Gabe Guo

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Google Scholar: https://scholar.google.com/citations?user=3yn4k9IAAAAJ&hl=en&oi=ao

Research Interests

Computational materials science, biometrics, robust representation learning

Education

Stanford University Palo Alto, CA, USA
Ph.D. in Computer Science 09/2024 –
DOE CSGF Fellow
Advisor: TBD

Columbia University New York, NY, USA
B.S. in Computer Science (Intelligent Systems) 09/2020 – 05/2024
Advisors: Prof. Hod Lipson, Prof. Tony Dear *GPA: 4.06/4.33*

SUNY Buffalo Buffalo, NY, USA
Credits in Computer Science and Math 06/2016 – 07/2019
Dual Enrollment Programs for Gifted Youth *GPA: 4.00/4.00*

Publications

Unveiling Intra-Person Fingerprint Similarity via Deep Contrastive Learning
Gabe Guo, Aniv Ray, Miles Izydorczak, Judah Goldfeder, Hod Lipson, Wenyao Xu.
https://www.science.org/doi/10.1126/sciadv.adi0329
Science Advances, Vol. 10, Issue 2, 2024.

MSLife: Digital Behavioral Phenotyping of Multiple Sclerosis Symptoms in the Wild Using Wearables and Graph-Based Statistical Analysis
Gabriel Guo, Hanbin Zhang, Liuyi Yao, Huining Li, Chenhan Xu, Zhengxiong Li, Wenyao Xu.
PACM IMWUT, 2021.

PDLens: Smartphone Knows Drug Efectiveness among Parkinson's via Daily-Life Activity Fusion
Hanbin Zhang, Gabriel Guo, Chen Song, Chenhan Xu, Kevin Cheung, Jasleen Alexis, Huining Li, Dongmei Li, Kun Wang, Wenyao Xu
ACM MobiCom, 2020.

RehabPhone: A Sotware-Defined Tool using 3D Printing and Smartphones for Personalized Home-based Rehabilitation

Hanbin Zhang, Gabriel Guo, Emery Comstock, Baicheng Chen, Xingyu Chen, Chen Song, Jerry Ajay, Jeanne Langan, Sutanuka Bhattacharjya, Lora A Cavuoto, Wenyao Xu
ACM MobiSys, 2020.

Demo Abstract: BIGHand - A Bilateral, Integrated, and Gamified Handgrip Stroke Rehabilitation System for Independent at-Home Exercise
Emery Comstock, Gabriel Guo, Wenyao Xu
ACM SenSys, 2019.

ARMove: A Smartphone Augmented Reality Exergaming System for Upper and Lower Extremities Stroke Rehabilitation: Demo Abstract
Gabriel Guo, Joshua Segal, Hanbin Zhang, Wenyao Xu.
ACM SenSys, 2019.

In Progress

DeepCollide: Scalable Data-Driven High DoF Configuration Space Modeling using Implicit Neural Representations
Gabriel Guo, Judah Goldfeder, Aniv Ray, Tony Dear, Hod Lipson.
https://arxiv.org/abs/2305.15376
Under revision at *IEEE Transactions on Robotics*, 2024.

Towards End-to-End Structure Determination from X-Ray Diffraction Data Using Deep Learning
Gabe Guo, Judah Goldfeder, Ling Lan, Aniv Ray, Albert Hanming Yang, Boyuan Chen, Simon JL Billinge, Hod Lipson.
https://arxiv.org/abs/2312.15136
Under revision at *npj Computational Materials*, 2024.

XRDnet: *Ab Initio* Nanostructure Solutions from PXRD via Score-Based Generative Modeling
Gabe Guo, Tristan Saidi, Maxwell W Terban, Simon JL Billinge, Hod Lipson.
To be submitted, 2024.

Research Experience

Creative Machines Lab (Columbia University)
Mentor: Professor Hod Lipson 06/2022 – 08/2024
Led research projects in: contrastive learning for cross-finger biometric recognition (patent pending), learning-based configuration space approximation, and deep 3D generative modeling for crystallography.

Billinge Group (Columbia University)
Mentor: Professor Simon Billinge 12/2023 – 08/2024
Leading research projects in: score-based generative models for nanostructure solutions from x-ray diffraction patterns, generative modeling of electron density fields.

Zemel Group (Columbia University)
Mentor: Professor Richard Zemel 03/2024 – 08/2024
Leading research project in uncertainty-aware self-supervised learning.

NSF REU in Biometrics
Mentor: Professor Wenyao Xu 05/2021 – 08/2021
Led deep learning research project in which we were the first in the world to discover the intra-person fingerprint correlation.

Embedded Sensors and Computing Lab (SUNY Buffalo)
Mentor: Professor Wenyao Xu 05/2018 – 04/2021
Various research projects in smart health, ubiquitous computing, and HCI. Started as a high school student.

Teaching Experience

Head Teaching Assistant, Computer Science (Columbia University)
Mentor: Professor Tony Dear 09/2023 – 05/2024
Created homeworks and exams, coordinated TA team, and organized weekly recitations for COMS 3203 (Discrete Mathematics) and COMS 4733 (Computational Robotics), in addition to typical TA responsibilities.

Teaching Assistant, Computer Science (Columbia University)
Mentor: Professor Tony Dear 09/2021 – 05/2023
Hosted office hours, graded homeworks, and taught recitations. Classes include: COMS 3251 (Computational Linear Algebra), COMS 3203 (Discrete Mathematics), COMS 4701 (Artificial Intelligence).

Industry Experience

Oliver Wyman New York, NY, USA
Consulting Intern Summer 2023

L3Harris Palm Bay, FL, USA
Software Engineering Intern Summer 2022

G Squared Web Development Buffalo, NY, USA
Self-Employed 2018 – 2022

Skills

Programming
Proficient in: Python (and associated libraries), Java.
Familiar with: C, C#, HTML, CSS, JavaScript, PHP, SQL, Bash.

Community Service

Columbia Engineering Student Council New York, NY, USA
Vice President 05/2022 – 05/2024
Representative 09/2021 – 05/2022

Organized and led various school spirit events attended by thousands of students. Spearheaded communications to student body. Collaborated with admins to improve schoolwide policies, including expanded fitness center hours, 24-hour dining hall service, and pass-fail grading.

Invited Talks

The New Era of Fingerprint Biometrics: Revealing Cross-Digit Similarity via Deep Contrastive Learning, CSE 709 (Graduate Seminar on IoT and Biometrics), University at Buffalo, Buffalo, NY, USA, November 3, 2023

The New Era of Fingerprint Biometrics: Revealing Cross-Digit Similarity via Deep Contrastive Learning, Seminar on Forensic Science in the Age of AI, New Jersey Association of Forensic Scientists, Newark, NJ, USA, May 10, 2024

Selected Press

CNN	"Are fingerprints unique? Not really, AI-based study finds"
BBC	"Our fingerprints may not be unique, claims AI"
BBC Science Focus	"Your fingerprints aren't unique after all, discovers AI"
Business Insider	"A college senior used AI . . . "
NPR Science Friday	"Is Each Fingerprint On Your Hand Unique?"
The Times	"AI can now link two separate fingerprints from same person"
The Sun	"AI YOU KIDDING?"
The Register	"AI flips the script on fingerprint lore"
Metro	"AI smashes the idea that all fingerprints are unique"
Daily Mail	"Our fingerprints may NOT be unique, study finds"
EuroNews	"Could AI improve forensics?"
New Scientist	"AI can tell if prints from two different fingers"
Live Science	"Forensic scientists have a new fingerprint-matching tool"
The National Desk	"AI finds new way to pair unmatchable fingerprints"
The Naked Scientists	"AI fingerprint breakthrough could aid future forensics"
Courthouse News	"AI disproves differences between same-hand fingerprints"
The Messenger	"Shocking New Fingerprints Study Could Solve Cold Cases"
Science Alert	"Groundbreaking Study Reveals Your Fingerprints . . . "
Futurism	"AI study claims human fingerprints . . . "
IFLScience	"AI Overturns Claim That Every Human Fingerprint Is Unique"
Biometric Update	"AI innovates in forensic biometrics"
The Financial Express	"Our fingerprints may not be unique, claims AI"
Business Day	"AI discovers that not every fingerprint is unique"
WION	"US university uses AI to prove our fingerprints are not unique"
WBAY Action 2	"3 BRILLIANT MINUTES: A.I. for doctors and detectives"
iHeartRadio Krime Podcast	"AI Discovers Fingerprints are Not Unique"

Awards

Department of Energy: Computational Science Graduate Fellowship	April 2024
NSF GRFP (Declined)	April 2024
Kosoresow Award for Excellence in Teaching (Columbia CS)	May 2024

Other Interests	Music composition and performance, film production, strength training, Bible study.