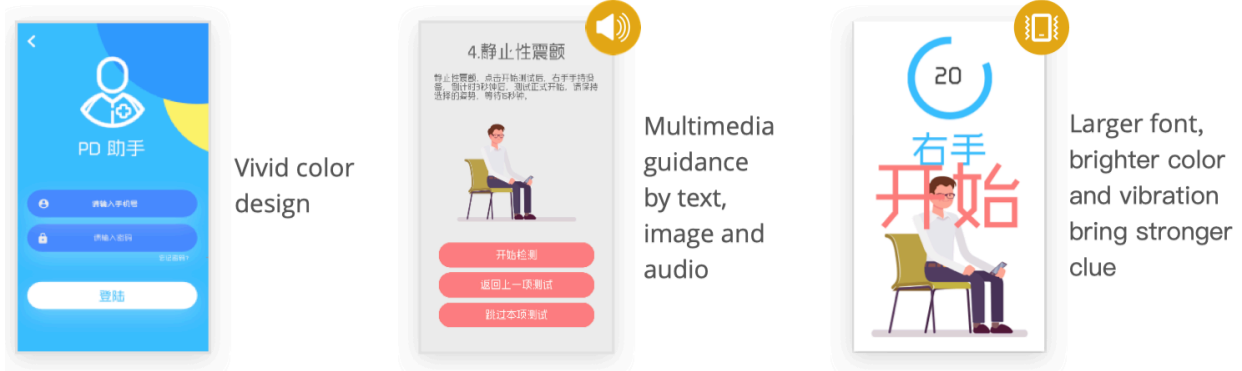
**Cooperation:** Xuanwu Hospital, Capital Medical University, Beijing, China

**My role:** Team Leader

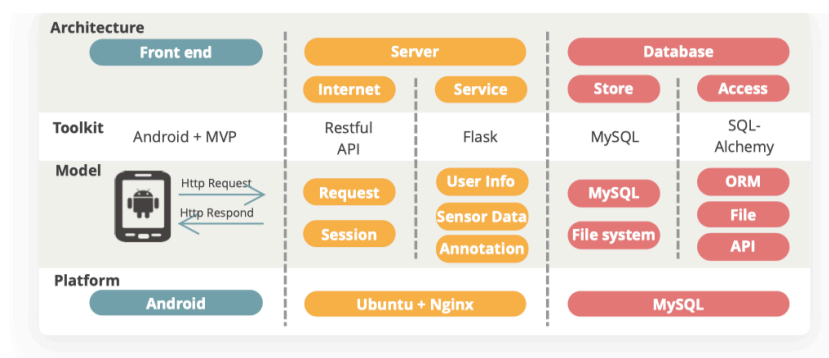
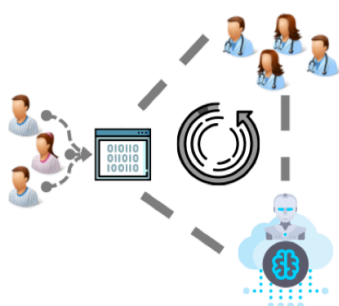
- 8 motor symptom assessments where accuracy ~90% compared with doctors' diagnosis



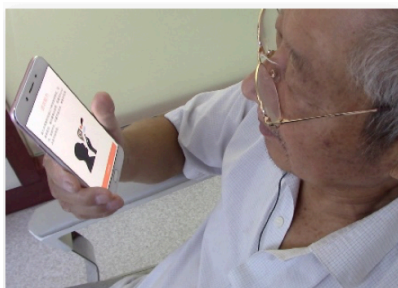
- User-friendly design especially for elderly patients



- System architecture design



- Applied in Xuanwu Hospital, Beijing, China and help improve diagnosis by ~10%

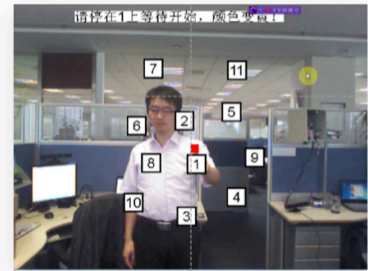
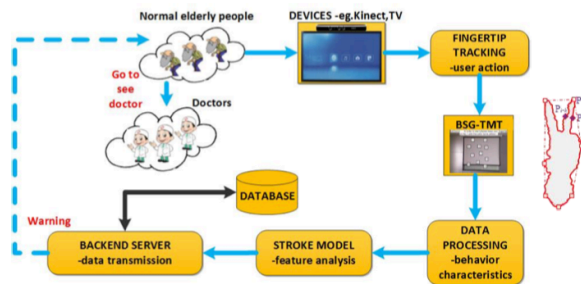


## Demos

### Name: Stroke Early warning system

**My role:** Core member

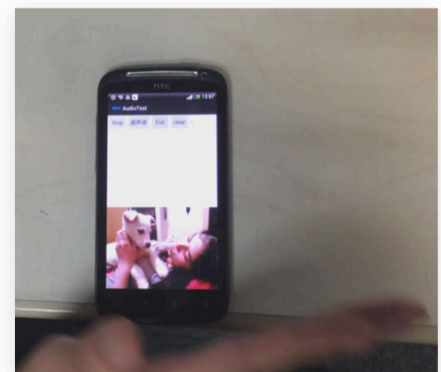
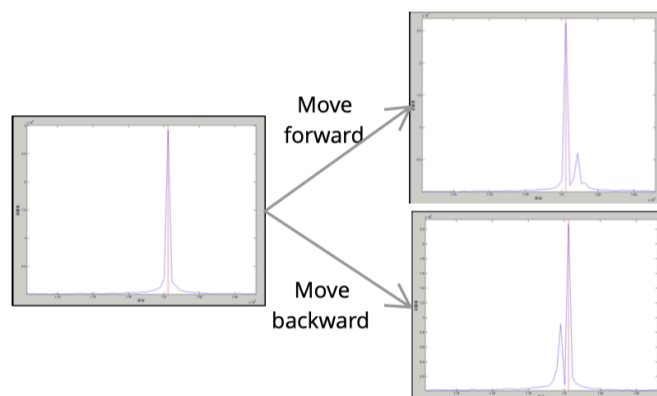
- Collect the RGB-D information of patient finger by Kinect
- Reconstruct the moving trace of fingertip, extract & select key motor features
- Over 95% accuracy by combining motor features and medical history



### Name: Ultrasound-based mid-air hand gesture interaction system

**My role:** Team leader

- Recognize the hand moving direction by the Doppler Effect of ultrasound
- Design 4 hand gestures: Forwards, Backwards, Click, Double Click
- Interaction with Android smartphone, e.g., controlling a photo gallery



### Name: AR-based immersive interaction system

**My role:** Core member

- Collect and transmit the remote image, and augment with local reality
- Feel like face-to-face education

