

Xin Tian

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EDUCATION

Ph.D., Electrical and Computer Engineering

University of Maryland (UMD), GPA: 3.8/4.0

Expected May 2022

College Park, MD

B.S., Optoelectronic Information Science and Engineering

Huazhong University of Science and Technology (HUST), GPA: 91.3/100, top 4%

June 2017

Wuhan, China

SKILLS

Programming languages: Python, MATLAB

RESEARCH EXPERIENCE

Heart Rate (HR) Estimation From Wrist-Type Photoplethysmography (PPG)

UMD, June 2018 - Present

- Implemented adaptive filter algorithms for PPG signal denoising with the motion cue.
- Conducted an iterative dynamic programming algorithm to estimate HR from the cleaned PPG and achieved comparable accuracy with state-of-the-art.
- Designed a graphic user interface (GUI) for result visualization in MATLAB.

Electrocardiogram (ECG) Reconstruction From Photoplethysmography (PPG)

UMD, Oct. 2018 - Present

- Assisted in designing a detailed signal model for the relation of ECG and PPG with deep biomedical insights.
- Gathered and analyzed data of 157 patients from a large-scale real-world clinical database with Python and SQL.
- Proposed a novel joint dictionary learning (DL) framework for inversely reconstructing clinically interpretable ECG from the more easily measured PPG signals with 24% improved reconstruction accuracy to the state-of-the-art.
- Compared related DL frameworks, including coupled DL, semi-coupled DL and projective DL.
- Constructed convolutional neural networks and a generative model of conditional VAE using Pytorch (GPU) with further improved reconstruction accuracy.

Remote Vital Signs Monitoring Using Regular RGB Cameras

UMD, July 2019 - Present

- Tested a Python-based remote PPG prototype on a range of lighting, motion and skin conditions with an average heart rate tracking accuracy of 1%.

PUBLICATIONS AND PATENTS

- Q. Zhu, **X. Tian**, C.-W. Wong, and M. Wu, "ECG Reconstruction via PPG: A Pilot Study", IEEE International Conf. on Biomedical and Health Informatics (BHI'19), Chicago, IL, May 2019. [**10.9%** acceptance rate for oral presentation]
- Q. Zhu, **X. Tian**, C.-W. Wong, and M. Wu: "Reconstruction of ECG from PPG Signals for Continuous Monitoring and Analytics," provisional patent filing March 2019.
- **X. Tian**, Q. Zhu, Y. Li, and M. Wu, "Cross-domain Joint Dictionary Learning for ECG Reconstruction From PPG", accepted by International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2020).
- Q. Zhu, **X. Tian**, C.-W. Wong and M. Wu, "Learning Your Heart Actions from Pulse: ECG Waveform Reconstruction From PPG", under preparation for journal publication.

TECHNICAL PROJECTS

Machine and Deep Learning

UMD, Sept. - Dec. 2018

- Constructed PCA, LDA, Bayesian classifier, k-NN and SVM for facial expression classification task.
- Applied transfer learning based on VGG net for monkey-species classification.

Multi-rate Signal Processing, Parametric Signal Modeling and Spectrum Estimation

UMD, Sept. - Dec. 2018

- Constructed a quadrature-mirror filter (QMF) bank for image decomposition and reconstruction.
- Built a linear predictive model based on Wiener filter for speech signal analysis.
- Implemented periodogram, AR model and MUSIC algorithm for spectrum estimation of real-world audio signal.

TEACHING EXPERIENCE

ENEE 489I: Solar Energy Conversion

ENEE 307: Electronic Circuits Design Laboratory

ENEE 222: Elements of Discrete Signal Analysis

ENEE 633: Statistical Pattern Recognition

HONORS AND AWARDS

National Scholarship

National Endeavor Fellowship

The Graduate Fellowship

Teaching Assistant Training and Development fellow mentor

2014-2015, HUST

2015-2016, HUST

2017-2018, UMD

2018-2020, UMD