

QUANG TRAN, Ph.D.

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EDUCATION

- 2020 **Ph.D., Civil and Environmental Engineering**
University of Illinois at Urbana-Champaign (UIUC)
Non-contact sensing systems and autonomous decision-making for early-age concrete
Advisor: Prof. Jeffery R. Roesler
- 2015 **M.S., Civil and Environmental Engineering**
California State University, Fullerton
Investigation of durability and compressive strength of HPC mixtures and modeling the corrosion initiation time through the electrical resistivity
Advisor: Prof. Pratanu Ghosh
- 2009 **B.E., Industrial System Engineering**
Ho Chi Minh City University of Technology, Vietnam

RESEARCH EXPERTISE AND INTEREST

- Pressure sensing
- Noninvasive characterization of construction materials and biological tissues.
- Ultrasound and microbubble cavitation
- Visual sensing and Deep learning algorithms

RESEARCH EXPERIENCE

- 2021- current **Postdoc Research Fellow**
Harvard Medical School, Boston Children's Hospital, and Brigham and Women's Hospital
Topic: Pressure sensing technique for the heart chambers
- Developed in-vitro dynamic pressure sensing using focused ultrasound, phased array (Verasonics system), and microbubbles such as FDA-approved Definity and pH-responsive self-eliminating microbubbles (IVMB). The subharmonic of IVMB correlates strongly with high and low pulse pressure cases ($R^2 = 0.88$ and 0.81), and the pressure sensitivity of IVMB (0.11 dB/mmHg), which is twice that of Definity microbubbles (0.05 dB/mmHg).
 - Established an intracardiac pressure sensing approach on the Langendorff system by leveraging focused ultrasound, phased array, and microbubbles.

- Studied the effect of a combination of 2 treatments, namely (1) blood-brain barrier opening using focused ultrasound and (2) radiation, on the growth of brain tumors in a rat model.

2020 - 2021 **Postdoc Research Associates**

Bioacoustics Research Lab at the University of Illinois at Urbana-Champaign

Topic: Modeling spatial distribution of scatterers (i.e., liver nuclei) using structure function (SF) to (i) elucidate ultrasonic scattering mechanisms in biological tissues and (ii) characterize tissues properties (i.e., scatterer size and density) for classifying disease type and stages

- Developed a sticky Hard Sphere (SHS) model for characterizing tumor microstructure (4T1, MAT, and EHS tumors) via quantitative ultrasound. The new stickiness parameter provided by SHS is sensitive to the grouping structure in tumor cell distribution. This stickiness parameter, combined with the radius and volume fraction estimated from the SHS model, enables better differentiation between different tumor types than using the radius and volume fraction obtained from the HS model.
- Wrote manuscripts for publications and NIH grant annual reports

2015 –2020 **Graduate Research Assistant**

University of Illinois at Urbana-Champaign

Topic: Developing non-contact sensing systems and autonomous decision-making for early-age concrete

- Developed automatic segmentation and quantification of sawcut joint damage using computer vision (i.e., RGB and RGB-D) and deep neural networks (i.e., Mask R-CNN).
- Developed a new algorithm using normalized transmission wave energy for rapid and non-destructive technique detection of crack under contraction joints with multi ultrasonic sensor array device and machine learning (i.e., support vector machine) with 96.1% classification accuracy
- Developed new fully non-contact ultrasonic techniques to characterize early-age concrete properties (i.e., setting time and near-surface distributed cracking)
- Implemented a field instrumentation program on continuously reinforced concrete pavement on Illinois tollway route 390 using strain gauges, humidity sensors, and temperature sensors
- Drafted manuscripts for publications (reports, journals, and papers) and participated in writing research proposals (FHWA, NCHRP, and UTC)
- Trained two undergraduate students in ultrasonic testing, computer vision, and deep learning algorithms.

2012 – 2015 **Graduate Research Assistant**

California State University, Fullerton

Topic: Investigating durability and compressive strength of HPC mixtures and modeling the corrosion initiation time through the electrical resistivity

- Conducted research on durability and sustainability of high-performance concrete structures related to chloride-induced corrosion attack using electrical resistivity (Funded by university intramural research grant and grants for new faculty from the Dean's office)
- Trained two undergraduate students in electrical resistivity testing and unconfined compression testing.

JOURNAL ARTICLES, PEER REVIEWED

- J15. **Tran Q.**, Han A., and O'Brien Jr W., "Sticky hard sphere model for characterizing tumor microstructure via quantitative ultrasound," IEEE transactions on ultrasonics, 2022 (in progress).
- J14. Tran Q., Balcarcel-Monzon M., Zhang Y., Dominguez S., Sack K., McDannold N., Kheir J., and Peng Y., "In situ generation of acoustic nanobubbles for dynamic pressure sensing," Advanced Sciences, 2022 (in progress).
- J13. **Tran Q.**, Ghosh P, "Variation of Electrical Resistivity and Charge Passed in High-Performance Concrete," Materials, V. 15, No. 19. 2022, pp. 6694, doi: <https://doi.org/10.3390/ma15196694>
- J12. **Tran Q.** and Jeffery JR, "Contactless Ultrasonic Test System for Set Times of Mortar and Concrete," ACI Materials Journal, V. 118, No. 2, 3/1/2021. 2021, doi: <https://doi.org/10.14359/51729328>
- J11. **Tran Q.** and Roesler JR, "Noncontact Ultrasonic and Computer Vision Assessment for Sawcut Initiation Time," Journal of Transportation Engineering Part B: Pavements, V. 146, No. 3. 2020, doi: <https://doi.org/10.1061/JPEODX.0000207>
- J10. **Tran Q.** and Roesler JR, "Rapid detection of concrete joint activation using normalized shear wave transmission energy," International Journal of Pavement Engineering, V. 23, No. 4, 2022/03/21. 2022, pp. 1025-37, doi: <https://doi.org/10.1080/10298436.2020.1785448>.
- J9. **Tran Q.** and Ghosh P, "Influence of pumice on mechanical properties and durability of high performance concrete," Construction and Building Materials, V. 249. 2020, doi: <https://doi.org/10.1016/j.conbuildmat.2020.118741>.
- J8. **Tran Q.**, Ghosh P, Lehner P, and Konečný P, "Determination of time dependent diffusion coefficient aging factor of HPC mixtures," Key Engineering Materials, V. 832. 2020, pp. 11-20, doi: <https://doi.org/10.4028/www.scientific.net/KEM.832.11>.
- J7. Konečný P, Lehner P, Ghosh P, Morávková Z, and **Tran Q.**, "Comparison of procedures for the evaluation of time dependent concrete diffusion coefficient model," Construction and Building Materials, V. 258, 2020/10/20/. 2020, pp. 119535, doi: <https://doi.org/10.1016/j.conbuildmat.2020.119535>.
- J6. Konečný P, Lehner P, Ghosh P, and **Tran Q.**, "Variation of diffusion coefficient for selected binary and ternary concrete mixtures considering concrete aging effect," Key Engineering Materials, V. 761. 2018, pp. 144-147, doi: <https://doi.org/10.4028/www.scientific.net/KEM.761.144> .
- J5. Choi H., Song H., **Tran Q.**, Roesler J. R., and Popovics J. S., "Contactless system for continuous monitoring of early-age concrete properties," Concrete International, V. 38, No. 9. 2016, pp. 35-41.
- J4. Ghosh P. and **Tran Q.**, "Influence of parameters on surface resistivity of concrete," Cement and Concrete Composites, V. 62. 2015, pp. 134-45, doi: <https://doi.org/10.1016/j.cemconcomp.2015.06.003>.
- J3. Ghosh P. and **Tran Q.**, "Correlation between bulk and surface resistivity of concrete," International Journal of Concrete Structures and Materials, V. 9, No. 1. 2015, pp. 119-32, doi: <https://doi.org/10.1007/s40069-014-0094-z>.
- J2. Lehner P., Konečný P., Ghosh P., and **Tran Q.**, "Numerical analysis of chloride diffusion considering time-dependent diffusion coefficient," International Journal of Mathematics and Computers in Simulation, V. 8, No. 1. 2014, pp. 103-6.
- J1. Ghosh P., **Tran Q.** and Le T., "Durability investigation of high-performance concrete mixtures with quality control and quality assurance", International Journal of Engineering, Sciences and Management (IJESM), Vol. 4, Issue 1, 2014.

CONFERENCE PUBLICATIONS

Papers

- C5. **Tran Q.** and Roesler JR, "Paste curing effectiveness with contactless sensing and 2D wavefield analysis" International Conference on Concrete Pavements, 2020, <https://www.doi.org/10.33593/mmj09v6u>.
- C4. **Tran Q.** and Ghosh, P., "Computation of diffusion coefficient and its aging factor for different binary and ternary based concrete mixtures," Transportation Research Board 96th Annual Meeting. No. 17-00502, 2017.
- C3. Ghosh P. and **Tran Q.**, "Influence of significant factors on bulk electrical resistivity of concrete," Transportation Research Board 94th Annual Meeting, No. 15-3023, 2015.
- C2. **Tran Q.**, and Ghosh, P., "Investigation of high-performance concrete by electrical conductivity measurement," In proceedings of conference "The Art of Innovation", California State University, Northridge, June 21st, 2013.
- C1. **Tran Q.** and Ghosh, P, "Influence of supplementary cementitious materials on reduction and variation of charge passed," Transportation Research Board 95th Annual Meeting. No. 16-1195, 2016.

Posters

- P3. **Tran Q.**, McDannold N., Kheir J., Balcarcel-Monzon M., Li R., Dominguez S., and Peng Y., "Acoustic response of pH-responsive self-eliminating microbubbles for dynamic pressure sensing," 10th annual Radiology Research Symposium, Boston, MA, May 2023.
- P2. **Tran Q.** and Roesler JR, "Integration of non-contact ultrasonic and computer vision for sawcut timing," Transportation Research Board 98th Annual Meeting, 2019.
- P1. **Tran, Q.**, Roesler JR, & Popovics J. S., "Rapid detection of contraction joint cracking using normalized shear wave transmission energy technique," Transportation Research Board 97th Annual Meeting. No. 18-05668, 2018.

CONFERENCE AND SEMINAR PRESENTATIONS

- S12. **Tran Q.**, O'Brien Jr W., and Han A., "Sticky hard sphere model for characterizing tumor microstructure via quantitative ultrasound," American Institute of Ultrasound in Medicines, 2023.
- S11. **Tran Q.** and Roesler JR, "Contactless ultrasonic and computer vision for setting time and sawcut timing," Illinois Ready Mixed Concrete Association 2020 Conference, Peoria, Illinois, February 2020.
- S10. **Tran Q.** and Roesler JR, "Integration of non-contact ultrasonic and computer vision for setting time and sawcut timing," Better Concrete Conference, Ames, Iowa, November 2019.
- S9. **Tran Q.** and Roesler JR, "Rapid quantification of sawcut damage using deep learning and RGB-D images," International Airfield and Highway Pavements Conference Site, Illinois, July 2019.
- S8. **Tran Q.** and Roesler JR, "Integration Of Non-Contact Ultrasonic And Computer Vision For Sawcut Timing", 7th International Transportation Ph.D. Student Symposium, The Hong Kong Polytechnic University, Oct 25-26, 2018.
- S7. **Tran Q.** and Roesler JR, "Integration of non-contact ultrasonic and computer vision for sawcut timing," Kent Seminar Series, Illinois, September 2018.
- S6. **Tran, Q.**, Roesler JR, & Popovics JS, "Rapid detection of contraction joint cracking using normalized shear wave transmission energy technique," 6th International Transportation Ph.D. Student Symposium, University of Illinois at Urbana Champaign, Oct 2017.

- S5. **Tran, Q.,** Roesler JR, & Popovics JS, “Rapid detection of contraction joint cracking using normalized shear wave transmission energy technique,” Kent Seminar Series, Illinois, September 2017.
- S4. **Tran Q.,** Choi H., Song H., Roesler JR, and Popovics JS, “Monitoring setting and stiffening of early age concrete using contactless ultrasonic systems,” International Conference on Concrete Pavement 11th, Texas, August 2016.
- S3. **Tran Q.,** Jarrett Hamud, and Ghosh, P, “Investigation of compressive strength and durability of high performance concrete”, In presentation of ACI meeting, California, Fullerton, March, 2014.
- S2. **Tran Q.** and Ghosh, P, “Durability investigation of high performance concrete mixtures”, In presentation of showcase of STEM Student Talent, California State University, Fullerton, May 2013.
- S1. **Tran Q.** and Ghosh, P, “Investigation of high performance concrete by measuring electrical resistivity using two different non-destructive instruments”, In presentation of Student Research Competition, California State University, Fullerton, February 2014.

JOURNAL REVIEW

- 1. Applied Sciences
- 2. Elsevier - Construction and Building Materials
- 3. Journal of Non-destructive Evaluation
- 4. International Journal of Pavement Engineering
- 5. Journal of Materials in Civil Engineering
- 6. Transportation Research Record
- 7. Transportation Research Board
- 8. Journal of King Saud University – Science
- 9. MDPI – Materials
- 10. MDPI – Building
- 11. Applied Science And Engineering Progress

HONORS AND AWARDS

- 2019 1st place Winner of BuiltWorlds Hackathon - Caterpillar
- 2019 Cozad Grand Prize 3rd place winner
- 2016 ACI James Instrument Student Award for Research: “Nondestructive testing of concrete”
- 2014 Dwight David Eisenhower Transportation Fellowship
- 2014 2nd place winner at 28th Annual California State University Student Research Competition
- 2014 CSUF Outstanding Student Scholarly and Creative Activities Award
- 2014 2nd prize winner in the California State University, Fullerton Student Research Competition
- 2013 Civil & Environmental Engineering/ Titan shops scholarship

PATENTS/ INVENTION DISCLOSURE

- 2017 Air-Coupled Ultrasonic System Integrating with Computer Vision for Sawcut Timing, *provisional patent UIUC2018-117-01(PRO) filed.*
- 2020 Automatic joint damage quantification using 3D reconstruction image and deep learning, *invention disclosure.*
- 2020 Rapid quantification of sawcut damage using deep learning and RGB-D images, *invention disclosure.*
- 2020 Concrete Curing Effectiveness with Contactless Ultrasonic Sensing, *invention disclosure.*
- 2020 Algorithm for rapid detection of concrete joint activation, *invention disclosure.*

PROFESSIONAL EXPERIENCE

- 2018 – 2019 **Technical Leader**
DeepWalk Research
- Managed the technical team of the start-up company to build software and application to autonomously detect and quantify damage on sidewalks
- 2009 – 2012 **Project Coordinator**
QUAN DAT façade COMPANY, Ho Chi Minh City, Vietnam
- Responsible administrative tasks for the project manager and team members to keep the Saigon M&C 47-storey façade project running smoothly

MEMBERSHIPS

- 2014 - Current Member, American Concrete Institute (ACI)
- 2018 - Current Member, American Society of Civil Engineers (ASCE)
- 2017-2018 Treasurer, American Concrete Institute
University of Illinois at Urbana Champaign
- 2017-2018 President, Vietnamese Society Community (VSC)
University of Illinois at Urbana Champaign
- 2014 Member, Chi Epsilon at California State University, Fullerton

ADDITIONAL ACTIVITIES

- UIUC Indoor intramural soccer (1st place Fall, 2018 and 2nd placed Fall, 2016)
- UIUC Outdoor intramural soccer (1st place winning Fall, 2017 and 3rd place in Fall, 2016)
- International UIUC Indoor World Cup tournament (1st placed in 2016-2017)
- UIUC COREC indoor soccer (2nd place Fall, 2016)
- Mid-American Cup (1st place Summer, 2016)
- Vietnamese Midwest Soccer Tournament (1st placed Spring, 2016)
- I love table tennis, skiing, traveling, and biking.