

Hossein Kabir

Postdoctoral Research Associate
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Education

- University of Illinois Urbana-Champaign** **2020–2025**
Ph.D. in Civil Engineering
Advisor: Prof. [Nishant Garg](#)
Dissertation: *Accelerating and Automating Sorptivity Measurements in Cementitious Systems via Computer Vision*; [Defense slides](#)
- University of Toronto** **2017–2019**
M.A.Sc. in Civil Engineering
Advisor: Prof. [R. Douglas Hooton](#)
Thesis: *Evaluation of the Autoclave Expansion Test for Cement*; [Defense slides](#)
- Sharif University of Technology** **2012–2016**
B.S. in Civil Engineering

Academic and Professional Appointments

- University of Illinois Urbana-Champaign** **May 2025–Present**
Postdoctoral Research Associate, Department of Mechanical Science and Engineering.
Supervisor: Prof. [William P. King](#).
- University of Illinois Urbana-Champaign** **Sep 2020–May 2025**
Graduate Research Assistant, Department of Civil and Environmental Engineering.
- Braun Intertec Corporation** **Jan 2020–Aug 2020**
Staff Engineer, Consulting Group.
- University of Toronto** **Sep 2017–Dec 2019**
Graduate Research Assistant, Department of Civil and Mineral Engineering.
- PERMAYON Advanced Strengthening Co.** **Jun 2015–Sep 2015**
Engineering Intern (Full-Time), structural strengthening and rehabilitation.

Research Interests

- AI, Automation, and Robotics in Construction
- Reality Capture, Sensing, and Inspection
- Construction Materials and Quality Control
- 3D Reconstruction and Digital Twins
- Additive Manufacturing and 3D Printing
- Sustainable and Resilient Infrastructure

Research Experience

- Computer Vision, 3D Reconstruction, and Digital Twins** **2025–Present**
University of Illinois Urbana-Champaign, Mechanical Science and Engineering
 - Develop computer-vision-based methods for high-precision 3D reconstruction, dimensional measurement, digital-twin generation, and automated inspection of engineered and additively manufactured components.
 - Develop single- and sparse-view reconstruction methods integrating camera calibration, optimal-view selection, depth and surface-normal estimation, geometric reconstruction, and uncertainty-aware validation.
 - Develop data-efficient reality-capture workflows using camera-based imaging, photogrammetry, and 3D measurement technologies for geometric inspection, dimensional verification, change detection, and quality assessment.
 - Develop machine learning methods that reduce the time, data, and specialized equipment required for 3D reconstruction and inspection, enabling more scalable automated measurement and quality-control workflows.

- **Computer Vision for Construction Materials and Infrastructure** **2020–2025**
University of Illinois Urbana-Champaign, Civil and Environmental Engineering
 - Developed computer-vision and machine-learning methods for automated testing and quality control of cementitious and concrete materials, including water transport, sorptivity, surface wettability, reactivity, durability, and performance assessment.
 - Designed imaging, sensing, and data-analysis workflows for rapid and reproducible characterization of conventional, high-performance, and low-carbon construction materials.
 - Developed multi-scale reality-capture and infrastructure-monitoring workflows integrating mobile, drone, and satellite imagery for roadway inspection, deterioration assessment, condition monitoring, and data-informed repair planning.
 - Integrated experimental characterization, advanced sensing, computer vision, and quantitative analysis to investigate material condition, spatial heterogeneity, moisture ingress, durability, and long-term infrastructure performance.
- **Construction Materials, Durability, and Long-Term Performance** **2017–2019**
University of Toronto, Civil and Mineral Engineering
 - Investigated cement and concrete durability, soundness, dimensional stability, and long-term performance as functions of material composition, processing, and environmental exposure.
 - Characterized cementitious materials using SEM/EDS, XRD/QXRD, and TG/DTA and related measured phases and microstructure to expansion, dimensional stability, and macroscopic engineering performance.
 - Studied composition–processing–structure–property relationships governing deterioration resistance, durability, dimensional stability, and service-life performance of cementitious materials.

Peer-Reviewed Journal Articles

1. **Kabir, H.**, Whealton, C. T., & King, W. P. Investigating the Three-Dimensional Reconstruction Accuracy of Additively Manufactured Parts using Structure from Motion. *Manufacturing Letters*, 2026. Accepted, in press.
2. Kulkarni, D. R., **Kabir, H.**, & King, W. P. Smart Sampling for Data-Efficient Three-Dimensional Reconstruction of Additively Manufactured Parts. *Manufacturing Letters*, 2026. Accepted, in press.
3. **Kabir, H.**, Wu, J., Dahal, S., Joo, T., & Garg, N. SorpVision: A Comprehensive Dataset for Cementitious Sorptivity Analysis Powered by Computer Vision. *Scientific Data*, **12**, 904, 2025. [DOI](#).
4. Min, Y., **Kabir, H.**, Kothari, C., Iqbal, M. F., & Garg, N. UR2: Ultra-rapid reactivity test for real-time, low-cost quality control of calcined clays. *Cement and Concrete Research*, **191**, 107806, 2025. [DOI](#).
5. **Kabir, H.**, Wu, J., Dahal, S., Joo, T., & Garg, N. Automated estimation of cementitious sorptivity via computer vision. *Nature Communications*, **15**(1), 9935, 2024. [DOI](#). [GitHub](#).
6. **Kabir, H.**, & Garg, N. Rapid prediction of cementitious initial sorptivity via surface wettability. *npj Materials Degradation*, **7**(1), 52, 2023. [DOI](#).
7. **Kabir, H.**, & Garg, N. Machine learning enabled orthogonal camera goniometry for accurate and robust contact angle measurements. *Scientific Reports*, **13**(1), 1497, 2023. [DOI](#). Recognized in [Engineering Top 100 of 2023](#) (Mar 2024).
8. **Kabir, H.**, & Aghdam, M. M. A generalized 2D Bézier-based solution for stress analysis of notched epoxy resin plates reinforced with graphene nanoplatelets. *Thin-Walled Structures*, **169**, 108484, 2021. [DOI](#).
9. **Kabir, H.**, Hooton, R. D., & Popoff, N. J. Evaluation of cement soundness using the ASTM C151 autoclave expansion test. *Cement and Concrete Research*, **136**, 106159, 2020. [DOI](#).
10. **Kabir, H.**, & Hooton, R. D. Evaluating soundness of concrete containing shrinkage-compensating MgO admixtures. *Construction and Building Materials*, **253**, 119141, 2020. [DOI](#).
11. **Kabir, H.**, & Aghdam, M. M. A robust Bézier-based solution for nonlinear vibration and post-buckling of random checkerboard graphene nanoplatelets reinforced composite beams. *Composite Structures*, **212**, 184–198, 2019. [DOI](#).
12. Kabir, M. Z., Shadan, P., & **Kabir, H.** A numerical and experimental study on the dynamical behavior of 3D-Panel Wall on Piloti RC Frame. *International Journal of Structural Integrity*, **9**(4), 475–490, 2018. [DOI](#).

Manuscripts Under Review

1. **Kabir, H.**, Bimrose, M. V., Whealton, C. T., Conway, C. H., Martin, A. F., Rashid, A., Zheng, W., & King, W. P. Deep Learning Enables 3D Manufacturing Inspection from a Single Image. *In review*, 2026.
2. **Kabir, H.**, Bimrose, M. V., Martin, A. F., Whealton, C. T., Conway, C. H., & King, W. P. Learning Optimal

Views for Accurate 3D Hand Reconstruction and Pose Estimation. *In review*, 2026.

3. Dahal, S., **Kabir, H.**, Tartakovsky, A. M., & Garg, N. Physics-Informed Discovery of Nonlinear Moisture Diffusivity in Cementitious Pastes from Sparse X-ray Radiographs. *In review*, 2026.
4. **Kabir, H.**, & Khodadadi, N. Physics-Informed Learning of Alkali-Silica Reaction Expansion Kinetics. *In review*, 2026.
5. Rashid, A., Whealton, C. T., Bimrose, M. V., Zheng, W., Conway, C. H., **Kabir, H.**, & King, W. P. Additive manufacturing source identification from internal 3D void structures measured using X-ray computed tomography. *In review*, 2026.
6. Kumar, A., **Kabir, H.**, & Garg, N. Predicting Durability of Precast Concrete Blocks via Resistivity and Sorptivity. *In review*, 2026.
7. Kothari, C., Iqbal, M. F., **Kabir, H.**, Min, Y., & Garg, N. ER2 - Easy Rapid Rheology Test for Predicting Workability of Cement-Calcined Clay Blends within Five Minutes: Role of Water Uptake. *In review*, 2026.

Patents and Invention Disclosures

- Garg, N., Min, Y., Kothari, C., **Kabir, H.**, & Iqbal, M. F. Methods of analyzing supplementary cementitious materials (SCMs) and predicting the behavior of SCMs in cementitious mixtures. International Patent Application No. PCT/US2024/046689; publication No. WO2025059518. [WIPO Patentscope](#).
- King, W. P., **Kabir, H.**, Bimrose, M. V., & Conway, C. Methods and systems for creating digital twins from point clouds. *Invention disclosure submitted to the University of Illinois Urbana-Champaign Office of Technology Management*.
- King, W. P., **Kabir, H.**, Bimrose, M. V., & Conway, C. Methods and systems for physically accurate 3D digital twins. *Invention disclosure submitted to the University of Illinois Urbana-Champaign Office of Technology Management*.
- **Kabir, H.**, Kumar, A., & Garg, N. Surface-wettability-based system and methods for rapid durability assessment of cementitious and concrete materials. *Invention disclosure submitted to the University of Illinois Urbana-Champaign Office of Technology Management*.

Research Funding and Proposal Contributions

- **iCAP Grant** **Jan 2025**
Automated Waste Sorting via Computer Vision and Robotics: A Feasibility Study
Illinois Green Fund and Student Sustainability Committee; award amount: \$181,000. [Project](#)
Role: Contributed to proposal writing and development for Prof. [Nishant Garg](#)'s group.
- **NSF I-Corps Regional and National Programs** **Aug 2023**
Venture-team participant; awards: \$5,000 and \$50,000 to Prof. [Nishant Garg](#)'s group. [NSF award and certificate](#)
Role: Contributed to proposal preparation and customer-discovery activities.
- **iCAP Grant** **Dec 2022**
Low-Cost Inspection and Sustainable Repair for Campus Pavements
Illinois Green Fund and Student Sustainability Committee; award amount: \$76,000. [Project](#)
Role: Contributed to proposal writing and development for Prof. [Nishant Garg](#)'s group.

Honors and Awards

- **S. P. Shah Fellowship, American Concrete Institute** **Apr 2024**
Award: \$10,000. [Link](#)
- **Teachers Ranked as Excellent** **Fall 2023**
Outstanding instructor rating, University of Illinois Urbana-Champaign. [List](#), [TA Evaluation](#).
- **Trailblazers in Engineering Fellowship** **Jul 2025**
Competitive selection, Purdue University, IN. [Link](#)
- **Stanford Rising Stars in Mechanical Engineering Award** **Sep 2026**
Competitive selection, Stanford University, Palo Alto, CA.

- **Emerging Engineering Educators (EMEE) Award** Mar 2026
Competitive selection, Chicago, IL.
- **Giatec Best Paper Award for Sustainability in Construction** Nov 2025
Runner-up, Giatec Scientific Inc. [Link](#)
- **Cozad New Venture Challenge Award** Apr 2025
Team Rapid Analytix Division (RAD), Technology Entrepreneur Center, University of Illinois Urbana-Champaign.
Award: \$5,000. [Link](#) and [presentation](#)
- **STEP Academic-Professional Development Award** Sep 2025
The Grainger College of Engineering, University of Illinois Urbana-Champaign.
- **Blueprint Tough Tech Commercialization Program** Oct 2024
Selected with Team Rapid Analytix Division for The Engine's competitive tough-tech commercialization program. [Certificate](#)
- **Conference Poster Award, Second Place** Nov 2019
ACI Fall Convention, Committee 123, Cincinnati, OH, USA. [Link](#)
- **Conference Travel Awards** 2022–2025
American Concrete Institute Spring and Fall Conventions: Orlando (2022), New Orleans (2024), Philadelphia (2024), and Baltimore (2025).

Teaching Experience

- **ME 470: Senior Design Project** Fall 2025
Co-Instructor, University of Illinois Urbana-Champaign; instructed a senior design team applying photogrammetry to manufacturing inspection and 3D reconstruction; guided data collection, digital-twin generation, validation, and presentations.
- **Graduate Academy Microteaching** Aug 2025
Instructor, University of Illinois Urbana-Champaign; observed teaching sessions, provided feedback, and facilitated group debriefs for a program serving more than 700 graduate teaching assistants.
[Acknowledgment](#)
- **Programming and Computing** Fall 2024; Spring 2025
Co-Instructor, University of Illinois Urbana-Champaign; contributed to syllabus and assignment development, help sessions, office hours, and grading for the inaugural course offering.
- **CEE 300: Behavior of Materials** Fall 2023; Spring 2024
Teaching Assistant and Laboratory Instructor, University of Illinois Urbana-Champaign; led discussion, problem-solving, laboratory, and recitation sessions and graded assignments and examinations. Recognized as [Teachers Ranked as Excellent](#) in Fall 2023. [TA Evaluation](#).
- **CIV209H1: Civil Engineering Materials** Spring 2018 and 2019
Teaching Assistant, University of Toronto; supported laboratory demonstrations on engineering-material selection, behavior, and structure-property relationships.
- **C37H3: Numerical Algorithms for Computational Mathematics** Spring and Fall 2018
Teaching Assistant, University of Toronto Scarborough; delivered tutorials, supported computational assignments, and graded homework and examinations.
- **MAT 332H5S: Introduction to Nonlinear Dynamics and Chaos** Fall 2018
Teaching Assistant, University of Toronto; facilitated tutorials and problem-solving sessions and supported grading.
- **CME261H1: Engineering Mathematics I** Fall 2017
Teaching Assistant, University of Toronto; led tutorials and graded assignments and examinations.
- **CE 20-111: Mechanics of Materials I** 2015–2016
Teaching Assistant, Sharif University of Technology; supported tutorials and office hours and graded assignments and examinations.

Research Mentoring and Leadership

- **Research Subgroup Lead and Mentor, MechSE, UIUC** **Oct 2025–Present**
Lead and mentor four Ph.D. students in 3D vision, computational photogrammetry, and AI-driven reconstruction; guide project scoping, algorithm development, experimental design, validation, and dissemination.
 - **Alex Jiang**: Single-view 3D reconstruction and optimal-view selection using a rotary imaging rig.
 - **Austin Martin**: Single- and multi-view 3D reconstruction for medical applications, including accuracy and cross-view consistency.
 - **Wonjun Jung**: Computer vision for two-phase heat-transfer analysis and heat-exchanger applications.
 - **Luyun (Bruce) Li**: Online and offline 3D reconstruction from short smartphone videos, emphasizing robustness and real-time constraints.
- **Research Subgroup Lead and Mentor, CEE, UIUC** **Jan 2024–Sep 2025**
Led and mentored two M.S. students on absorption measurements in concrete, masonry, and precast materials; guided algorithm development, experimental design, validation, and dissemination.
 - **Sunav Dahal**: X-ray-based characterization of sorptivity and validation using physics-informed neural networks.
 - **Achyuth Kumar**: Vision-transformer segmentation of wetting fronts for absorption measurements in infrastructure materials.
- **Software Lead, Rapid Analytix Division** **2022–2025**
Led software architecture and analysis pipelines for a venture team developing five-minute, field-deployable, AI-assisted quality control of cementitious materials.
- **Imprint i-Program, Illinois Leadership Center** **Fall 2024**
Completed a leadership seminar series on mentoring, professional transitions, and intentional network building. [Link](#)

Invited Talks and Lectures

1. **Kabir, H.** Chemistry and Production of Portland Cement. Two full-length guest lectures, Behavior of Materials (CEE 300), Department of Civil and Environmental Engineering, University of Illinois Urbana-Champaign, Urbana, IL, USA, 2026.
2. **Kabir, H.** Computer Programming in Cement Chemistry: Methods and Applications. Guest lecture, Advanced Cement Chemistry (CEE 502), Department of Civil and Environmental Engineering, University of Illinois Urbana-Champaign, Urbana, IL, USA, 2026.
3. **Kabir, H.** Automated Sorptivity Analysis for Cementitious Materials: A Framework for Enhanced Durability Assessment. Construction Materials Seminar Series, Department of Civil and Environmental Engineering, University of Illinois Urbana-Champaign, Urbana, IL, USA, 2024. [Flyer](#).
4. **Kabir, H.** Automating Durability Testing in Construction Materials via Computer Vision. Department of Mechanical Science and Engineering (MechSE), University of Illinois Urbana-Champaign, Urbana, IL, USA, 2024.
5. **Kabir, H.** Redesigning Contact Angle Goniometry. SocialFuse, Technology Entrepreneur Center, University of Illinois Urbana-Champaign, Urbana, IL, USA, 2022.

Conference Publications

1. Conway, C. H., Zheng, W., Ji, E., **Kabir, H.**, Ferreira, P., Do, M. N., Tawfick, S., & King, W. P. Investigating Dimensional Accuracy and Repeatability of Small Parts Made Using High-Precision Resin-Based Additive Manufacturing. 54th North American Manufacturing Research Conference (NAMRC 54), Society of Manufacturing Engineers (SME), Penn State University, PA, USA, 2026. [Proceedings](#).
2. Kumar, Y. A., **Kabir, H.**, & Garg, N. Predicting Durability of Precast Concrete Blocks via Resistivity and Sorptivity. TRANS-IPIC UTC Workshop, Chicago, IL, USA, 2026. [Proceedings](#).
3. **Kabir, H.**, Dahal, S., & Garg, N. Computer Vision-Driven Sorptivity Tests for Cementitious Materials. C3 Symposium, Chicago, IL, USA, 2025. [Proceedings](#).
4. **Kabir, H.**, Dahal, S., & Garg, N. Estimating Cementitious Sorptivity via Computer Vision. 4th R. N. Raikar Memorial International Conference & Ghosh-Mukherjee International Symposium, Mumbai, India, 2024. [Proceedings](#).
5. **Kabir, H.**, & Garg, N. Predicting Sorptivity via Surface Wettability. 10th International Conference on Concrete under Severe Conditions (CONSEC24), Chennai, India, 2024. [Proceedings](#).

6. **Kabir, H.**, & Garg, N. Low-Cost and Reliable Contact Angle Goniometry for Cementitious Materials. 16th International Congress on the Chemistry of Cement (ICCC 2023), Bangkok, Thailand, 2023. [Proceedings](#).
7. **Kabir, H.**, Hooton, R. D., & Popoff, N. J. Periclase and the autoclave who cried ‘Wolf!’—Determining the influence of ASTM C151 cement autoclave expansion on the volume stability of concrete. 17th Euroseminar on Microscopy Applied to Building Materials (EMABM), Toronto, ON, Canada, 2019. [Proceedings](#).

Conference Presentations and Posters

1. **Kabir, H.**, Whealton, C. T., & King, W. P. Investigating the Three-Dimensional Reconstruction Accuracy of Additively Manufactured Parts using Structure from Motion. 54th North American Manufacturing Research Conference (NAMRC 54), Penn State University, PA, USA, 2026 (*Oral presentation*).
2. Kulkarni, D. R., **Kabir, H.**, & King, W. P. Smart Sampling for Data-Efficient Three-Dimensional Reconstruction of Additively Manufactured Parts. 54th North American Manufacturing Research Conference (NAMRC 54), Penn State University, PA, USA, 2026 (*Oral presentation*).
3. Conway, C. H., Zheng, W., Ji, E., **Kabir, H.**, Ferreira, P., Do, M. N., Tawfick, S., & King, W. P. Investigating Dimensional Accuracy and Repeatability of Small Parts Made Using High-Precision Resin-Based Additive Manufacturing. 54th North American Manufacturing Research Conference (NAMRC 54), Society of Manufacturing Engineers (SME), Penn State University, PA, USA, 2026 (*Oral presentation*).
4. Kumar, Y. A., **Kabir, H.**, & Garg, N. Predicting Durability of Precast Concrete Blocks via Resistivity and Sorptivity. TRANS-IPIC UTC Workshop, Chicago, IL, USA, 2026 (*Oral presentation*).
5. **Kabir, H.**, Dahal, S., Kumar, A., & Garg, N. Computer Vision for Accelerated and Automated Sorptivity Testing. American Concrete Institute (ACI) Fall Convention, Baltimore, MD, USA, 2025 (*Oral presentation*).
6. **Kabir, H.**, Dahal, S., Kumar, A., & Garg, N. Computer Vision-Driven Sorptivity Tests for Cementitious Materials. C3 Symposium, Chicago, IL, USA, 2025 (*Oral presentation*).
7. Min, Y., **Kabir, H.**, Kothari, C., Iqbal, F., & Garg, N. UR2: Ultra-Rapid Reactivity Test for Real-Time, Low-Cost Quality Control of SCMs. American Concrete Institute (ACI) Spring Convention, Toronto, ON, Canada, 2025 (*Oral presentation*).
8. **Kabir, H.**, Dahal, S., Baten, B., & Garg, N. Accelerating and Automating Sorptivity Measurements via Computer Vision. Shaping the Fate of Low-Carbon Cement Science (LCCS 25), Ascona, Switzerland, 2025 (*Oral presentation*).
9. **Kabir, H.**, Dahal, S., Kumar, A., & Garg, N. Deploying Computer Vision for Rapid Sorptivity Testing. 15th Advances in Cement-Based Materials (ACerS), University of Colorado Boulder, Boulder, CO, USA, 2025 (*Oral presentation*).
10. Min, Y., **Kabir, H.**, Kothari, C., Iqbal, F., & Garg, N. UR2: An Ultra-Rapid Reactivity Test for Supplementary Cementitious Materials. 15th Advances in Cement-Based Materials (ACerS), University of Colorado Boulder, Boulder, CO, USA, 2025 (*Oral presentation*).
11. **Kabir, H.**, Dahal, S., & Garg, N. Automating and Accelerating Sorptivity Measurements Using Computer Vision. Engineering Mechanics Institute (EMI) Conference, Anaheim, CA, USA, 2025 (*Oral presentation*).
12. **Kabir, H.** Real-Time Imaging and AI for Intelligent, Low-Carbon Infrastructure. Trailblazers in Engineering (TBE), Purdue University, West Lafayette, IN, USA, 2025 (*Poster*).
13. **Kabir, H.**, Dahal, S., & Garg, N. Estimating Cementitious Sorptivity via Computer Vision. 4th R. N. Raikar Memorial International Conference & Ghosh–Mukherjee International Symposium, Mumbai, India, 2024 (*Oral presentation*).
14. **Kabir, H.**, & Garg, N. Real-Time Estimation of Cementitious Sorptivity via Computer Vision. American Concrete Institute (ACI) Fall Convention, Philadelphia, PA, USA, 2024 (*Oral presentation*). [Video](#).
15. **Kabir, H.**, & Garg, N. Predicting Sorptivity via Surface Wettability: A Computer Vision Approach. American Concrete Institute (ACI) Spring Convention, New Orleans, LA, USA, 2024 (*Oral presentation*). [Video](#).
16. **Kabir, H.**, & Garg, N. Predicting Sorptivity via Surface Wettability. 10th International Conference on Concrete under Severe Conditions, Chennai, India, 2024 (*Oral presentation*).
17. Min, Y., Kothari, C., Iqbal, F., **Kabir, H.**, & Garg, N. An Ultra-Rapid Reactivity (UR2) Test for Real-Time Quality Control of Calcined Clays. 14th Advances in Cement-Based Materials (ACerS), Missouri University of Science and Technology (Missouri S&T), Rolla, MO, USA, 2024 (*Oral presentation*).
18. **Kabir, H.**, & Garg, N. Sorptivity Prediction in Seconds. Engineering Mechanics Institute Conference and Probabilistic Mechanics & Reliability Conference (EMI/PMC), Chicago, IL, USA, 2024 (*Oral presentation*).
19. **Kabir, H.**, & Garg, N. Initial Sorptivity Prediction in Seconds. Gordon Research Conference: Advanced

Materials for Sustainable Infrastructure Development, Ventura, CA, USA, 2024 (*Poster*).

20. Dahal, S., **Kabir, H.**, & Garg, N. Prediction of Unsaturated Moisture Transport Properties of Cementitious Materials Using Physics-Informed Neural Networks. American Concrete Institute (ACI) Fall Convention, Philadelphia, PA, USA, 2024 (*Poster*).
21. Min, Y., **Kabir, H.**, Kothari, C., Iqbal, F., & Garg, N. An Ultra-Rapid Reactivity (UR2) Test for Real-Time, Low-Cost Quality Control of Calcined Clays. Gordon Research Conference: Advanced Materials for Sustainable Infrastructure Development, Ventura, CA, USA, 2024 (*Poster*).
22. **Kabir, H.**, & Garg, N. Low-Cost Automated Orthogonal Camera Goniometry for Accurate Wettability Assessment. Advances in Cement-Based Materials, Columbia University, New York City, NY, USA, 2023 (*Oral presentation*).
23. **Kabir, H.**, & Hooton, R. D. Evaluating the Autoclave Expansion Test as a Performance Measure of Deleterious Levels of Periclase in Cement. American Concrete Institute (ACI) Fall Convention, Cincinnati, OH, USA, 2019 (*Poster*).

Book Chapter & Technical Report

1. **Kabir, H.**, Kumar, Y. A., & Garg, N. Computer vision for automated sorptivity testing in structural materials. *Artificial Intelligence and Machine Learning in Structural Engineering and Materials*, Elsevier. Accepted, in press.
2. **Kabir, H.**, Samouh, H., & Garg, N. Assessment of road conditions on the University of Illinois campus: Integrating mobile, drone, and satellite imagery. *Student Sustainability Committee, Illinois Climate Action Plan, University of Illinois Urbana-Champaign*, Urbana, IL, 2024. [Report](#).

Professional Service

- **Session Co-Chair, NAMRC 54** **Jun 2026**
Co-chaired two technical sessions at the 54th North American Manufacturing Research Conference, Penn State University.
- **Search Committee Member, Research Engineer Hire, UIUC MechSE** **Spring 2026**
Reviewed applications, interviewed candidates, and recommended finalists for a research engineer position supporting computer-vision and manufacturing research.
- **Exhibit Judge, UIUC Engineering Open House** **Spring 2026**
Evaluated student engineering exhibits at the 2026 Engineering Open House.
- **Conference Service, Transportation and Highway Engineering Conference** **Feb 2026**
Supported organization of the 2026 T.H.E. Conference hosted by UIUC Civil and Environmental Engineering.
- **Poster Judge, ACI Committee 123 Poster Session** **Nov 2025**
ACI Fall Convention, Baltimore, MD, USA.
- **Journal Reviewer** **2024–Present**
Cement and Concrete Research; Cement and Concrete Composites; Composite Structures; Engineering Fracture Mechanics; Construction Innovation; European Journal of Environmental and Civil Engineering; Environment, Development and Sustainability; and [PeerJ Computer Science](#).
- **Conference Service, EMI/PMC** **Jul 2024**
Supported organization of the Engineering Mechanics Institute Conference and Probabilistic Mechanics and Reliability Conference hosted by UIUC.
- **Session Moderator, ACI Spring Convention** **Mar 2024**
Moderated the session “Challenges in AI/ML for the Concrete Industry.”
- **ACI Committee 135, Voting Member** **Apr 2023–Present**
Lead contributing author for the ACI 135 Emerging Technology Report (STAR chapter); coordinate drafting and editing related to AI/ML integration and implications for practice.
- **Graduate Mentor, UIUC ACI Student Chapter** **Spring 2022**
Mentored two undergraduate students for the ACI Spring Concrete Competition, supporting formulation design, mix optimization, and testing. [Team submission](#).

Media Coverage

- **Trailblazers in Engineering Fellow** **Jul 2025**
Purdue College of Engineering and The Grainger College of Engineering. [Purdue](#) and [Illinois](#)
- **Five-Minute Quality-Control Test for Sustainable Cementitious Materials** **Feb 2025**
AZoBuild and Illinois News Bureau coverage of a rapid, field-deployable test for supplementary cementitious materials. [AZoBuild](#) and [Illinois](#)
- **Automated Sorptivity Test for Concrete** **Dec 2024**
The Grainger College of Engineering coverage of a computer-vision-based method for automated water-absorption measurements. [Link](#)
- **S. P. Shah Fellow** **Apr 2024**
The Grainger College of Engineering and American Concrete Institute. [Illinois](#) and [ACI](#)
- **Fast, Automated Test for Cement Durability** **Jul 2023**
Coverage by The American Ceramic Society, Engineers Ireland, EurekAlert, and Illinois News Bureau. [ACerS](#); [Engineers Ireland](#); [EurekAlert](#); [Illinois](#)
- **Headline Feature, ACI SmartBrief** **Jul 2023**
“Fast, Economical Test Gauges Cement Durability.” [Link](#)

Technical Skills

- **Computational and Analytical:** Computer vision; single- and multi-view 3D reconstruction; SfM/MVS; NeRFs and Gaussian splatting; camera calibration; monocular depth and surface-normal estimation; photogrammetric measurement; optical metrology; machine learning and deep learning; numerical modeling and finite element analysis; statistics and design of experiments.
- **Experimental and Imaging:** Laser profilometry; XRD/QXRD; Raman imaging and spectroscopy; SEM/EDS; rheometry; X-ray radiography and CT; FTIR; AFM; ultrasonic pulse velocity; and ultrasonic tomography.
- **Software and Tools:** Python (NumPy, pandas, SciPy, scikit-learn, Matplotlib); PyTorch; OpenCV; MATLAB; R; BoTorch; Git/GitHub; Linux; L^AT_EX; Abaqus; SolidWorks; Autodesk Fusion 360; Blender; nTopology; CloudCompare; and PolyWorks.

Professional Memberships

- American Concrete Institute (ACI)
- Society of Manufacturing Engineers (SME)
- American Ceramic Society (ACerS)
- American Society of Mechanical Engineers (ASME)

References

- **William P. King**
Professor, Department of Mechanical Science and Engineering, University of Illinois Urbana-Champaign
Email: wpk@illinois.edu
- **Nishant Garg**
Associate Professor, Department of Civil and Environmental Engineering, University of Illinois Urbana-Champaign
Email: nishantg@illinois.edu
- **John S. Popovics**
Professor, Department of Civil and Environmental Engineering, University of Illinois Urbana-Champaign
Email: johnpop@illinois.edu
- **R. Douglas Hooton**
Professor Emeritus, Department of Civil & Mineral Engineering, University of Toronto
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- **Karl R. Peterson**
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