

Ahmed Allam

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PROFILE

A well-rounded PhD with research experience in acoustics and automation, as well as strong communication skills gained through teaching and working with multidisciplinary teams from academia and the industry. Special experience in:

- Smart materials and piezoelectric transducers
- Analytical and numerical modeling (COMSOL/MATLAB)
- Data acquisition and signal processing (LabVIEW/MATLAB/C)
- Phased array systems and ultrasonic NDE
- Automation and mechatronics systems design
- Commercial software development (C/Java/Python)

EDUCATION

Georgia Institute of Technology. Atlanta, GA

PhD in Mechanical Engineering. 2021
Focus: Acoustics and Vibration. Minor: Automation, Robotics and Control GPA: 4.0
Dissertation: Acoustic Power Transfer Leveraging Piezoelectricity and Metamaterials.
Advisers: Prof. Alper Erturk – Prof. Karim Sabra

Ain Shams University. Cairo, Egypt

MSc in Mechanical Engineering. 2017
Thesis: Wave Propagation Control Using Active Acoustic Metamaterials GPA: 3.9
BSc in Mechatronics Engineering with High Honors. 2012
Graduation Project: Development of Piezoelectric Harvester Subjected to Magnetic Constraining Field GPA: 3.88

EXPERIENCE

Smart Structures and Dynamical Systems Lab ([SSDSL](#)), Georgia Tech. Atlanta, GA Jan. 2018 – Present

Post-doctoral fellow (Sept 2021 – Present), Graduate Research Assistant (Jan 2018 – Aug 2021)

Contributed to 3 funded research projects under the supervision of Prof. Alper Erturk and Prof. Karim Sabra.

Collaborated with 8 lab peers, 3 visiting scholars, and external collaborators from the industry, national labs, and other universities.

Lab Management:

- Recommended and handled the requisition of key lab equipment including an ultrasonic phased array system, 3D printers, hydrophones, data acquisition systems, and other testing equipment.

Ultrasonic Power and Data Transfer Through Metallic Enclosures:

- Collaborated with Sandia National Labs to develop a portable ultrasonic power transfer system prototype for sealed metallic enclosures. (COMSOL/MATLAB/SolidWorks/Keysight ADS)

Ultrasonic Imaging of 3D-printed Metallic Components:

- Collaborated with engineers from Tronos Inc, and the University of Colorado to develop new techniques for non-destructive testing of 3D-printed aerospace components using phased arrays and scanning laser vibrometry. (Verasonics/Polytech)

Acoustic Power Transfer and Harvesting:

- Constructed and programmed a 3-axis stage for a scanning hydrophone setup. (SolidWorks/MATLAB/LabVIEW)
- Designed, 3D-printed, and experimentally tested the first 3D lens for focusing aqueous ultrasonic waves using graded phononic crystals/metamaterials concepts. (COMSOL/MATLAB/AUTOCAD)
- Created and tested an airborne sound energy harvesting system leveraging phononic crystals for enhanced electric power output. (COMSOL/MATLAB/AUTOCAD)
- Developed new analytical models to simulate acoustic power transfer systems with practical transducer sizes. (Mathematica)
- Teamed with a visiting scholar to develop a new class of active piezoelectric metamaterials for manipulating surface acoustic waves (COMSOL/MATLAB).

Acoustic Engineer

Worked with a multidisciplinary team of 5 engineers to develop software and hardware solutions for simulating sound propagation in ducts, muffler design, and experimental testing.

SIDLAB Data Acquisition Module:

- Redesigned a software module for exciting loudspeakers & collecting microphone signals using the 4-microphone technique. The new module increased the acquisition speed 5 times without sacrificing accuracy. (LabVIEW/ C/ Labwindows CVI)
- Integrated the module in SIDLAB commercial software for analyzing sound in ducts and acoustic testing automation.

SIDLAB Test Rig:

- Collaborated with a group of multidisciplinary engineers to design, fabricate, and commission 3 setups for acoustic testing of mufflers to customers in the USA, China, Germany, and the UAE.

SIDLAB Sound Transmission Loss Module:

- Created a data acquisition module for testing sound transmission losses in building materials. (JAVA/C/LabVIEW/MATLAB)
- Delivered the module to customers and provided comprehensive training on using the software.

Ain Shams University (ASU). Cairo, Egypt

Aug. 2012 – Jan. 2018

Teaching Assistant, Mechatronics Department (March. 2014 – Jan. 2018)

- Conducted labs, recitations, and practical tutorials; held weekly office hours; graded assignments, projects, and exams for undergraduate classes (≈ 50 students per class) including: Modeling of Dynamic Systems (3 sem.), Digital Image Processing, Design of Measurement Systems (2 sem.), Automatic Control (2 sem.), Mechatronic Systems (3 sem.), MEMS.
- Streamlined the assignment of teaching workload among 12 TAs in the mechatronics department.
- Prepared and conducted an introductory class to modeling and simulation using MATLAB and SIMULINK (≈ 12 students).
- Prepared lab material and activities for a C++ programming class.
- Created and published online educational videos for the “Digital Image Processing” class.
- Mentored 6 groups of 4-5 students working on a variety of projects such as integrated measurement systems, mobile robots, articulated robotic arms, and other mechatronics projects.
- Maintained and updated the mechatronics department website and social pages with an outreach of 250 students.

Research Assistant, Group for Advanced Research in Dynamic Systems ASU-GARDS (Sept. 2012 – Jan. 2018)

Worked on several research projects funded by the EU in the fields of acoustics, educational software, vocational education, and virtual reality.

Active Acoustic Metamaterials:

- Designed, modeled, and experimentally tested a new class of active acoustic metamaterials based on the adaptive feedback control of a piezoelectric diaphragm. The material is the 1st to achieve a wide range of actively programmed density. (ANSYS APDL/MATLAB/LabVIEW)

Electronic Laboratories for Engineering Education (TEMPUS-eLab):

- Programmed 3 virtual online laboratory experiments that were integrated into Mechanical Design/Acoustics /Electrochemistry undergraduate courses helping potentially thousands of students. (JAVA)

Academic-Industry Partnership (TEMPUS-AIP):

- Developed teaching material for a new diploma for the development and training of vocational teachers in Egypt.

SKILLS & INTERESTS

Technical:

Proficient: Piezoelectric transducer design, FEA, lumped-parameter modeling, multiphysics modeling & simulation, data acquisition & signal processing, acoustic testing, 3D printing, scanning laser vibrometry, vibration analysis-measurement & control, underwater acoustic measurements, ultrasonic phased arrays, array beamforming, ultrasonic imaging.

Good command: RF and electronic circuit design, microcontrollers, mechanical design, traditional machining.

Programming Languages:

Proficient: MATLAB, C/C++, JAVA. Good command: Python.

Engineering Software:

Proficient: COMSOL Multiphysics, MATLAB, LabVIEW, Labwindows CVI.

Good command: SolidWorks, Keysight ADS, ANSYS APDL, Mathematica, SIMULINK.

Familiar: Autodesk Inventor, Simscape, ANSYS Workbench, AUTOCAD.

Laboratory Equipment:

Proficient at using: Oscilloscopes, DAQs, signal generators, pulsers, impedance analyzers, hydrophones, microphones, power amplifiers, speakers, shakers, accelerometers, laser vibrometers, FDM & SLA 3D printers, laser cutters, bench drills, mills.

Other Software:

Linux (Ubuntu and Debian), Latex, Git, JIRA, Microsoft office.

Languages:

Fluent: English. Native: Arabic. Conversational: French, Spanish.

Hobbies:

Learning new languages, DIY projects, car maintenance, soccer, technology enthusiast.

HONORS AND AWARDS

International student stipend from the Acoustical Society of America (ASA).	2014
Certificate of merit from the Egyptian president for academic achievement.	2013
Excellence award for ranking top of the class.	2007 – 2012

PUBLICATIONS AND CONFERENCES ([GOOGLE SCHOLAR PROFILE](#))

Journal Publications

- **Allam A**, Alfahmi O, Patel H, Sugino C, Harding M, Bishop P, Ruzzene M, & Erturk A, Ultrasonic testing of thick and thin Inconel 625 alloys manufactured by selective laser melting, under prep, Additive Manufacturing.
- **Allam A**, Sugino C, Harding M, Bishop P, Erturk A, & Ruzzene M, Phased Array Ultrasonic Testing of Inconel 625 Produced by Selective Laser Melting, ASME J Nondestructive Evaluation, vol. 4, no. 041006, May 2021.
- **Allam A**, Sabra K, & Erturk A, Sound energy harvesting by leveraging a 3D-printed phononic crystal lens, Applied Physics Letters, vol. 118, no. 10, p. 103504, Mar. 2021. (IF: 3.791)
- **Allam A**, Sabra K, & Erturk A, 3D-printed gradient-index phononic crystal lens for underwater acoustic wave focusing Physical Review Applied, vol. 13, no. 6, p. 064064, June 2020. (IF: 4.985)
- **Allam A**, Sabra K, & Erturk A, Aspect ratio-dependent dynamics of piezoelectric transducers in wireless acoustic power Transfer, IEEE T on Ultrasonics, Ferroelectrics, and Frequency Control, vol. 67, no. 5, pp. 984–996, May 2020. (IF: 2.725)
- Alan S, **Allam A**, & Erturk A, Programmable mode conversion and bandgap formation for surface acoustic waves using piezoelectric metamaterials, Applied Physics Letters, vol. 115, no. 9, p. 093502, Aug 2019. (IF: 3.791)
- **Allam A**, Elsabbagh A, & Akl W, Experimental demonstration of one-dimensional active plate-type acoustic metamaterial with adaptive programmable density, The Journal of Applied Physics, 121(12), 125106, Mar 2017. (IF: 2.286)
- **Allam A**, Elsabbagh A, & Akl W, Modeling and design of two-dimensional membrane-type acoustic metamaterials with tunable anisotropic density, The Journal of the Acoustic Society of America, 140, 3607, Nov 2016. (IF: 1.84)

Conference presentations and publications:

- **Allam A**, Sabra K, & Erturk A, Enhanced Sound Energy Harvesting by Leveraging Gradient-Index Phononic Crystals, in ASME 2020 Conference on Smart Materials, Adaptive Structures & Intelligent Systems, Virtual, Online, 15 Sep 2020.
- **Allam A**, Sugino C, Harding M, Bishop P, Erturk A, Ruzzene M, Ultrasonic inspection of additive manufactured components, QNDE 2020, Virtual, Online Conference, 25 -26 Aug 2020.
- **Allam A**, Sabra K, and Erturk A, Controlling underwater sound propagation using 3-D-printed phononic crystals, 178th Meeting of the Acoustical Society of America, San Diego, California, 2-6 Dec 2019.
- **Allam A**, Sabra K, and Erturk A, Gradient index phononic crystals for manipulating sound in acoustic power transfer applications, Phononics 2019, Tucson, Arizona, 3-7 June 2019.
- Alan S, **Allam A**, and Erturk A, Surface acoustic wave manipulation using piezoelectric metamaterials, Phononics 2019, Tucson, Arizona, 3-7 June 2019.
- **Allam A**, Sabra K, and A. Erturk, Comparison of various models for piezoelectric receivers in wireless acoustic power transfer, in Active and Passive Smart Structures and Integrated Systems XIII, Denver, Colorado, 2019, vol. 10967, p. 109670S.
- **Allam A**, and Elnady T, Characterization of mufflers, in proceedings of the 22nd International Congress on Acoustics, Buenos Aires, Sept. 2016.