Alan Dingtian **ZHANG** Senior Scientist @ Hyperfine

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Overview: I am a senior scientist at Hyperfine, Inc., creating human sensing and electromagnetic interference (EMI) suppression technologies for the world's first portable magnetic resonance imaging (MRI) system, with a track of U.S. Food and Drug Administration (FDA)-cleared product updates and several patents. I received my Computer Science Ph.D. at Ubicomp Group, Georgia Tech, with my thesis on ubiquitous self-powered ambient light sensing surfaces that enable implicit activity detection and explicit interactions on everyday surfaces. My work in ubiquitous and wearable computing was featured in 10+ peer-reviewed publications and distinguished paper awards.

Research Interest: Ubiquitous & wearable computing, self-powered sensing, signal processing, and machine learning

Employment

Present	Hyperfine, Inc., Senior Scientist (2022 – Present) Research Scientist (2021 – 2022)	
2021	Leading the research & development of patient motion sensing and EMI noise cancellation technologies	
	for the world's first FDA-cleared, portable, ultra-low-field portable MRI. Work featured in 2 FDA-cleared soft-	
	ware updates, 1 peer-reviewed journal paper, 2 non-provisional patents (pending), and multiple provi-	
	sional patents.	
	> Developed and deployed FDA 510(k)-cleared patent-pending core algorithms for EMI noise cancel-	
	lation, which improved image signal-to-noise ration (SNR) for all sequences. Researched and op-	
	timized interference suppression methods with physical and statistical modeling of the signal and	
	noise changing over time, followed by noise removal using signal processing (e.g., filtering) and ma-	
	chine learning techniques.	
	> Developing several patent-pending EMI noise cancellation hardware and software, including noise	
	sensors, EMI shielding, sequences, and algorithms, in the next generation product and improved its	
	performance against various types of self-generated and environmental EMI sources.	
	> Researching and developing MR-compatible, low-latency, high-accuracy external-sensor-based mo-	
	tion tracking technologies for subtle (e.g., respiratory, cardiovascular) and bulk patient motion track-	
ing. Exploring various sensing modalities for motion tracking including capacitive, or		
	pressure sensing. Developed motion sensing hardware and soltware prototypes for ultra-tow-field	
	MRI Scaliner and Imaging Sequences.	
2021	Georgia Institute of Technology. Graduate Research Assistant	
2015	Founding fellow of the Internet of Materials (IOM) project, an unconventional post-Moore computing ini-	
	tiative to weave computation into the fabric of everyday surfaces and address its grand challenges such	
	as scale, power, form factors, and privacy. Demonstrated novel techniques for ubiquitous and wearable	
	computing through 10+ peer-reviewed publications, patents, and awards.	
	> Researched ubiquitous self-powered ambient light sensing surfaces based on flexible electronics. Led	
	an interdisciplinary team to exploit ambient light fluctuations at the surface level of everyday ob-	
	jects and developed two human activity sensing systems, OptoSense (Ubicomp'20 Distinguished Pa-	
	per) and the computational photodetector (npj Flexible Electronics). OptoSense demonstrated self-	
	powered sensing of implicit human activities and explicit interactions using arrays of photodetectors	
	and flexible photovoltaic cells. Computational photodetectors use arbitrarily shaped and intercon-	
	nected organic photodiodes to extract motion information of nearby objects in the analog domain to	
	achieve self-powered and privacy-preserving human activity detection.	
	> Researched and developed self-sustained ubiquitous sensory systems: Serpentine (CHI'19), Ubiqui-	
	Touch (Ubicomp'20), and AutoSense (IEEE Pervasive Computing). Serpentine is a self-powered de-	
	formable cord based on triboelectric nanogenerators and leverages machine learning to recognize	
	input gestures such as twirl and pull for smart garment applications. UbiquiTouch is a self-power	
	wireless touch interface communicating to a nearby smartphone using ambient FM backscatter. Au-	
	toSense harnesses energy from wind, light, vibration, and heat in and around the automobile to power	
	add-on sensors.	
	> Researched novel input techniques for mobile and wearable devices leveraging machine learning	
	and a rich set of sensors (e.g., accelerometer, gyroscope, microphone) in the work of BeyondTouch	
	(ISWC'16) and Whoosh (IUI'15). BeyondTouch enriches the input experience of a commodity smart-	
	phone with tapping and sliding gestures on and around the device. Whoosh recognizes non-voice	
	input such as blows or sip-and-puff to complement touch and speech on a commodity smartwatch.	
	Ubiquitous computing wearable computing Seit-powered sensing Electronic prototyping Machine learning	

Summer 2018	Facebook, Inc., Machine Learning PhD Intern Researched machine learning algorithms for building meaningful connections between users and groups. Developed features, metrics, and models that improved existing content recommendation performance. Visualized and analyzed key factors in predicting user's online social behavior. Machine learning Ranking Content recommendation Feature engineering	
Summer 2017	 Disney Research, Research Associate Intern Worked under Dr. Alanson Sample and Prof. Scott Hudson to develop a 3D fabrication pipeline that produces paper-based board books with embedded interactive elements — sensing (capacitive, vibrational, magnetic, and optical) and actuation (visual, audible, and mechanical) for storytelling. 3D printing Electronic prototyping Sensing & actuation 	
Summer 2016	Technicolor Research, Research & Innovation Intern Worked under Dr. Kent Lyons to explore continuous finger tracking with 5 degrees of freedom with mag- netic sensing. Developed a wearable prototype that tracks finger-mounted permanent magnets with wrist- worn magnetometers and particle filter. Finger tracking Wearable input Magnetic sensing	
Summer 2014	2Dme, <i>Technical Co-Founder</i> Co-founded the startup and led the technology development & showcasing with successful admission to the incubator Bizdom. Led a team of engineers and designers to develop 2D avatar-based chatting application with real-time facial expression capturing. Co-developed vision-based facial expression mapping and animation mechanisms. Entrepreneurship Mixed-reality Computer vision	

EDUCATION

2021 2015	Georgia Institute of Technology, School of Interactive Computing Ph.D. Computer Science Ubicomp Group. Advisor: Dr. Gregory D. Abowd Thesis: Ubiquitous self-powered ambient light sensing surfaces
2015	Georgia Institute of Technology
2013	M.S. Computer Science
2013	Tsinghua University
2009	B.S. Computer Science and Technology

Awards

2021	Distinguished Paper Award at ACM Ubicomp 2021
2020	Center for Research into Novel Computing Hierarchies (CRNCH) Ph.D. Research Fellowship

Skills

Software	e Python (PyTorch, TensorFlow, OpenCV, Pandas, Plotly), C/C++ (Linux, embedded programming), Java (An-	
	droid), C# (Unity3D), Javascript, Docker, AWS	
Hardware	Circuit design (EagleCAD, KiCad), electronic prototyping, embedded systems (Teensy, Android, Raspberry	
	Pi), Inkjet & 3D printing, robotics (Epson VT6L)	

PROFESSIONAL SERVICE

ReviewerACM Conference on Human Factors in Computing Systems (CHI)
ACM International joint conference on Pervasive and Ubiquitous Computing / International Symposium on
Wearable Computers (Ubicomp/ISWC)
ACM Symposium on User Interface Software and Technology (UIST)
ACM Conference on Creativity & Cognition (C & C)
IEEE Internet of Things (IoT) Journal

MICELLANEOUS

Outdoor Activity & Martial Arts	Completed full Marathon (Beijing 2010); avid hiker, swimmer, and Muay Thai kickboxer
Piano	Certified amateur pianist; multiple-time choir accompanist
Language	Mandarin (Native), English (Fluent)

PUBLICATIONS

- [1] Padormo, F., Cawley, P., Dillon, L., ..., **Zhang, D.**, ..., and Hajnal, J. V. 2023. In vivo T1 mapping of neonatal brain tissue at 64 mT. Magnetic Resonance in Medicine, **89**(3), 1016-1025 (2023).
- [2] Zhang, D., Fuentes-Hernandez, C., Vijayan, R., Zhang, Y., Li, Y., Park, J.W., Wang, Y., Zhao, Y., Arora, N., Mirzazadeh, A., Do, Y., Cheng, T., Swaminathan, S., Starner, T., Andrew, T.L. and Abowd, G.D.. 2022. Flexible Computational Photodetectors for Self-Powered Activity Sensing. *Npj Flexible Electronics* 6(1), 1-8 (2022).
- [3] Do, Y., Park, J.W., Wu, Y., Basu, A., **Zhang, D.**, Abowd, G.D. and Das, S.. 2022. Smart Webcam Cover: Exploring the Design of an Intelligent Webcam Cover to Improve Usability and Trust. In *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*. IMWUT '21. ACM, New York, NY.
- [4] Park, J.W., Cheng, T., **Zhang, D.**, Zhao, Y., Arriaga, R.I., Starner, T., Gupta, M., Zhang, Y. and Abowd, G.D.. 2021. Applying Compute-proximal Energy Harvesting to Develop Self-Sustained Systems for Automobiles. *IEEE Pervasive Computing*.
- [5] Zhang, D., Park, J.W., Zhang, Y., Zhao, Y., Wang, Y., Li, Y., Bhagwat, T., Chou, W.F., Jia, X., Fuentes-Hernandez, C., Kippelen, B., Starner T. and Abowd, G.D.. 2020. OptoSense: Towards Ubiquitous Self-Powered Ambient Light Sensing Surfaces (Distinguished Paper Award). In *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*. IMWUT '20. ACM, New York, NY.
- [6] Waghmare, A., Xue, Q., **Zhang, D.**, Zhao, Y., Mittal, S., Arora, N., Byrne, C., Starner, T. and Abowd, G.D.. 2020. UbiquiTouch: Self sustaining ubiquitous touch interfaces. In *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*. IMWUT '20. ACM, New York, NY.
- Shahmiri, F., Chen, C., Waghmare, A., Zhang, D., Mittal, S., Zhang, S.L., Wang, Y.C., Wang, Z.L., Starner, T. and Abowd, G.D..
 Serpentine: A self-powered reversibly deformable cord sensor for human input. In *Proceedings of the 2019 CHI* Conference on Human Factors in Computing Systems. CHI '19. ACM, New York, NY.
- [8] Reyes, G., **Zhang, D.**, Ghosh, S., Shah, P., Wu, J., Parnami, A., Bercik, B., Starner, T., Abowd, G.D. and Edwards, W.K.. 2016. Whoosh: non-voice acoustics for low-cost, hands-free, and rapid input on smartwatches. In *Proceedings of the 2016 ACM International Symposium on Wearable Computers*. ISWC '16. ACM, New York, NY.
- [9] MacIntyre, B., Zhang, D., Jones, R., Solomon, A., Disalvo, E. and Guzdial, M.. 2016. Using projection ar to add design studio pedagogy to a cs classroom. In *2016 IEEE Virtual Reality (VR)*.
- [10] Zhang, C., Guo, A., Zhang, D., Li, Y., Southern, C., Arriaga, R.I. and Abowd, G.D.. 2016. Beyond the touchscreen: an exploration of extending interactions on commodity smartphones. In ACM Transactions on Interactive Intelligent Systems (TiiS). TiiS '16. ACM, New York, NY.
- [11] Zhang, C., Guo, A., **Zhang, D.**, Southern, C., Arriaga, R. and Abowd, G.D.. 2015. Beyondtouch: Extending the input language with built-in sensors on commodity smartphones. In *Proceedings of the 20th International Conference on Intelligent User Interfaces* (pp. 67-77).
- [12] Davis, N.M., Popova, Y., Sysoev, I., Hsiao, C.P., **Zhang, D.** and Magerko, B. 2014. Building Artistic Computer Colleagues with an Enactive Model of Creativity. In 2014 International Conference on Computational Creativity (ICCC).

Awarded Patents

- [1] Hamidi-Rad, S., Lyons, K., and Zhang, A.. 2020. Method and apparatus for providing immersive reality content.
- [2] Shahmiri, F., Chen, C., Abowd, G.D., Mittal, S., Starner, T., Wang, Y.C., Wang, Z.L., **Zhang, D.**, Zhang, S.L., and Waghmare, A.. 2020. Flexible sensing interface systems and methods.
- [3] Hamidi-Rad, S., Lyons, K., Pushparaja, A., Agarwal, G., **Zhang, A.**, Kanchinadam, T., and Khurana, R. 2018. Determining full-body pose for a virtual reality environment.