

# Hongyi Pan, Ph.D.

Postdoctoral Research Fellow  
December 12, 2023

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## Education

### University of Illinois Chicago

Ph.D. in Electrical and Computer Engineering  
Advisor: Ahmet Enis Cetin (IEEE Fellow)

Chicago, Illinois, USA  
August 2019 – August 2023

### University of Illinois Chicago

Master in Electrical and Computer Engineering

Chicago, Illinois, USA  
August 2017 – May 2019

### Chang'an University

Bachelor in Automation

Xi'an, Shaanxi, China  
September 2014 – July 2018

## Work Experience

### Northwestern University

Postdoctoral Research Fellow. Advisor: Ulas Bagci  
Topic: Federated learning, domain generalization, eye-tracking-based medical image analysis.

Chicago, Illinois, USA  
June 2023 – Present

### InnoPeak Technology (OPPO US Research Center)

Engineering Intern. Advisor: Xihua Dong  
Topic: Attention-based variable rate super-sampling (VRSS) for graphics rendering.

Bellevue, Washington, USA  
May 2022 – August 2022

### University of Illinois Chicago

Teaching Assistant and Research Assistant. Advisor: Ahmet Enis Cetin  
Topic: Wildfire detection,  $\ell_1$ -norm kernel PCA, orthogonal-transform-based neural network layer.

Chicago, Illinois, USA  
August 2019 – May 2023

## Editorial Services

Associate Editor, Signal, Image and Video Processing

June 2023 – Present

## Selected Honors and Awards

UIC Graduate Student Award for Exceptional Research Promise

May 2022

## Teaching Experience

### Teaching assistant at University of Illinois Chicago

ECE 266: Introduction to Embedded Systems  
ECE 317: Digital Signal Processing I  
ECE 407: Pattern Recognition I  
ECE 415: Image Analysis and Computer Vision I  
ECE 491: Digital Speech Processing  
ECE 491: Introduction to Neural Networks

Fall 2019  
Spring 2020, Summer 2021  
Spring 2022  
Fall 2020, Fall 2021, Fall 2022  
Fall 2020, Fall 2021, Fall 2022  
Spring 2021, Spring 2022, Spring 2023

## Selected Research Projects

### Federated Domain Generalization for Medical Image Analysis

June 2023 – Present

The goal of this effort is to develop a Federated domain generalization for medical image analysis tasks. We improved the main-stream Fourier-transform-based domain generalization using a soft-thresholding function. Preliminary work is presented in [C15].

## Eye-Tracking-Based Medical Image Analysis.

February 2023 – Present

The goal of this effort is to develop an AI system to integrate computer-aided detection and diagnosis systems with radiologists' perceptive knowledge and patterns via eye-tracking. In [C11], we use eye gaze as a novel interactive prompt by leveraging the real-time interactive prompting feature of META's Segment Anything Model (SAM) for image segmentation. We present the GazeSAM system to enable users to collect target segmentation masks by simply looking at the region of interest. In [C12], we proposed a novel gaze-guided graph neural network (GazeGNN) for chest X-ray image classification.

## Orthogonal Transform Based Neural Network Layers

March 2021 – April 2023

We proposed a family of orthogonal-transform-based neural network layers based on the convolution theorem. Related peer-reviewed papers include [J4, C3, C5, C6, C8, C9].

## $L_1$ -Norm Kernel PCA

March 2021 – May 2023

We proposed a family of multiplication-free  $\ell_1$ -norm kernel principal component analysis (PCA) methods. Related peer-reviewed papers include [J5, C2, C4, C10].

## Neural Network Based Wildfire Detection

May 2018 – January 2021

We deployed a MobileNet-V3-based real-time wildfire detection model on Nvidia Jetson Nano. It obtained satisfactory results on the HPWREN wildfire surveillance database. Related peer-reviewed papers include [J1, J3, C1].

## Publications (\*: equal contribution, [J]: journal, [C]: conference.)

[C15] **Hongyi Pan**, Bin Wang, Zheyuan Zhang, Xin Zhu, Debesh Jha, Ahmet Enis Cetin, Concetto Spampinato, and Ulas Bagci. "Domain Generalization with Fourier Transform and Soft Thresholding." In *ICASSP 2024-2024 IEEE International Conference on Acoustics, Speech and Signal Processing*, IEEE, 2024.

[C14] Xin Zhu, **Hongyi Pan**, Shuaiang Rong, and Ahmet Enis Cetin. "Electroencephalogram Sensor Data Compression Using An Asymmetrical Sparse Autoencoder With A Discrete Cosine Transform Layer." In *ICASSP 2024-2024 IEEE International Conference on Acoustics, Speech and Signal Processing*, IEEE, 2024.

[C13] Xin Zhu, **Hongyi Pan**, Salih Atici, and Ahmet Enis Cetin. "Stein Variational Gradient Descent-based Detection For Random Access With Preambles In MTC." In *ICASSP 2024-2024 IEEE International Conference on Acoustics, Speech and Signal Processing*, IEEE, 2024.

[J9] Xin Zhu, Daoguang Yang, **Hongyi Pan**, Hamid Reza Karimi, Didem Ozevin, and Ahmet Enis Cetin. "A novel asymmetrical autoencoder with a sparsifying discrete cosine Stockwell transform layer for gearbox sensor data compression." *Engineering Applications of Artificial Intelligence* 127 (2024): 107322.

[C12] Bin Wang\*, **Hongyi Pan**\*, Armstrong Aboah, Zheyuan Zhang, Elif Keles, Drew Torigian, Baris Turkbey, Elizabeth Krupinski, Jayaram Udupa, and Ulas Bagci. "GazeGNN: A Gaze-Guided Graph Neural Network for Disease Classification." *IEEE CVF Winter Conference on Applications of Computer Vision* 2024.

[J8] Tong Wah Lim, **Hongyi Pan**, Mi Pan, Michael Francis Burrow, and Colman McGrath. "Agreement in quantification of removable prosthesis plaque area coverage using a semi-automated planimetric assessment method." *Journal of Dentistry* (2023): 104721.

[J7] Minye Yang, Zhilu Ye, **Hongyi Pan**, Mohamed Farhat, Ahmet Enis Cetin, and Pai-Yen Chen. "Electromagnetically unclonable functions generated by non-Hermitian absorber-emitter." *Science Advances* 9, no. 36 (2023): eadg7481.

[J6] Ziliang Hong, Emadeldeen Hamdan, Yifei Zhao, Tianxiao Ye, **Hongyi Pan**, and Ahmet Enis Cetin. "Wildfire detection via transfer learning: a survey." *Signal, Image and Video Processing* (2023): 1-8.

[C11] Bin Wang, Armstrong Aboah, Zheyuan Zhang, **Hongyi Pan**, and Ulas Bagci. "GazeSAM: Interactive Image Segmentation with Eye Gaze and Segment Anything Model." In *NeurIPS 2023 Workshop on Gaze Meets ML*. 2023.

[C10] **Hongyi Pan**, Erdem Koyuncu, and Ahmet Enis Cetin. "Robust Array Signal Processing Using L1-Kernel-Based Principal Component Analysis." In *2023 IEEE-APS Topical Conference on Antennas and Propagation in Wireless Communications (APWC)*, pp. 113-118. IEEE, 2023.

[C9] **Hongyi Pan**, Xin Zhu, Salih Furkan Atici, and Ahmet Cetin. "A hybrid quantum-classical approach based on the Hadamard transform for the convolutional layer." In *International Conference on Machine Learning*, pp. 26891-26903. PMLR, 2023.

[C8] **Hongyi Pan**\*, Xin Zhu\*, Zhilu Ye\*, Pai-Yen Chen, and Ahmet Enis Cetin. "Real-time wireless ecg-derived respi-

ration rate estimation using an autoencoder with a dct layer.” In *ICASSP 2023-2023 IEEE International Conference on Acoustics, Speech and Signal Processing*, pp. 1-5. IEEE, 2023.

[C7] Salih Atici\*, **Hongyi Pan**\*, Mohammed H. Elnagar, Veerasathpurush Allareddy, Omar Suhaym, Rashid Ansari, and Ahmet Enis Cetin. “Classification of the Cervical Vertebrae Maturation (CVM) Stages Using the Tripod Network.” In *ICASSP 2023-2023 IEEE International Conference on Acoustics, Speech and Signal Processing*, pp. 1-5. IEEE, 2023.

[C6] Ahmet Enis Cetin and **Hongyi Pan**. “Hybrid Binary Neural Networks: A Tutorial Review.” In *2023 IEEE 41st VLSI Test Symposium*, pp. 1-12. IEEE, 2023.

[J5] **Hongyi Pan**, Diaan Badawi, Ishaan Bassi, Sule Ozev, and Ahmet Enis Cetin. “Detecting anomaly in chemical sensors via L1-kernel-based principal component analysis.” *IEEE Sensors Letters* 6, no. 10 (2022): 1-4.

[J4] **Hongyi Pan**, Diaan Badawi, and Ahmet Enis Cetin. “Block walsh–hadamard transform-based binary layers in deep neural networks.” *ACM Transactions on Embedded Computing Systems* 21, no. 6 (2022): 1-25.

[C5] **Hongyi Pan**, Diaan Badawi, Chang Chen, Adam Watts, Erdem Koyuncu, and Ahmet Enis Cetin. “Deep Neural Network with Walsh-Hadamard Transform Layer For Ember Detection during a Wildfire.” In *2022 IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops*, pp. 256-265. IEEE, 2022.

[C4] **Hongyi Pan**, Diaan Badawi, Runxuan Miao, Erdem Koyuncu, and Ahmet Enis Cetin. “Multiplication-avoiding variant of power iteration with applications.” In *ICASSP 2022-2022 IEEE International Conference on Acoustics, Speech and Signal Processing*, pp. 5608-5612. IEEE, 2022.

[C3] **Hongyi Pan**, Diaan Badawi, and Ahmet Enis Cetin. “Fast Walsh-Hadamard Transform and Smooth-Thresholding Based Binary Layers in Deep Neural Networks.” In *2021 IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops*, pp. 4645-4654. IEEE, 2021.

[C2] **Hongyi Pan**, Diaan Badawi, Erdem Koyuncu, and A. Enis Cetin. “Robust Principal Component Analysis Using a Novel Kernel Related with the  $L_1$ -Norm.” In *2021 29th European Signal Processing Conference*, pp. 2189-2193. IEEE, 2021.

[C1] **Hongyi Pan**, Diaan Badawi, and Ahmet Enis Cetin. “Fourier domain pruning of mobilenet-v2 with application to video based wildfire detection.” In *2020 25th International Conference on Pattern Recognition*, pp. 1015-1022. IEEE, 2021.

[J3] **Hongyi Pan**, Diaan Badawi, and Ahmet Enis Cetin. “Computationally efficient wildfire detection method using a deep convolutional network pruned via fourier analysis.” *Sensors* 20, no. 10 (2020): 2891.

[J2] Diaan Badawi, **Hongyi Pan**, Sinan Cem Cetin, and A. Enis Cetin. “Computationally efficient spatio-temporal dynamic texture recognition for volatile organic compound (voc) leakage detection in industrial plants.” *IEEE Journal of Selected Topics in Signal Processing* 14, no. 4 (2020): 676-687.

[J1] **Hongyi Pan**, Diaan Badawi, Xi Zhang, and Ahmet Enis Cetin. “Additive neural network for forest fire detection.” *Signal, Image and Video Processing* 14 (2020): 675-682.

## Reviewer Services

**Journals:** Signal, Image and Video Processing; Fire Technology; IEEE Sensors Journal; IEEE Transactions on Neural Networks and Learning Systems; IEEE Transactions on Medical Imaging; IEEE Journal of Biomedical and Health Informatics; ACM Transactions on Embedded Computing Systems; Plos Ones; Medical Image Analysis.

**Conferences:** IEEE International Conference on Acoustics, Speech, and Signal Processing 2023&2024; International Conference on Machine Learning 2023.

## Skills

**Programming Languages:** Python3, MATLAB, C, C++, LaTeX.

**Scientific Tools/Software:** PyTorch, TensorFlow, MATLAB, Octave, Altium Designer, Multisim, Proteus, SolidWorks, Onshape, Photoshop, LTSpice, Microsoft Office, ...

**Operating Systems:** Windows, Linux (Ubuntu, Raspbian), Mac OS.

**Microcontrollers:** Raspberry Pi, Nvidia Jetson Nano, Arduino, STM32, MSP430, 80C51.

**Musical Instruments:** Piano.

## Language

Mandarin Chinese (native), English (fluent).