

BO MI LEE, PHD

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CURRENT EMPLOYMENT

Postdoctoral Research Fellow in Computer Science, University of California, Davis, CA

Apr 2019 – Present

EDUCATION

Ph.D. in Structural Engineering

Mar 2019

University of California, San Diego, CA
University of California, Davis, CA

Dissertation: Model-enabled Design of Nano-structured Thin Film Sensors

Advisor: Prof. Kenneth J. Loh

M.S. in Civil and Environmental Engineering

Aug 2011

Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea

Thesis: Performance Enhancement of Vibration-based Energy Harvesting Systems for Civil Engineering Applications

Advisor: Prof. Hyung-Jo Jung

B.S. in Applied Physics

Aug 2009

Hanyang University, Ansan, South Korea

Advisor: Prof. Dong-Soo Shin

Graduated with Honors

WORK EXPERIENCE

Researcher, Korea Institute of Construction Technology (KICT), Goyang, South Korea

2011 – 2012

RESEARCH EXPERIENCES

Postdoctoral Researcher

2019 – Present

University of California, Davis

Advisor: Prof. Ilias Tagkopoulos

- Design and implement conductive nanomaterial-based sensors to detect volatile organic compounds in human breath for diagnostic applications.

Graduate Student Researcher

2013 – 2019

University of California, San Diego

University of California, Davis

Advisor: Prof. Kenneth J. Loh

- Developed a distributed strain sensor using carbon nanotube (CNT)-based nanocomposites and the principle of electrical time-domain reflectometry.
- Developed a computational model of conductive nanofiller (CN)-based thin films to investigate the relationship between the bulk electrical and electromechanical behavior and various parameters (*e.g.*, CN length, density, and dispersed shapes).
- Applied a model-enabled design approach for assembling CNT-based thin film sensors.
- Characterized the surface topography of nanocomposites using micro- and nano-scale microscope images and image processing.

- Fabricated carbon nanotube-based strain sensors using various bottom up fabrication techniques including spray coating, layer-by-layer, vacuum filtration, PCB printing, and evaluated their strain sensing behavior.

Researcher

2011 – 2012

Korea Institute of Construction Technology (KICT), Goyang, South Korea

- Supervisor: Dr. Ki Tae Park
- Project: Development of Patch/Implant System based on IT technology for Safe Management of Large Scale-Structure

Graduate Research Assistant

2009 – 2011

Korea Advanced Institute of Science and Technology, Daejeon, South Korea

- Advisor: Hyung-Jo Jung
- Proposed a new design of piezoelectric energy harvesting systems to improve energy generation efficiency

TECHNICAL SKILLS

Fabrication Techniques: Fused deposition modeling, spin coating, spray fabrication, sputtering, vacuum filtration, layer-by-layer deposition, and PCB printing

Microscopy and Measurements: Atomic force microscopy (AFM), scanning electron microscopy (SEM), optical microscopy, and Raman spectroscopy

Mechanical Testing: tensile compression test and three-point bending test

Computer and Programming: MATLAB, SAP 2000, COMSOL, AutoCAD, Fusion 360, Adobe Illustrator, and Microsoft Applications

HONORS AND AWARDS

Dissertation Fellowship, University of California, San Diego	2018
Best Symposium Paper for the American Society of Mechanical Engineers (ASME) Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS)	2018
Graduate Research Fellowship, University of California, San Diego	2016-2018
National Science Foundation (NSF) Scholarship for the 2014 Asia-Pacific Summer School at National Taiwan University	2014
Graduate Research Fellowship, University of California, Davis	2013-2016
U-city Fellowship, Ministry of Land, Infrastructure and Transport, South Korea	2009-2001
Award for Academic Excellence, Hanyang University, South Korea	2009
Multiple Merit-Based Scholarships, Hanyang University, South Korea	2005-2009

PUBLICATIONS

Peer-Reviewed Journal Publications

1. **B. M. Lee**, Z. Huang, and K. J. Loh, 2020, “Effect of Carbon Nanotube Alignment on Nanocomposite Sensing Performance,” *Material Research Express*, IOP, Accepted.
2. **B. M. Lee**, K. J. Loh, and F. Lanza di Scalea, 2018, “Distributed Strain Sensing Using Electrical Time Domain Reflectometry with Nanocomposites,” *IEEE Sensors*, IEEE, 18(23), 9515-9525, DOI: 10.1109/JSEN.2018.2872910.
3. **B. M. Lee** and K. J. Loh, 2017, “Carbon Nanotube Thin Film Strain Sensors: Comparison between Experimental Tests and Numerical Simulations,” *Nanotechnology*, IOP, 28(15), 1-15, DOI: 10.1088/1361-6528/aa6382 (This work is featured by IOP Publishing: Highlights of 2017).
4. **B. M. Lee**, K. J. Loh, and Y. S. Yang, 2017, “Carbon Nanotube Thin Film Strain Sensor Models Assembled using Nano- and Micro-Scale Imaging,” *Computational Mechanics*, Springer, 60(1), 39-49, DOI: 10.1007/s00466-017-1391-6.

5. **B. M. Lee** and K. J. Loh, 2015, “A 2D Percolation-based Model for Characterizing the Piezoresistivity of Carbon Nanotube-based Films,” *Journal of Material Science*, Springer, 50(7), 2973-2983, DOI: 10.1007/s10853-015-8862-y.
6. I. H. Kim, H. J. Jung, **B. M. Lee**, and S. J. Jang, 2011, “Broadband Energy-Harvesting Using A Two Degree-of-Freedom Vibration Body,” *Applied Physics Letters*, AIP, 98, 214102/1-3, DOI: 10.1063/1.3595278.

Journal Papers in Preparation

1. **B. M. Lee**, F. Li, I. Tagkopoulos, “Reduced Graphene-based Sensors for Detection of Biomarkers in Breath,” *Sensors*, MDPI (Expected submission, Sep. 2020).

Conference Papers

1. **B. M. Lee**, K. J. Loh, and F. Lanza di Scalea, “Distributed Strain Sensing Using Carbon Nanotube Thin Film and Electrical Time-Domain Reflectometry,” *Proceedings of the ASME 2018 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, San Antonio, TX, September 10-12, 2018 (Best Symposium Paper).
2. **B. M. Lee**, Long Wang, and K. J. Loh, “Characterization of Carbon Nanotube Strain Sensors using Experimental Tests and Percolation Modeling,” *Proceedings of the 10th International Workshop on Structural Health Monitoring*, Stanford, CA, September 1-3, 2015.
3. **B. M. Lee**, K. J. Loh, A. Burton, and B. R. Loyola, “Modeling the Electromechanical and Strain Response of Carbon Nanotube-based Nanocomposites,” *Proceedings of SPIE – 21st Annual Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA, March 9-13, 2014.
4. **B. M. Lee**, K. T. Park, Y. J. Yu, and J. H. Lee, “Energy Harvesting for Standalone 3D Position Detection System Based on IMU Sensing Methodology,” *Proceedings of the 37th Korean Society of Civil Engineering*, Goyang, South Korea, November 2-4, 2011.
5. **B. M. Lee**, I. H. Kim, and H. J. Jung, “Studying Efficiency of Different Geometric Designs of Vibration-based Energy Harvesting,” *Proceedings of the 36th Korean Society of Civil Engineering*, Incheon, South Korea, October 20-22, 2010.

Book Contributions

1. **B. M. Lee**, S. Gupta, K. J. Loh, and S. Nagarajaiah, “Strain Sensing and Structural Health Monitoring Using Nanofilms and Nanocomposites,” *Innovative Developments of Advanced Multifunctional Nanocomposites in Civil and Structural Engineering*, (eds. K. J. Loh and S. Nagarajaiah), Elsevier, Kidlington, England, 2016.
2. K. J. Loh, D. Ryu, and **B. M. Lee**, “Bio-inspired Sensors for Structural Health Monitoring,” *Biotechnologies and Biomimetics for Civil Engineering*, (eds. F. P. Torgal, J. A. Labrincha, M. V. Diamanti, C. P. Yu, and H. K. Lee), Springer, London, England, 2014.

Patent

1. K. T. Park, Y. J. Yoo, J. H. Lee, and **B. M. Lee**, “Apparatus for Position-Information of Underground Pipe having Prominence Impact Absorbing Member,” Korea Patent (Serial No. 10-2011-0123989).

ORAL PRESENTATIONS

Invited Talk

1. **B. M. Lee** and K. J. Loh, “Nanostructured Thin Film Sensors and Urban Resilience,” The Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong, October 22, 2019.
2. **B. M. Lee** and K. J. Loh, “Model-Enabled Design of Carbon Nanotube Thin Film Sensors,” University of California, San Diego, CA, March 5, 2018.
3. **B. M. Lee** and K. J. Loh, “Numerical Simulations of Carbon Nanotube Thin Film Strain Sensors,” KAIST, Daejeon, South Korea, August 16, 2017.

Conference Oral Presentations

1. "Model-Enabled Design of Carbon Nanotube-Polymer Thin Film Strain Sensors," *ASME 2018 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, San Antonio, TX, September 11, 2018.
2. "Distributed Strain Sensing Using Carbon Nanotube Thin Film and Electrical Time-Domain Reflectometry," *ASME 2018 Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, San Antonio, TX, September 10, 2018.
3. "Carbon Nanotube Thin Film Strain Sensor Models from Image Analysis," *Engineering Mechanics Institute Conference*, San Diego, CA, June 5, 2017.
4. "Characterization of Carbon Nanotube Strain Sensors Using Experimental Tests and Percolation Modeling," *10th International Workshop on Structural Health Monitoring*, Stanford, CA, September 1, 2015.
5. "Numerical Investigation of Carbon Nanotube-based Thin Film Piezoresistivity," *The 10th International Workshop on Advanced Smart Materials and Smart Structures Technology*, Taipei, Taiwan, August 2, 2014.
6. "Modeling the Electromechanical and Strain Response of Carbon Nanotube-based Nanocomposites," *SPIE Annual Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA, March 11, 2014.
7. "Efficiency Improvement of Piezoelectric Vibration Energy Harvesting Device," *International Conference on Computational & Experimental Engineering and Sciences*, Nanjing, China, April 20, 2011.

Conference Poster Presentations

1. **B. M. Lee**, K. J. Loh, "Model-enabled Design of Carbon Nanotube Thin Film Sensor," Asian Deans' Forum 2019 The Rising Stars Women in Engineering, Seoul, South Korea, October 24-27, 2019.
2. **B. M. Lee**, L. Wang, S. Gupta, M. Funderburk, H. J. Lee, F. Azhari, and K. J. Loh, "Engineering Scalable Multifunctional and Stimuli-responsive Nanocomposites," *Center for Extreme Events Research (CEER) Summit*, San Diego, CA, February 22, 2017.
3. **B. M. Lee**, K. T. Park, Y. J. Yu, and J. H. Lee, "Energy Harvesting for Standalone 3D Position Detection System Based on IMU Sensing Methodology," *37th Korean Society of Civil Engineering*, Goyang, South Korea, November 2-4, 2011.
4. **B. M. Lee**, I. H. Kim, and H. J. Jung, "Studying Efficiency of Different Geometric designs of Vibration-based Energy Harvesting," *36th Korean Society of Civil Engineering*, Incheon, South Korea, October 20-22, 2010.

TEACHING AND MENTORSHIP EXPERIENCES

Graduate Student Mentor

2016 – 2019

University of California, San Diego

Mentored an undergraduate student Mr. Zachary Huang on a project "Alignment of Multi-Walled Carbon Nanotubes (MWCNTs) in Composites Induced by Dielectrophoresis"

Graduate Student Instructor

University of California, Davis

ENG104L Mechanics of Material Laboratory

Winter 2016

ECI213 Structural Dynamics

Winter 2015

SYNERGISTIC ACTIVITIES

Shortlisted participant for *2019 Asian Dean's Forum The Rising Stars Women in Engineering Workshop*

Organizing student member for *2017 Engineering Mechanics Institute Conference*

Organizing student member for *10th International Workshop on Structural Health Monitoring*

Student participant for *2015 Asia-Pacific Summer School on Smart Structures Technology*, Taipei, Taiwan

PROFESSIONAL EXPERIENCE

Journal Reviewer, *Sensors*, MDPI

Conference Session Co-chair, *2018 ASME SMASIS*

PROFESSIONAL MEMBERSHIPS

American Society of Mechanical Engineer (ASME)

American Society of Civil Engineers (ASCE)

The International Society for Optical Engineering (SPIE)

Korean-American Scientists and Engineers Association (KSEA)

Korean Society of Civil Engineers (KSCE), Student Member