GUANGYU XU

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University of Massachusetts, 100 Natural Resources Road, Amherst, MA 01003

EMPLOYMENT

UNIV. OF MASSACHUSETTS, AMHERST — Amherst, MA

Associate Professor, Electrical and Computer Engineering — *2022 - present*

Associate Professor (adjunct), Biomedical Engineering — *2022 - present*

Assistant Professor, Electrical and Computer Engineering — *2016 - 2021*

EDUCATION

UNIV. OF CALIFORNIA, LOS ANGELES — Los Angeles, CA

Ph.D., Electrical Engineering — *2006-2011*

TSINGHUA UNIVERSITY — Beijing, China

Master of Science, Electrical Engineering — *2003-2006*

TSINGHUA UNIVERSITY — Beijing, China

Bachelor of Science, Fundamental Sciences — *2000-2003*

RESEARCH INTEREST

Neuroengineering, Precision Medicine, Nanotechnology, Bioinformatics, Retinomorphic Imaging, Machine Vision.

PROFESSIONAL EXPERIENCE

MIT MEDIA LAB, ED BOYDEN LAB — Cambridge, MA

Postdoctoral Associate — *2014 - 2016*

- **Development of spatially multiplexed multi-signal cellular imaging technologies**

HARVARD UNIVERSITY, DONHEE HAM LAB — Cambridge, MA

Postdoctoral Fellow — *2011- 2014*

- **Development of high-performance all-electrical DNA chip technologies**

UCLA, KANG WANG LAB — Los Angeles, CA

Graduate Research Assistant — *2006-2011*

- **Variability effects and scaling behavior in graphene electronics**

LAWRENCE BERKELEY NATIONAL LAB, MOLECULAR FOUNDRY — Berkeley, CA

Guest Researcher — *2009-2010*

- **Low frequency noise spectroscopy in graphene nanostructures**

TSINGHUA UNIVERSITY, NANO-OPTOELECTRONICS LAB — Beijing, China

Graduate Research Assistant — *2003-2006*

- **Micro-structured fiber and Bragg fiber design**

TEACHING AND MENTORING EXPERIENCE

UMASS AMHERST — Amherst, MA

Instructor, ECE 697BS, 597/697BE*:* Introduction to Biosensors and Bioelectronics — *Spring 2016, 2018, 2020, 2021*

Instructor, ECE 310, 323, 324: Electronics I and II — *Fall 2016 – Fall 2017, Fall 2018 – Fall 2019, Fall 2020*

Instructor, ECE 696, 796, ChemE 496: Independent Study — *Spring 2016, Fall 2018 – Spring 2019*

Instructor, ECE 415, 416: Senior Design Project I, II — *Fall 2017 – Spring 2018*

MIT MEDIA LAB — Cambridge, MA

Tutoring two graduate students: molecular biology and cell imaging — *Spring 2015 – Fall 2015*

UCLA Los Angeles, CA

Teaching Assistant, EE121B: Principles of Semiconductor Device Design *Spring 2008*

Teaching Assistant, EE122L: Semiconductor Devices Laboratory *Spring 2008*

Teaching Assistant, EE122L: Semiconductor Devices Laboratory *Winter 2008*

Tutoring two graduate students: characterization and modeling in carbon electronics *Fall 2008 – Fall 2010*

BOOK CHAPTERS

1. J. Abbott, D. Ham, and G. Xu, "All-Electrical Graphene DNA Sensor Array", **Biosensors and Biodetection: Methods and Protocols, Volume 2: Electrochemical, Bioelectronic, Piezoelectric, Cellular and Molecular Biosensors, Springer,** 169-187 (2017).

JOURNAL PAPERS (+Graduate student advisee, ++Undergraduate student advisee)

1. D. Mao+, Z. Xiong+, M. Donnelly+, and G. Xu, "Brushing-Assisted Two-Color Quantum-Dot Micro-LED Array Towards Bi-Directional Optogenetics", **IEEE Electron Device Lett.**, 42, 1504-1507 (2021)
2. Z. Xiong+, K. Ren, M. Donnelly+, M. You, and G. Xu, "Spectrally Filtered Photodiode Pairs for On-Chip Ratiometric Aptasensing of Cytokine Dynamics", **Sens. Actuators B Chem,** 345, 130330 (2021).
3. F. Sun+, Z. Xiong+, J. Park+, and G. Xu, "Close-Packed PEDOT:PSS-Coated Graphene Microelectrodes for High-Resolution Interrogation of Neural Activity", **IEEE Trans. Electron Devices**, 68, 3080-3086 (2021).
4. M. Kokabi+, M. Donnelly+, and G. Xu, "Benchmarking Small-Dataset Structure-Activity-Relationship Models for Prediction of Wnt Signaling Inhibition", **IEEE Access**, 8, 228831-228840 (2020)
5. J. Park+, F. Sun+, Y. Xie++, Z. Xiong+, and G. Xu, "Low-Impedance Low-Artifact PEDOT:PSS-Coated Graphene Electrodes Towards High Density Optogenetic Electrophysiology", **IEEE Electron Device Lett.**, 41, 1261-1264 (2020)
6. D. Mao+, N. Li, Z. Xiong+, Y. Sun, and G. Xu, "Single-Cell Optogenetic Control of Calcium Signaling with a High-Density Micro-LED array", **iScience,** 21, 403-412, doi: 10.1016/j.isci.2019.10.024 (2019)
7. Z. Xiong+, F. –J. Hwang, F. Sun+, Y. Xie++, D. Mao+, G. –L. Li, and G. Xu. "Spectrally Filtered Passive Si Photodiode Array for On-Chip Fluorescence Imaging of Intracellular Calcium Dynamics", **Sci. Rep.,** 9:9083, doi: 10.1038/s41598-019-45563-8 (2019).
8. M. Donnelly+, D. Mao+, J. Park+, and G. Xu, "Graphene Field-Effect Transistors: The Road to Bioelectronics", **J. Phys. D: Appl. Phys.,** 51: 493001 (2018)
9. L. Lyu+, P. Jaswal++, and G. Xu. "Effect of Channel-Width and Chirality on Graphene Field-Effect Transistor Based Real-Time Biomolecue Sensing", **AIP Adv.,** 8, 035322 (2018).
10. D. Mao+, J. Morley++, Z. Zhang++, M. Donnelly++, and G. Xu. "High-yield passive Si photodiode array towards optical neural recording", **IEEE Electron Device Lett.**, 39, 524-527 (2018).
11. G. Xu, J. Abbott and D. Ham. "Optimization of CMOS-ISFET based Biomolecular Sensing: Analysis and Demonstration in DNA Detection", **IEEE Trans. Electron Devices** 63, 3249-3256 (2016).
12. G. Xu, J. Abbott, L. Qin, K. Yeung, Y. Song, H. Yoon, J. Kong and D. Ham. "Electrophoretic and Field-Effect Graphene for All-Electrical DNA Array Technology", **Nat. Commun.** 5:4866, doi: 10.1038/ncomms5866 (2014).
13. G. Xu, Y. Zhang, X. Duan, A. A. Balandin and K. L .Wang. "Variability Effects in Graphene: Challenges and Opportunities for Device Engineering and Applications", **Proc. IEEE.** 101, 1670-1688 (2013).
14. G. Xu, C. M. Torres, Jr., J. Tang, J. Bai, E. B. Song, Y. Huang, X. Duan, Y. Zhang and K. L. Wang. "Edge Effect on Resistance Scaling Rules in Graphene Nanostructures", **Nano Lett.** 11, 1082-1086 (2011).
15. G. Xu, C. M. Torres, Jr., J. Bai, J. Tang, T. Yu, Y. Huang, X. Duan, Y. Zhang and K. L. Wang. "Line-width Roughness in Nanowire-Mask Based Graphene Nanoribbons", **Appl. Phys. Lett.** 98, 243118 (2011).
16. M. Wang, E. B. Song, S. Lee , J. Tang, M. Lang, C. Zeng , G. Xu, Y. Zhou and K. L. Wang. "Quantum Dot Behavior in Bilayer Graphene Nanoribbons", **ACS Nano.** 5, 8769-8773 (2011).
17. E. B. Song, B. Lian, S. M. Kim, S. Lee, T-K. Chung, M. Wang, C. Zeng, G. Xu, K. Wong, Y. Zhou, H. I. Rasool, D. H. Seo, H.-J Chung, J. Heo, S. Seo, and K. L. Wang. "Robust Bi-stable Memory Operation in Single- Layer Graphene Ferroelectric Memory", **Appl. Phys. Lett.** 99, 042109 (2011).
18. G. Xu, C. M. Torres, Jr., Y. Zhang, F. Liu, E. B. Song, M. Wang, Y. Zhou, C. Zeng and K. L. Wang. "Effect of Spatial Charge Inhomogeneity on 1/f Noise Behavior in Graphene", **Nano Lett.** 10, 3312-3317 (2010).

19. G. Xu, C. M. Torres, Jr., E. B. Song, J. Tang, J. Bai, X. Duan, Y. Zhang and K. L. Wang. "Enhanced Conductance Fluctuation by Quantum Confinement Effect in Graphene Nanoribbons", **Nano Lett.** 10, 4590-4594 (2010).
20. G. Xu, J. Bai, C. M. Torres, Jr., E. B. Song, J. Tang, Y. Zhou, X. Duan, Y. Zhang and K. L. Wang. "Low-Noise Submicron Channel Graphene Nanoribbons", **Appl. Phys. Lett.** 97, 019034 (2010).
21. E. B. Song, B. Lian, G. Xu, B. Yuan, C. Zeng, A. Chen, M. Wang, S. Kim, M. Lang, Y. Zhou and K. L. Wang. "Visibility and Raman Spectroscopy of Mono and Bilayer Graphene on Crystalline Silicon", **Appl. Phys. Lett.** 96, 081911 (2010).
22. C. Zeng, M. Wang, Y. Zhou, M. Lang, B. Lian, E. B. Song, G. Xu, J. Tang, C. M. Torres, Jr., and K. L. Wang, "Tunneling Spectroscopy of Metal-Oxide-Graphene Structure", **Appl. Phys. Lett.** 97, 032104 (2010).
23. G. Xu, F. Liu, S. Han, K. Ryu, A. Badmaev, B. Lei, C. Zhou and K. L. Wang. "Low-Frequency Noise in Top- Gated Ambipolar Carbon Nanotube Field Effect Transistors", **Appl. Phys. Lett.** 92, 223114 (2008).
24. G. Xu, W. Zhang, Y. Huang and J. Peng. "Loss Characteristics of Single-HE_{11}-Mode Bragg Fiber", **IEEE J. Lightwave Technol.** 25, 359-366 (2007).
25. G. Xu, W. Zhang, Y. Huang and J. Peng. "Large Dispersion Properties and Nonlinear Effects in Up/Down Doping Honeycomb Photonic Crystal Fiber", **Opt. Eng.** 45, 125004, (2006).

CONFERENCE PAPERS/TALKS (+Graduate student advisee, ++Undergraduate student advisee)

1. Z. Xiong+, K. Ren, M. Donnelly+, M. You, and G. Xu, "Label-Free Ratiometric Monitoring of Interferon Gamma Dynamics with Spectrally Filtered Si Photodiode Pairs", **Conference on Lasers and Electro-Optics (CLEO),** AF2Q.5, San Jose (2021).
2. D. Mao+, Z. Xiong+, M. Donnelly+, and G. Xu, "High-Density Two-Color Micro-LED Array Based on Brushing-Assisted Micropatterning of Quantum Dots", **Conference on Lasers and Electro-Optics (CLEO),** SW2F.2, San Jose (2021).
3. F. Sun+, Z. Xiong+, J. Park+, and G. Xu, "High-Resolution Neurostimulation and Optogenetic Electrophysiology with PEDOT:PSS-Coated Graphene", **66th IEEE International Electron Devices Meeting (IEDM),** 14.3.1-14.3.4, San Francisco (2020).
4. J. Park+, D. Mao+, Y. Xie++, Z. Xiong+, and G. Xu, "High-Density Multilayer Graphene Microelectrode Arrays for Optogenetic Electrophysiology in Human Embryonic Kidney Cells", **78th IEEE Device Research Conference (DRC),** 2-H, Columbus (2020).
5. D. Mao+, Z. Xiong+, N. Li, Y. Sun, and G. Xu, "Optogenetic Control of Calcium Signaling in Single Cells via a Micro-LED Array", **Conference on Lasers and Electro-Optics (CLEO),** STh1M.4, San Jose (2020).
6. Z. Xiong+, F- J. Hwang, D. Mao+, G. –L. L, and G. Xu, "Color-Filtered Si Photodiode Array for On-Chip Calcium Imaging in Living Cells", **76th IEEE Device Research Conference (DRC),** V-46, 197-198, Santa Barbara (2018).
7. D. Mao+, J. Morley++, Z. Zhang++, M. Donnelly++, and G. Xu. "High-yield passive Si photodiode array towards optical neural recording", **63th IEEE International Electron Devices Meeting (IEDM),** 26.2.1-26.2.4, San Francisco (2017).
8. G. Xu, C. Linghu, K. Piatkevich, K. Adamala, and E. Boyden. "Simultaneous Imaging of Multiple Signaling Pathways in a Living Cell through Spatial Scaffolding", **MIT Department of Brain and Cognitive Sciences Interview Day Poster Session,** Cambridge (2016).
9. K. Piatkevich, E. Jung, G. Xu, F. Chen, and E. Boyden. "Engineering Tools for Mapping Brain Computations", **Junior Scientist Workshop on Protein Engineering: Making and Using Tools for Neuroscience and Other Biological Problems**, Janelia Research campus, Ashburn (2016).
10. G. Xu, K. Piatkevich, K. Adamala, and E. Boyden. "Spatial Multiplexing for Simultaneous Imaging of Multiple Signaling Pathways in a Living Cell", 734.11/DD27, **Society for Neuroscience**, Chicago (2015).
11. N. Sun, Y. Liu. L. Qin, G. Xu and D. Ham. "Solid-State and Biological Systems Interface", **38th ESSCIRC Meeting,** pp. 14-17, Boareaux, France, **invited paper and plenary talk** (2012).
12. G. Xu, C. M. Torres Jr., J. Bai, J. Tang, X. Duan, Y. Zhang and K. L. Wang. "Effect of Edge Disorders on the Scaling Behaviors of Graphene Nanostructures", AA11.4, **MRS Fall Meeting**, Boston (2011).
13. G. Xu, Y. Zhang, F. Liu, X. Duan, Y. Huang and K. L. Wang. "Electronic Transport in Graphene and Graphene Nanoribbons", P21, **DOE BES E-Beam Microcharacterization Centers and Nanoscale Science Research Centers Contractors' Meeting**, The Westin Annapolis (2011).
14. G. Xu, C. M. Torres, Jr., X. Duan, Y. Zhang and K. L. Wang. "Variability Effects in Graphene: Probing its Charge Distribution, Band Structure and Scaling Behavior", P36, **Nature Conference - Graphene: The Road to**

Applications, Boston (2011).

15. G. Xu, C. M. Torres, Jr., E. B. Song, J. Tang, J. Bai, X. Duan, Y. Zhang and K. L. Wang. "Low-Frequency Noise of Graphene Nanostructures for Device and Material Characterizations", Y6.7, **MRS Spring Meeting**, San Francisco (2011).
16. G. Xu, C. M. Torres, Jr., E. B. Song, J. Tang, J. Bai, X. Duan, Y. Zhang and K. L. Wang. "Enhanced Conductance Fluctuation by Quantum Confinement Effect in Graphene Nanoribbons", T37.00008, **APS March Meeting**, Dallas (2011).
17. G. Xu, J. Bai, C. M. Torres Jr., E. B. Song, J. Tang, Y. Zhou, X. Duan, Y. Zhang, Y. Huang and K. L. Wang. "Nanowire-Mask Based Fabrication of High Mobility and Low Noise Graphene Nanoribbon Short-Channel Field-Effect Transistors", **68th IEEE Device Research Conference (DRC)**, III-11, 71-72, Notre Dame (2010).
18. G. Xu, C. M. Torres, Jr., Y. Zhang, F. Liu, E. B. Song, M. Wang, Y. Zhou, C. Zeng and K. L. Wang. "Electron-Hole Puddle Induced Scattering and 1/f Noise Behavior in Graphene", **APS March Meeting**, BAPS.2010.MAR.L21.9, Portland (2010).
19. G. Xu, C. M. Torres, Jr., Y. Zhang, F. Liu, E. B. Song, M. Wang, Y. Zhou, C. Zeng, and K. L. Wang. "Effect of Spatial Charge Inhomogeneity on 1/f Noise Behavior in Graphene", **8th International Workshop on Future Information Processing Technologies**, Kyoto, Japan, **invited** (2010).
20. G. Xu, Y. Zhang and K. L. Wang. "Effect of Spatial Charge Inhomogeneity on 1/f Noise Behavior in Graphene", **16th International Conference on Superlattices, Nanostructures and Nanodevices**, IT-27, Beijing, China, **invited** (2010).
21. K. L. Wang, G. Xu and C. M. Torres. "Random Telegraph Signal and Flicker Noise in Carbon Electronics: Carbon Nanotube and Graphene", **LBNL ALS/TMF User Meeting**, Berkeley, **invited** (2009).
22. G. Xu, C. M. Torres, Jr., Y. Zhang, F. Liu, E. B. Song, M. Wang, Y. Zhou, C. Zeng and K. L. Wang. "Electron-Hole Puddle Related Scattering in Graphene", **LBNL ALS/TMF User Meeting**, TMF-34D-CARB, Berkeley (2009).
23. E. Song, B. Lian, C. Zeng, G. Xu, Y. Zhou, C. M. Torres, M. Wang and K. Wang. "Fundamental Studies of Graphene on Crystalline Silicon", **Nano-DDS Conference**, IV (S1) Graphene #3, Fort Lauderdale (2009).
24. G. Xu, F. Liu, S. Han, K. Ryu, A. Badmaev, C. Zhou and K. L. Wang. "Low-Frequency Noise in Top-Gated Ambipolar Carbon Nanotube Field-Effect Transistors", **APS March Meeting**, BAPS.2008.MAR.B35.3, New Orleans (2008).
25. G. Xu, W. Zhang, Y. Huang, and J. Peng. "Optical Properties of Solid Core Honeycomb Photonic Crystal Fiber with Different Doping Levels", **20th International Optics Conference**, Proc. SPIE, 6025, 602505, Changchun, China (2006).

PATENTS

1. G. Xu, "Spectrally Filtered Photodiode Pair", U.S. Non-Provisional Application No.: 63/154,867, Filed on 2/23/2022 (2022).

INVITED SEMINARS

1. University of Michigan Ann Arbor, MI, January 2022.
2. Washington University in St. Louis, MO, April 2021.
3. Massachusetts Institute of Technology, MA, March 2021.
4. University of Massachusetts Amherst, MA, September 2020.
5. Raytheon BBN Technologies, MA, June 2020.
6. University of Southern California, CA, June 2018.
7. University of Massachusetts Medical School, MA, April 2016.
8. Worcester Polytechnic Institute, MA, March 2016.
9. Washington University in St. Louis, MO, May 2015.
10. Ohio State University, Columbus, OH, November 2014.

PROFESSIONAL SERVICE

IEEE MEMS Technical Program Committee:

Bio and Medical MEMS, August 2021 – now;

IEEE NER 2021 Mini-Symposium, Organizer:

Advanced Neurotechnologies for the Central and Peripheral Nervous System, May 2021;

IEEE EMBC 2020 Workshop, Organizer:

Advancing neural interfaces and neurotechnologies towards improved understanding of the brain (canceled);

IEEE IEDM Technical Program Committee, Session Co-chair:

Sensors, MEMS, and Bioelectronics, June 2019 – May 2021;

NSF Panelist:

EPMD - Bioelectronics and Sensors, February 2017;

CCSS - Wearable and Implantable Systems and Neurotechnology, March 2018;

NCS - Integrative Understandings of Neural and Cognitive Systems, May 2019, May 2020, May 2021;

SenSE - Multimodal Sensor Systems for Precision Health Enabled by Data Harnessing, Artificial Intelligence, and Learning, July 2020;

SCH - Smart Health and Biomedical Research in the Era of Artificial Intelligence and Advanced Data Science, April 2021;

NIH Panelist:

BNVT - Bioengineering of Neuroscience, Vision Technologies, March 2021;

Samsung Electronics Panelist:

Information and Communications Technology-based Convergence Grant Program, August 2017.

Reviewer:

Proceedings of the IEEE, Nano Letters, ACS Nano, Scientific Reports, Journal of American Chemistry Society, Chemical Society Reviews, Applied Physics Letters, IEEE Transactions on Biomedical Circuits and Systems, IEEE Transactions on Electronic Devices, IEEE Electron Device Letters, Nanotechnology, among others.

IEEE Senior Membership:

Electron Devices Society, Micro Electro Mechanical Systems Technical Community, February 2022 – now;

University and College Service:

Department space committee – Department of Biomedical Engineering, 2016;

Faculty search committee – ECE-IALS joint hire on bioelectronics, 2017;

ECE graduate seminar committee, 2017 – now;

Faculty search committee – Department of Biomedical Engineering, 2018;

Department personnel committee – Department of Biomedical Engineering, 2019 – now.