Steven K. Ayer, Ph.D., E.I.T.

University of Colorado Boulder
College of Engineering and Applied Sciences
Department of Civil, Environmental,
and Architectural Engineering

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Education:

2013 Ph.D., Architectural Engineering, The Pennsylvania State University
Dissertation:
Sustainability Education of Engineering Students Using Augmented Reality and Simulation Games

2008 M.A.E., Architectural Engineering, The Pennsylvania State University

2008 B.A.E., Architectural Engineering, The Pennsylvania State University

Academic Experience:

2023 – Present Associate Professor, Department of Civil, Environmental, and Architectural Engineering, College of Engineering and Applied Sciences, University of Colorado Boulder

2024 – Present Affiliate Faculty – Engineering Education Program, College of Engineering and Applied Sciences, University of Colorado Boulder

2023 – Present Faculty Director – Civil Engineering, Department of Civil, Environmental, and Architectural Engineering, College of Engineering and Applied Sciences, University of Colorado Boulder

2023 – 2025 Adjunct Professor, Del E. Webb School of Construction, School of Sustainable Engineering and the Built Environment, Ira A. Fulton Schools of Engineering, Arizona State University

2020 – 2023 Associate Professor, Del E. Webb School of Construction, School of Sustainable Engineering and the Built Environment, Ira A. Fulton Schools of Engineering, Arizona State University

2014 – 2020 Assistant Professor, Del E. Webb School of Construction, School of Sustainable Engineering and the Built Environment, Ira A. Fulton Schools of Engineering, Arizona State University

2013 – 2014 Postdoctoral Scholar, The Pennsylvania State University

Industrial Experience:

2013 Clark Construction Group, LLC, Research Intern, Bethesda, MD

- Developed process for improving site planning visualization with SketchUp
- Created and taught course to provide fundamental site utilization modeling skills to employees

2009 – 2010 Bentley Systems, Inc., Research Intern, University Park, PA
- Tested effectiveness of new software tools in development
- Developed an intelligent virtual prototype to aid in facility management with the use of Bentley's ProjectWise Explorer, ProjectWise Administrator, Microstation, Navigator, and DM Studio

2006 – 2008 Gilbane Building Co., Construction Engineering Intern, State College, PA
- Organized BIM coordination efforts using Navisworks, Revit, and AutoCAD
- Developed virtual mock-up using 3D CAD and rendering software

2006 – 2007 The Pennsylvania State University, Lab Assistant, University Park, PA
- Modeled architectural elements of buildings using Revit
- Created instructional videos on how to use lab resources

2004 – 2005 Department of Conservation and Natural Resources, Commonwealth of PA, Engineering Intern, Harrisburg, PA
- Designed waste-water treatment systems for PA State Park facilities
- Tested soil to find percolation rates, designed the system, and prepared permit application documents

Professional Licensure:
2008 Engineer In Training (E.I.T.) status achieved

Areas of Expertise:

Teaching
- Building information modeling (BIM) project execution planning strategies
- Technical BIM computer skills
- Virtual design and construction (VDC) based project management strategies

Research Topics
- Mobile computing technologies for virtual design and construction (VDC)
- Augmented (or "Mixed") and Virtual Reality technologies for the AEC fields
- Visualization strategies and simulation games for pedagogical research

Honors and Awards:
2025 Civil Engineering Faculty Appreciation Award

2024 Outstanding Reviewer Award from ASCE's Journal of Civil Engineering Education.

2020 Selected for ASU's Peer Leadership Academy (peerLA). ASU's peerLA consists of 30 nominated faculty from across the university each year. The aim of this experience is to produce faculty and staff leaders who can advance the goals of the ASU Enterprise.

2019 2019 VDC Faculty Boot Camp Attendee at Milwaukee School of Engineering, Approx. $1000 in travel funding. 15 faculty members from across the country were selected from all who submitted proposals to attend this three-day VDC teaching seminar.

2018 School of Sustainable Engineering and the Built Environment Teaching Award, Arizona State University, $2000. This is awarded to one instructor annually based on teaching evaluations and innovations in the classroom to advance teaching excellence.

2018 Cache Valley Electric Lecturer Award. $1000

2017 Cache Valley Electric Lecturer Award. $1000

2016 Construction Industry Institute (CII) New Scholar award for researchers new to CII that submitted competitive qualifications submissions for CII's annual research qualifications requests. Approx. $1500

2016 Outstanding Reviewer Award from ASCE's Journal of Computing in Civil Engineering.

2016 Cache Valley Electric Lecturer Award. $1000

2012 Partnership for Achieving Construction Excellence (PACE) award for best graduate poster, Annual S:PACE roundtable

2012 FIATECH Technology Showcase student scholarship for graduate students.
Approx. $1500

2012 National Sciences Foundation Graduate Engineering Education Consortium for Students Fellowship. Approx. $1000

2009 William L. and Barbara A. Keefauver Scholarship in Engineering. Amount. $5000

2008 Charles A. Merica award for leadership in Architectural Engineering

Publications, Intellectual Property, and Presentations

SUMMARY OF PUBLICATIONS AND INTELLECTUAL PROPERTY
Refereed Conference Papers: 45
Technical Reports or other Papers (non-refereed): 1
Total Journal Publications (Published, In Press, and /or Accepted): 44
Manuscripts Submitted / In Revision: 1

SUMMARY OF PRESENTATIONS
Invited Presentations – External: 27
Invited Presentations – ASU Internal: 11
Invited Conference Presentations, including students: 8
Peer-reviewed Conference Presentations, including students: 39
Non-refereed Conference Presentations: 2

LEGEND

Bold Font: Ph.D. Student of Ayer's
Underline: Master's Student of Ayer's
(#) Undergraduate Student of Ayer's
(∞) Other/Visiting Undergraduate Student

Journals

Peer-Reviewed Journal Publications (published and accepted):

1. **Patil, K.**, Ayer, S. K., Bhandari, S., Hallowell, M, and Perry, L. (2025). "Bringing Reality to Virtual Reality: The Role of Environmental Richness in Improving Construction Practitioners' VR Experience." Construction Innovation: Information, Process, Management, (2025)25(7):358-383. https://doi.org/10.1108/CI-01-2025-0014.

2. Lopez, J., Perry, L., Bhandari, S., Ayer, S., and Hallowell, M. (2025). "Does Safety Training in VR Generate Emotional Engagement and Situational Interest Among Construction Workers?" Journal of Construction Engineering and Management, 152(3). https://doi.org/10.1061/JCEMD4.COENG-16211.

3. **Patil, K.**, Ayer, S., **McCord, K.**, Perry, L., Wu, W., London, J., and **Kline, A.** (2025). "Characteristics of Authentic Construction Learning Experiences to Enable Accurate Consideration of Cost-Effective Alternatives." Buildings, 2025, 15(14), 2446. https://doi.org/10.3390/buildings15142446.

4. **Kline, A. R.,** & Ayer, S. K. (2025). "Construction scheduling challenges and implications: An interview study with industry professionals." Higher Education, Skills and Work-Based Learning, (2025) 15 (5):1115-1128. https://doi.org/10.1108/HESWBL-02-2025-0075.

5. Lopez, J., Bhandari, S., Perry, L., Ayer, S., Hallowell, M., and Jones, M. (2025). "Analyzing the Impact of Virtual Reality and Haptic Feedback on the Safety Skills of Construction Workers." Journal of Construction Engineering and Management, Vol. 151(8). https://doi.org/10.1061/JCEMD4.COENG-15981

6. Khudzari, F., Haron A. T., Ayer, S., and **Rahman, R.A.** (2025). “Transformative trajectories: PLS-SEM analysis of factors influencing emerging technologies in construction adoption in Malaysia.” Information Technology in Construction, Vol. 30, pg. 45-64, https://doi.org/10.36680/j.itcon.2025.003

7. Ghorbani, Z., Ayer, S., and Messner, J. (2025). “A Taxonomy for Augmented Reality Use Cases in the AECO Industry.” Construction Innovation: Information, Process, Management. https://doi-org.colorado.idm.oclc.org/10.1108/CI-07-2024-0211

8. Elgamal, S., Ayer, S., and Parrish, K. (2024). “A Review of VR in Undergraduate Construction Education and Training: Unveiling the Opportunities to Address Content Areas from ACCE’s SLOs.” International Journal of Construction Education and Research, 21(3), 408–432. https://doi.org/10.1080/15578771.2024.2409705

9. **El Kassis, R.**, Ayer, S., El Asmar, M., and Parrish, K. (2024). “Framework Guiding and Supporting Augmented Reality Implementation for Synchronized Communication.” Practice Periodical on Structural Design and Construction, 29 (4). https://doi.org/10.1061/PPSCFX.SCENG-1511

10. **McCord, K.**, Ayer, S.K., Gheisari M., Turkan, Y., Mutis, I., Katz, G., and Fruchter, R. (2024). “Computing in AEC Education: Hindsight, Insight, Foresight.” Journal of Computing in Civil Engineering. https://doi.org/10.1061/JCCEE5.CPENG-5646

11. **El Kassis, R.**, Ayer, S.K., and El Asmar, M. (2023). “Augmented Reality Applications for Synchronized Communication in Construction: A Review of Trends and Opportunities.” Applied Sciences, Special Issue: Advanced Virtual, Augmented, and Mixed Reality: Immersive Applications and Innovative Techniques. 13(13), 7614. https://doi.org/10.3390/app13137614

12. **Patil, K.**, Bhandari, S., Agrawal, A., Ayer, S., Perry, L., and Hallowell, M. (2023). “An Analysis of YouTube Comments to Inform the Design of Virtual Reality Training Simulations to Target Emotional Arousal.” Journal of Construction Engineering and Management. 149(9). https://ascelibrary.org/doi/10.1061/JCEMD4.COENG-13245

13. **McCord, K.**, Ayer, S., Wu, W., Perry, L., London, J., and Kopitske, J. (2023). “Using Augmented Reality to Simulate Authentic Learning Building Assessment and Construction Experiences.” Journal of Architectural Engineering. 29(3). https://doi.org/10.1061/JAEIED.AEENG-1531

14. **El Kassis, R.**, Ayer, S.K., El Asmar, M., and Tang, P. (2023). “Discovering Factors that Influence the Use of Augmented Reality (AR) Technology on Active Construction Sites.” Transportation Research Record. https://doi.org/10.1177/03611981221131311

15. Hillestad, D., Sullivan, K., Hurtado, K., Ayer, S., and Smithwick, J. (2022). “Condition Assessments in the Facility Management Profession – A Literature Review.” Journal of Facility Management Education and Research. 5(2): 62–73. https://doi.org/10.22361/jfmer/151123

16. Hillestad, D., Sullivan, K., Hurtado, K., Ayer, S., and Smithwick, J. (2022). “Analysis of Standardization and Guidelines for Facility Condition Assessments.” Journal of Facility Management Education and Research. 5(2): 52–61. https://doi.org/10.22361/jfmer/151122

17. **McCord K. H.**, Ayer S. K., Perry L. A., **Patil K. R.**, London J. S., Khoury V.∞, Wu W. (2022). “Student Approaches and Performance in Element Sequencing Tasks Using 2D and Augmented Reality Formats.” Education Sciences. 12(4):247. https://doi.org/10.3390/educsci12040247

18. El Asmar, P.∞, **Chalhoub, J.**, Ayer, S., and **Abdallah, A.** (2021). “Contextualizing Benefits and Limitations Reported for Augmented Reality in Construction Research.” Journal of Information Technology in Construction, 26, 720-738. https://doi.org/10.36680/j.itcon.2021.039

19. **McCord, K.**, Ayer, S., Lamanna, A., Eicher, M., London, J., and Wu, W. (2021). “Construction Education Needs Derived from Industry Evaluations of Students and Academic Research Publications.” International Journal of Construction Education and Research. DOI: 10.1080/15578771.2021.1974985

20. Harikrishnan, A., **Abdallah, A.**, Ayer, S., El Asmar, M., and Tang, P. (2021). “Feasibility of Augmented Reality Technology for Contextually-Relevant Communication in the Construction Industry.” Advanced Engineering Informatics, 50(October 2021), 101363.

21. Jang, Y., Kim, K., Leite, F., Ayer, S., and Cho, Y. (2021). “Identifying the perception differences of emerging construction-related technologies between industry and academia to enable high levels of collaboration.” Journal of Construction Engineering and Management, 147(10).

22. **Chalhoub, J.**, Ayer, S., and Ariaratnam, S. (2021). “Augmented Reality for Enabling Un- and Under-Trained Individuals to Complete Construction Specialty Tasks.” Journal of Information Technology in Construction, 26(2021), 128-143.

23. **Chalhoub, J.**, Ayer, S., and **McCord, K.** (2021). “Augmented Reality to Enable Users to Identify Deviations for Model Reconciliation.” Buildings, 11(2), 77.

24. London, J., Lam, C., Borders, J., Perry, L., Ayer, S., and Wu, W. (2020). “Experts’ and Novices’ Perspectives on the Priority of Affective Dimensions in Civil

Engineering: A Mixed Methods Study." International Journal of Engineering Education, 36 (5), 1640–1651.

25. Wu, W., Sandoval, A., Gunji, V., Ayer, S., London, J., Perry, L., **Patil, K.**, and **Smith, K.** (2020). "Comparing Traditional and Mixed Reality-facilitated Apprenticeship Learning in a Wood Frame Construction Lab." Journal of Construction Engineering and Management, 146(12), 04020139-1 - 04020139-13.

26. Fenais, A., Ariaratnam, S., Ayer, S., and Smilovsky, N. (2020). "A review of augmented reality applied to underground construction." Journal of Information Technology in Construction, 25, 308-324.

27. Hartless, J., Ayer S., London, J., and Wu, W. (2020). "Comparison of building design assessment behaviors of novices in augmented- and virtual-reality environments." Journal of Architectural Engineering, 26(2), 1-11.

28. Fenais, A., Ariaratnam, S., Ayer, S., and Smilovsky, N. (2019). "Integrating geographic information systems, augmented reality, and cloud-based solutions for mapping underground utilities." Infrastructures, 4(4), 60.

29. **Chalhoub, J.**, and Ayer, S. (2019). "Exploring the performance of an augmented reality application for construction layout tasks." Multimedia Tools and Applications, 78, 35075–35098.

30. **Rahman, R.**, and Ayer, S. (2019). "Enhancing the non-technological skills required for effective building information modeling through problem-based learning." Journal of Information Technology in Construction, 24, 154-166.

31. **Rahman, R.**, Ayer, S., and London, J. (2019). "Applying problem-based learning in a building information modeling course." International Journal of Engineering Education, vol. 35-3, 965-967.

32. **Alsafouri, S.**, and Ayer, S. (2019). "Leveraging mobile augmented reality devices for enabling specific human behaviors in design and constructability review." Advances in Civil Engineering, vol. 2019, Article ID 3951986, 1-11.

33. Khalek, I., **Chalhoub, J.**, and Ayer S. (2019). "Augmented reality for identifying maintainability concerns during design." Advances in Civil Engineering, vol. 2019, Article ID 8547928, 1-12.

34. **Chalhoub, J.**, and Ayer, S. (2019). "Effect of varying task attributes on augmented reality aided point layout." Journal of Information Technology in Construction, 24, 95-111.

35. **Beauregard, M.**, and Ayer, S. (2019). “Leveraging previously reported research to create a decision support tool for institutional facility maintenance.” Journal of Facilities Management, 17(3), 249-266.

36. Wu, W., Hartless, J., Tesei, A., Gunji, V., Borders, J., Ayer, S., and London, J. (2019). “Design assessment in virtual and mixed reality environments: A comparison of novices and experts.” Journal of Construction Engineering and Management, 145(9), 1-14.

37. **Alsafouri, S.**, and Ayer, S. (2019). “Mobile augmented reality to influence design and constructability review sessions.” Journal of Architectural Engineering, 25(3), 1-11.

38. **Beauregard, M.**, and Ayer S. (2018). “Maintaining performance: Understanding the relationship between facility management and academic performance at K-12 schools in the state of Arizona.” Facilities, 36(11/12), 618-634.

39. **Alsafouri, S.**, and Ayer, S. (2018). “Review of ICT implementations for facilitating information flow between virtual models and construction project sites.” Automation in Construction, 86(February 2018), 176-189.

40. **Chalhoub, J.**, and Ayer, S. (2018). “Using mixed reality for electrical construction design communication.” Automation in Construction, 86(February 2018), 1-10.

41. **Rahman, R.**, Ayer, S., Tang, P., and Eicher, M. (2017). “Building information modeling skills in construction-related disciplines: A social network and job advertisement-based comparative analysis.” Engineering Project Organization Journal, 7(1), 21-36.

42. Ayer, S., Messner, J., and Anumba, C. (2016). “Augmented reality gaming in sustainable design education.” Journal of Architectural Engineering, 22(1), 1-8.

43. Ayer, S., Messner, J., and Anumba, C. (2014). “Development of ecoCampus: A prototype system for sustainable building design education.” Journal of Information Technology in Construction, 19, 520-533.

44. Ayer, S., Messner, J., and Anumba, C. (2014). “Challenges and benefits of open-ended sustainable design in first year engineering.” Journal of Professional Issues in Engineering Education and Practice, 140(2), 1-7.

Manuscripts Submitted:

1. **Patil, K.**, Ayer, S. K., and Bhandari, S. (Submitted 2025). “Virtual Reality for Emotion Driven Decision Making in Hazardous Construction Environments.” Engineering, Construction and Architectural Management.

2. Ly A. M., Celoza, A., Ayer S. K., and Behzadan, A. (Submitted 2025). “Management Perspectives of AI in the Electrical Construction Industry.” Journal of Construction Engineering and Management.

3. Guilherme, L.L.F, and Ayer S. (Submitted 2025). “Systematic Review of AR and VR Learning: Misalignment Between Objectives, Outcomes, and Assessment.” Journal of Architectural Engineering.

Technical Reports or other Papers (non-refereed)

1. Ayer, S.K., Celoza, A., Behzadan, A., and Ly, M.A. (2025). “Artificial Intelligence (AI) for the Electrical Construction Industry – 2024 Report.” ELECTRI International, Final Research Report.

2. Ayer, S.K., Cho, Y.K., Lobel, J., Jones, E., Kim, Y., Hemans, D., Jacob, E., and Wruble, G. (2024). “Defining a Path for the Digital Transformation of the Capital Projects Industry.” Construction Industry Institute, Research Team 403 Final Report.

3. Ayer, S.K., **El Kassis, R.**, El Asmar, M., and Tang, P. (2022). “Human-Augmented Technology Interaction for Improving Construction Quality Control and Task Monitoring: An Application of Augmented Reality for Visualization and Remote Project Management Support (Report No. 676-19-803).” Nevada Department of Transportation. https://www.dot.nv.gov/doing-business/about-ndot/ndot-divisions/planning/research/research-reports

Conference Papers

Refereed Conference Publications:

1. Sherratt, F., Franz, B., Ayer, S., and Sherratt, S. (2025). “Artificial problems with artificial solutions? Exploring the robustness of use cases within AI-focused construction management research.” ARCOM, Dundee, U.K.

2. Khudzari, F., **Rahman R.**, Ayer, S., Harun, A. (2023). “Critical factors influencing construction technology adoption: A multivariate analysis.” World Sustainable Construction Conference Series. AIP Conference Proceedings 2688, 030020-1–030020-13.

3. **Kline, A.**, and Ayer, S.K. (2022). “Student Perceptions of Construction Scheduling Teaching Methods.” Proceedings from the 58th Annual Associated Schools of Construction International Conference, Auburn, AL.

4. Hillestad, D., Hurtado, K., Ayer, S.K., Sullivan, K., and Smithwick, J. (2022). “Project Delivery Method for Facility Condition Assessments – A Study of Industry

Practices by AEC Service Providers." Proceedings from the 58th Annual Associated Schools of Construction International Conference, Auburn, AL.

5. **McCord, K.**, Ayer, S., **Patil, K.**, Wu, W., London, J., and Perry, L. (2022). "Full Scale Augmented Reality To Support Construction Sequencing Education Case Study." Proceedings from ASCE's 2022 Construction Research Congress, Arlington, VA.

6. **El Kassis, R.**, Ayer, S.K., El Asmar, M., and Tang, P. (2022). "Augmented Reality Communication on Active Construction Sites: A Pilot Study Exploring Non-Technological Factors." Proceedings from ASCE's 2022 Construction Research Congress, Arlington, VA.

7. **El Kassis, R.**, Ayer, S.K., El Asmar, M., and Tang, P. (2021). "Defining Factors that Support or Hinder Commercially-Available Augmented Reality (AR) Devices for Construction Communication." Proceedings of the 2021 ASCE International Conference on Computing in Civil Engineering (i3CE2021).

8. **McCord, K.**, and Ayer, S. (2021). "Student Responses to Faculty Innovation in Virtual Construction Education." Proceedings of the 2021 ASC Virtual International Conference.

9. Khudzari, F., **Rahman, R. A.**, & Ayer, S. K. (2021). Factors Affecting the Adoption of Emerging Technologies in the Malaysian Construction Industry. In IOP Conference Series: Earth and Environmental Science (Vol. 641, No. 1, p. 012006). IOP Publishing.

10. Palekar, A., Bevier, A.#, and Ayer, S. (2020). "Leveraging Automotive Industry Strategies to Define a New Paradigm for Construction-to-Operation Information Handover." Proceedings from ASCE's 2020 Construction Research Congress, Tempe, AZ.

11. Feghaly, J., Ayer, S., and El Asmar, M. (2020). "Assessing the Impact of Utilizing Building Information Modeling for Alternative Project Delivery Method Projects." Proceedings from ASCE's 2020 Construction Research Congress, Tempe, AZ.

12. **Patil, K.**, Ayer, S., Wu W., and London, J. (2020). "Mixed Reality Multimedia Learning To Facilitate Learning Outcomes From Project Based Learning." Proceedings from ASCE's 2020 Construction Research Congress, Tempe, AZ.

13. Radzi, A.∞, Bokhari, H.∞, **Rahman, R.**, and Ayer, S. (2019). "Key attributes of change agents for successful technology adoptions in construction companies: A thematic analysis." The 2019 ASCE International Conference on Computing in Civil Engineering, Atlanta, Georgia.

14. Cho, Y., Jang, Y., Kim, K., Leite, F., and Ayer, S. (2019). "Understanding different views on emerging technology acceptance between academia and the AEC/FM

industry." The 2019 ASCE International Conference on Computing in Civil Engineering, Atlanta, Georgia.

15. Khalek, I., **Chalhoub, J.,** and Ayer, S. (2019). "Indicators of effective design for maintainability in conceptual design." Proceedings from ASCE's Architectural Engineering Institute: Integrated Building Solutions – The National Agenda, Tysons, Virginia.

16. Hartless, J., **Chalhoub, J.**, and Ayer, S. (2019). "Mixed reality to enable construction design comprehension for digital natives." Proceedings from ASCE's Architectural Engineering Institute: Integrated Building Solutions – The National Agenda, Tysons, Virginia.

17. **Chalhoub, J.**, and Ayer, S. (2018). "Performance effects of using mixed reality for electrical point layout tasks." 18th International Conference on Construction Applications of Virtual Reality, Auckland, New Zealand.

18. Hartless, J., Borders, J., Lam, C., Ayer, S., London, J., Wu, W. (2018). "A new approach to testing augmented- and virtual-reality to support tacit knowledge generation in design assessment." 18th International Conference on Construction Applications of Virtual Reality, Auckland, New Zealand.

19. Khalek, I., **Chalhoub, J.**, and Ayer, S. (2018). "Which is it- augmented-, mixed-, or virtual reality? A meta-analysis of terminology in recent research." 18th International Conference on Construction Applications of Virtual Reality, Auckland, New Zealand.

20. **Patil, K.**, Bhandari, S., Ayer, S., and Hallowell, M. (2018). "Potential for virtual reality and haptic feedback to enhance learning outcomes among construction workers." 18th International Conference on Construction Applications of Virtual Reality, Auckland, New Zealand.

21. Wu, W., Tesei, A., Hernandez, K., Ayer, S., London, J., and Luo, Y. (2018). "Closing the skills gap: Construction and engineering education using mixed reality – A case study." Frontiers in Education 2018 Conference, San Jose, CA.

22. **Rahman, R.,** and Ayer, S. (2018). "Defining a problem based learning activity to enhance critical skills for resolving prevalent issues on BIM projects." 2018 Construction Research Congress, New Orleans, Louisiana.

23. **Chalhoub, J.**, **Alsafouri, S.**, and Ayer, S. (2018). "Leveraging site survey points for mixed reality BIM registration." 2018 Construction Research Congress, New Orleans, Louisiana.

24. **Beauregard, M.**, and Ayer, S. (2018). “Are facility maintenance and operations enabling performance: A study of K-12 schools.” 2018 Construction Research Congress, New Orleans, Louisiana.

25. Fenais, A., Smilovsky, N., Ariaratnam, S., and Ayer, S. (2018). “A meta-analysis of augmented reality challenges in the underground utility construction industry.” 2018 Construction Research Congress, New Orleans, Louisianna.

26. **Rahman, R.**, and Ayer, S. (2017). “Learning assessment strategies for problem-based BIM teaching modules related to challenges of people and process.” 6th CSCE/CRC International Construction Specialty Conference. Vancouver, British Columbia, Canada.

27. **Beauregard, M.**, Ayer, S. (2017). “Strategies for maximizing OpEx at K-12 educational facilities.” 6th CSCE/CRC International Construction Specialty Conference. Vancouver, British Columbia, Canada.

28. **Chalhoub, J.**, and Ayer, S. (2017). “Perception of industry professionals about mixed reality for electrical prefabrication.” 6th CSCE/CRC International Construction Specialty Conference. Vancouver, British Columbia, Canada.

29. **Chalhoub, J.**, and Ayer, S. (2017). “Mixed reality for electrical prefabrication tasks.” 2017 International Workshop on Computing in Civil Engineering, Seattle, Washington.

30. **Rahman, R.**, and Ayer, S. (2017). “Issues in the implementation of building information modeling: A case study-based analysis.” 34th International CIB W78 IT in Construction Conference, Heraklion, Crete, Greece.

31. Goodwin, S., and Ayer, S. (2017). “Employing BIM tools to streamline fabrication.” 34th International CIB W78 IT in Construction Conference, Heraklion, Crete, Greece. (Note: The first author was a graduate student conducting an independent study under Ayer. This publication is the output of this work.)

32. Perikamana, A., Ayer, S., **Beauregard, M.**, and **Alsafouri, S.** (2017). “Development of a collaborative process mapping activity to improve students BIM process mapping understanding.” 25th Annual Conference of the International Group for Lean Construction, Heraklion, Crete, Greece.

33. **Alsafouri, S.**, and Ayer, S. (2017). “A step-by-step procedure for implementing mixed reality in design and constructability review sessions.” 17th International Conference on Construction Applications of Virtual Reality, Heraklion, Crete, Greece.

34. **Rahman R.**, **Alsafouri, S.**, Tang, P., and Ayer, S. (2016). “Comprehending building information modeling skills of project managers based on social media analysis.”

International Conference on Sustainable Design, Engineering and Construction, Tempe, Arizona.

35. **Beauregard M.**, **Alsafouri, S.**, and Ayer, S. (2016). "Development of a peer review-based activity to improve students' BIM process mapping understanding." Academic Interoperability Coalition's 10th BIM Academic Symposium, Gainesville, FL.

36. **Rahman R.**, **Alsafouri, S.**, Tang, P., and Ayer, S. (2016). "Building information modeling skills for career success." Academic Interoperability Coalition's 10th BIM Academic Symposium, Gainesville, Florida.

37. **Alsafouri, S.**, Ayer, S., and Tang, P. (2015). "Mobile virtual design and construction adoption in the architecture, engineering, construction, and operation fields." 15th International Conference on Construction Applications of Virtual Reality, Banff, Alberta, Canada.

38. Ayer, S., Messner, J., and Anumba C. (2015). "Understanding the implications of augmented reality out of context in engineering education." International Construction Specialty Conference, Vancouver, British Columbia, Canada.

39. Ayer, S., Cribbs, J., Hailer, J., and Chasey, A. (2015). "Best practices and lessons learned in BIM project execution planning in construction education." Academic Interoperability Coalition's 9th BIM Academic Symposium, Washington DC, USA.

40. Ayer, S., Macht, G., Leicht, R., and Nembhard, D. (2014). "Teams assessing teams: How peer evaluation is affected by team member personality traits." 2014 Construction Research Congress, Atlanta, Georgia.

41. Ayer, S., Messner, J., and Anumba, C. (2013). "ecoCampus: A new approach to sustainable design education." 13th International Conference on Construction Applications of Virtual Reality, London, England.

42. Ayer, S., Messner, J., and Anumba, C. (2013). "Assessing the impact of using photographic images to influence building retrofit design education." 2013 Architectural Engineering Institute, University Park, Pennsylvania.

43. Ayer, S., Leicht, R., and Smith, C. (2012). "Assessing the impact of physical prototyping in first-year engineering education." 2012 Construction Research Congress, West Lafayette, Indiana.

44. Ayer, S., Messner, J., and Anumba, C. (2011). "Determining the appropriate role for mixed reality technologies in facility management." 11th International Conference on Construction Applications of Virtual Reality, Weimar, Germany.

45. Ayer, S. (2011). “Analysis of how construction managers can address facility managers’ needs with the use of BIM.” 2011 College of Engineering Research Symposium, University Park, Pennsylvania.

Presentations

Invited Presentations – External:

1. Faust, K., Sturts-Dossick, C., Ayer, S., and Garvin, M. “Fostering Academic Resilience through Collaboration and Community Building.” Panel session for ASCE’s Fostering Inclusive Academic Communities (FIAC) Committee. Online.

2. Ayer, S. (2025). “Implementing Evidence-Based Technologies.” Safety Leadership Institute. Houston, Texas.

3. Shane, J. and Ayer, S. (2025). “AASHTO Estimating Guide Update (NCHRP 10-122).” Transportation Estimators’ Association (TEA) Conference, Olympia, Washington.

4. Ayer, S. (2024). “Emerging Technologies BIM Lab: Overview of Research and Teaching.” Academic Interoperability Coalition, Online.

5. Ayer, S., Caldas, C., Krumins, A., and Omichinski, D. (2023). “Panel: Sharing lessons learned when leading a CII research team.” CII Annual Conference, San Antonio, Texas.

6. Ayer, S. (2022). “Leveraging VDC information in BIM for FM.” Southwest Buildings and Facilities Management Trade Show and Conference, Phoenix, Arizona.

7. Ayer, S. and Hale, S. (2022). “HATI: Overview of ASU/NDOT research on Augmented Reality for Construction Communication.” NDOT Transportation Conference, Reno, NV.

8. Ayer, S., Hale, S., and El Kassis, R. (2022). “Project Update: Human-Augmented Technology Interaction (HATI) for Improving Construction Quality Control and Task Monitoring: An Application of Augmented Reality (AR) for Visualization and Remote Project Management Support.” NDOT Resident Engineers Conference, Fallon, NV.

9. Ayer, S. and Albert, A. (2021). “Safety Training - Multimedia Interventions.” Invited presenter for University of Colorado’s Construction Safety Research Alliance (CSRA) Community of Practice, online webinar.

10. Ayer, S. (2021). “Virtual Reality and Haptic Technologies for Safety Hazard Training.” Invited keynote presentation for University of Colorado’s Construction Safety Research Alliance (CSRA) Conference, Boulder, Colorado.

11. Ayer, S. (2021). “Research Methods for Studying Technology in Construction.” Invited presentation for the STG Design Labs Seminar.

12. Dutton, D., Johnson, C., and Ayer, S. (2021). “Revealing the True Power of BIM.” Invited presenter on InEight webinar.

13. Ayer, S. (2021). “Visualization Technologies for Construction.” Invited Presentation for The Eastman Symposium (Conference to celebrate the contributions of Prof. Chuck Eastman).

14. Ayer, S. (2021). “Evaluating emerging technologies to assess impact.” Guest Lecture, Texas A&M, Instructor: Amir Behzadan.

15. Ayer, S. (2020). “BIM Philosophy: Introduction to BIM and Technology in Construction.” Guest Lecture, University of Malaysia, Pahang, Instructor Rahimi Rahman.

16. Ayer, S. (2020). “Academic Careers in Architectural Engineering.” Guest Presentation, The Pennsylvania State University, Hosted by Penn State’s Architectural Engineering Graduate Student Association.

17. Ayer, S. (2020). “Leveraging VDC information in BIM for FM.” Southwest Buildings and Facilities Management Trade Show and Conference, Phoenix, Arizona.

18. Ayer, S., Conner, S., Harikrishnan, A., and Abdallah, A. (2020) “Human-Augmented Technology Interaction (HATI) for Improving Construction Quality Control and Task Monitoring: An Application of Augmented Reality (AR) for Visualization and Remote Project Management Support” NDOT Resident Engineers Conference, Laughlin, NV.

19. Ayer, S. (2019). “Value proposition for the creative economy: The university as the farm team to the industry.” International Council of Shopping Centers (ICSC) CenterBuild Conference. Invited Panelist to represent Del E. Webb School of Construction, Phoenix, Arizona.

20. Ayer, S. (2019). “Introduction to: The Emerging Technologies Building Information Modeling Lab.” The Society for Construction Solutions’ Phoenix Chapter, Phoenix, Arizona.

21. Ayer, S., and Khalek, I. (2018). “Emerging Technology Building Information Modeling Lab research overview.” ATG USA’s Phoenix Area BIM User Group, Tempe, Arizona.

22. Ayer, S. (2018). “Project report: Augmented reality for electrical construction tasks.” ELECTRI International Council Meeting, Atlanta, Georgia.

23. Ayer, S. (2017). “Augmented reality for electrical construction tasks.” ELECTRI International Council Meeting, Boston, Massachusetts.

24. Ayer, S. (2016). “BIM education at ASU: Toward a distributed BIM curriculum.” The BIM Summit ABQ 2016, Albuquerque, New Mexico.

25. Ayer, S. (2016). “Augmented reality visualization for prefabrication of electrical systems.” ELECTRI International Council Meeting, Napa, California. (Because of schedule conflicts, this was a remote presentation.)

26. Ayer, S. (2015). “Technology to solve problems.” FIATECH’s Tech Tuesday Webinar, Online webinar.

27. Ayer, S. (2014). “Challenges in augmented reality and visualization in the field.” Invited panelist on FIATECH’s implementation subgroup panel discussion, Online webinar.

Invited Presentations – Internal to University:

1. Ayer, S. and Goodrum, P. (2025). “Benefits and Drawbacks of Augmented and Virtual Reality for Safety.” Construction Safety Research Alliance Safety Summit, Boulder, CO.

2. Ayer, S., Torres-Machi, C., Celoza, A., and MacRossie-Martinez, C. (2025). “AI in Civil Engineering.” Panel Discussion hosted by Chi Epsilon, Boulder, CO.

3. Ayer, S. (2025). “Emerging Technologies BIM Research Group Overview.” CU Boulder Engineering Education Lightning Talk for graduate student recruitment, Boulder, CO.

4. Ayer, S. (2024). “Failing My Way to Success.” CU Boulder Faculty Stories series speaker, Boulder, CO.

5. Sherratt F. and Ayer, S. (2024). “Technology in Safety: The Good, The Bad, and The Ugly.” Invited presenter for University of Colorado’s Construction Safety Research Alliance (CSRA) Community of Practice, online webinar.

6. Ayer, S., and **Chalhoub, J.** (2018). “Emerging visualization technologies in construction.” Construction in Indian Country National Conference 2018, Chandler, AZ. (This conference was organized by ASU.)

7. Ayer, S., Hedlund, M., and Richardson, C. (2017). “Technology and the built environment.” Panelist on January 25, 2017 for ASU’s Real Estate Council Meeting, Tempe, Arizona.

8. Ayer, S. (2016). “Emerging Technologies Building Information Modeling Lab.” Presented on December 1, 2016 at the Alliance for Construction Excellence (ACE) Monthly Task Force Meeting, Tempe, Arizona. (ACE was run by ASU at the time of this presentation.)

9. Ayer, S. (2015). “Construction technology: BIM and emerging technologies.” Presented on November 19, 2015 at the Association for the Advancement of Cost Engineering member meeting, Tempe, Arizona. (This presentation was held at ASU.)

10. Ayer, S. (2015). “Construction technology: Introduction to BIM.” Presented at the 2015 Construction in Indian Country Conference, Scottsdale, Arizona. (This conference was organized by ASU.)

11. Ayer, S. (2014). “Strategic futures roundtable discussion.” Invited panelist, Arizona Commerce Authority, Tempe, Arizona. (This presentation was held at ASU.)

Invited Conference Presentations, including students:

1. **Rahman, R.** (2017) “Building information modeling (BIM) skills for construction project success.” Academic poster presented at Construction Industry Institute Annual Conference, Orlando, Florida. (This was my PhD student whose work was selected for presentation at this conference.)

2. Ayer, S. (2016). “Emerging technologies building information modeling lab.” Construction Industry Institute Annual Conference, National Harbor, Maryland.

3. Ayer, S. (2016). “Augmented reality gaming in sustainable design education.” Construction Industry Institute Annual Conference, National Harbor, Maryland.

4. **Alsafouri, S.** (2016) “Construction design review decisions and visualization technology through mixed reality and mobile computers.” Academic poster presented at Construction Industry Institute Annual Conference, National Harbor, Maryland. (This was my PhD student whose work was selected for presentation at this conference.)

5. Veatch, J., Voeller, J., Vo, D., Wible, R., and Ayer, S. (2016). “Cognitive computing breakout session.” FIATECH 2016 Technology Conference and Showcase, Austin, Texas.

6. Ayer, S. (2015). “Change readiness & scanning the horizon.” Presented at the 2015 FIATECH and COMIT Efficiency Through Digital Projects Conference, London, UK.

7. Leite, F., Sattan, R., Sutton, T., and Ayer, S. (2015). “The future now – Game changing technologies & practices H-360 team” Presented at the 2015 FIATECH Leadership Forum, Glendale, Arizona.

8. Sattan, R., Sutton, T., Hijazi, F., Ayer, S., and Golparvar-Fard, M. (2015). “Scanning the horizon: Identifying and tracking global technologies and processes.” Presented at the FIATECH 2015 Technology Conference and Showcase, Boca Raton, Florida.

Peer-reviewed Conference Presentations, including students:

1. Sherratt, F., and Ayer, S. (2025). “Artificial problems with artificial solutions? Exploring the robustness of use cases within AI-focused construction management research.” ARCOM, Dundee, U.K.

2. Ayer, S. (2025). “Mixed Reality in Construction Engineering Management Education.” ASEE’s Rocky Mountain Section Conference 2025, Boulder, CO.

3. **El Kassis**, R., Ayer, S., El Asmar, M. and Parrish, K. (2024). “A Guiding Framework Supporting Augmented Reality Implementation for Synchronized Communication.” Transportation Research Board Conference, Washington DC.

4. **Kline, A.** (2022). “Student Perceptions of Construction Scheduling Teaching Methods.” Proceedings from the 58th Annual Associated Schools of Construction International Conference, Auburn, AL.

5. **El Kassis, R.** (2022). “Augmented Reality Communication on Active Construction Sites: A Pilot Study Exploring Non-Technological Factors.” Proceedings from ASCE’s 2022 Construction Research Congress, Arlington, VA.

6. **El Kassis, R.** (2021). “Defining Factors that Support or Hinder Commercially-Available Augmented Reality (AR) Devices for Construction Communication.” Proceedings of the 2021 ASCE International Conference on Computing in Civil Engineering (i3CE2021).

7. **McCord, K.** (2021). “Student Responses to Faculty Innovation in Virtual Construction Education.” Proceedings of the 2021 ASC Virtual International Conference.

8. **Patil, K.** (2020). “Mixed Reality Multimedia Learning To Facilitate Learning Outcomes From Project Based Learning.” Proceedings from ASCE’s 2020 Construction Research Congress, Tempe, AZ.

9. Wu, W., Sandoval, A., Gunji, V., Ayer, S. K., and London, J. (2019). "Learning Affordance of Mixed Reality in Undergraduate Construction Management

Curriculum – A Wood Framing Case Study." Poster presented at the 55th Associated Schools of Construction Annual International Conference, ASC, Denver, Colorado.

10. Ayer, S. (2019). “Key attributes of change agents for successful technology adoptions in construction companies: A thematic analysis.” The 2019 ASCE International Conference on Computing in Civil Engineering, Atlanta, Georgia.

11. Ayer, S. (2019). “Indicators of effective design for maintainability in conceptual design.” Paper presented at ASCE’s Architectural Engineering Institute: Integrated Building Solutions – The National Agenda, Tysons, Virginia.

12. Ayer, S. (2019). “Mixed reality to enable construction design comprehension for digital natives.” Paper presented at ASCE’s Architectural Engineering Institute: Integrated Building Solutions – The National Agenda, Tysons, Virginia.

13. **Chalhoub, J.** (2018). “Performance effects of using mixed reality for electrical point layout tasks.” Paper presented at the 18th International Conference on Construction Applications of Virtual Reality, Auckland, New Zealand. (Presented by my PhD student)

14. Ayer, S. (2018). “A new approach to testing augmented- and virtual-reality to support tacit knowledge generation in design assessment.” Paper presented at the 18th International Conference on Construction Applications of Virtual Reality, Auckland, New Zealand.

15. **Chalhoub, J.** (2018). “Which is it- augmented-, mixed-, or virtual reality? A meta-analysis of terminology in recent research.” Paper presented at the 18th International Conference on Construction Applications of Virtual Reality, Auckland, New Zealand. (Presented by my PhD student)

16. Ayer, S. (2018). “Potential for virtual reality and haptic feedback to enhance learning outcomes among construction workers.” Paper presented at the 18th International Conference on Construction Applications of Virtual Reality, Auckland, New Zealand.

17. **Rahman, R.** (2018). “Defining a problem based learning activity to enhance critical skills for resolving prevalent issues on BIM projects.” Paper presented at the 2018 Construction Research Congress, New Orleans, Louisiana. (Presented by my PhD student)

18. Ayer, S. (2018). “Leveraging site survey points for mixed reality BIM registration.” Paper presented at the 2018 Construction Research Congress, New Orleans, Louisiana.

19. Ayer, S. (2018). “Are facility maintenance and operations enabling performance: A study of K-12 schools.” Paper presented at the 2018 Construction Research Congress, New Orleans, Louisiana.

20. Ayer, S. (2017). “Learning assessment strategies for problem-based BIM teaching modules related to challenges of people and process.” Paper presented at the 6th CSCE/CRC International Construction Specialty Conference. Vancouver, British Columbia, Canada.

21. Ayer, S. (2017). “Strategies for maximizing OpEx at K-12 educational facilities.” Paper presented at the 6th CSCE/CRC International Construction Specialty Conference. Vancouver, British Columbia, Canada.

22. **Chalhoub, J.,** and Ayer, S. (2017). “Perception of industry professionals about mixed reality for electrical prefabrication.” Paper presented at the 6th CSCE/CRC International Construction Specialty Conference. Vancouver, British Columbia, Canada. (This paper was co-presented with my PhD student and I.)

23. Ayer, S. (2017). “Mixed reality for electrical prefabrication tasks.” Paper presented at the 2017 International Workshop on Computing in Civil Engineering, Seattle, Washington.

24. Ayer, S. (2017). “Issues in the implementation of building information modeling: A case study-based analysis.” Paper presented at the 34th International CIB W78 IT in Construction Conference, Heraklion, Crete, Greece.

25. Ayer, S. (2017). “Employing BIM tools to streamline fabrication.” Paper presented at the 34th International CIB W78 IT in Construction Conference, Heraklion, Crete, Greece.

26. Ayer, S. (2017). “Development of a collaborative process mapping activity to improve students BIM process mapping understanding.” Paper presented at the 25th Annual Conference of the International Group for Lean Construction, Heraklion, Crete, Greece.

27. **Hartless, J.,** and Ayer, S. (2017). “A step-by-step procedure for implementing mixed reality in design and constructability review sessions.” Paper presented at the 17th International Conference on Construction Applications of Virtual Reality, Heraklion, Crete, Greece. (This paper was co-presented with my student and I.)

28. **Rahman R.,** and Ayer, S. (2016). “Comprehending building information modeling skills of project managers based on social media analysis.” Paper presented at the International Conference on Sustainable Design, Engineering and Construction, Tempe, AZ. (This paper was co-presented with my PhD student and I.)

29. **Beauregard M.,** and Ayer, S. (2016). “Development of a peer review-based activity to improve students’ BIM process mapping understanding.” Paper presented at the Academic Interoperability Coalition’s 10th BIM Academic Symposium, Gainesville, FL. (This paper was co-presented with my PhD student and I.)

30. **Rahman R.,** and Ayer, S. (2016). “Building information modeling skills for career success.” Paper presented at the Academic Interoperability Coalition’s 10th BIM Academic Symposium, Gainesville, FL. (This paper was co-presented with my PhD student and I.)

31. Ayer, S. (2015). “Mobile virtual design and construction adoption in the architecture, engineering, construction, and operation fields.” Paper presented at the 15th International Conference on Construction Applications of Virtual Reality, Banff, Alberta, Canada.

32. Ayer, S. (2015). “Understanding the implications of augmented reality out of context in engineering education.” Paper presented at the International Construction Specialty Conference, Vancouver, British Columbia, Canada.

33. Ayer, S. (2015). “Best practices and lessons learned in BIM project execution planning in construction education.” Paper presented at the 9th BIM Academic Symposium and Job Task Analysis Review, Washington DC, USA.

34. Ayer, S. (2014). “Teams assessing teams: How peer evaluation is affected by team member personality traits.” Paper presented at the 2014 Construction Research Congress, Atlanta, Georgia.

35. Ayer, S. (2013). “ecoCampus: A new approach to sustainable design education.” Paper presented at the 13th International Conference on Construction Applications of Virtual Reality, London, England.

36. Ayer, S. (2013). “Assessing the impact of using photographic images to influence building retrofit design education.” Paper presented at 2013 Architectural Engineering Institute (AEI), University Park, Pennsylvania.

37. Ayer, S. (2012). “Assessing the impact of physical prototyping in first-year engineering education.” Paper presented at 2012 Construction Research Congress, West Lafayette, Indiana.

38. Ayer, S. (2011). “Determining the appropriate role for mixed reality technologies in facility management.” Paper presented at the International Conference on Construction Applications of Virtual Reality (CONVR), Weimar, Germany.

39. Ayer, S. (2011). “Analysis of how construction managers can address facility managers’ needs with the use of BIM.” Paper presented at the College of Engineering Research Symposium (CERS), University Park, Pennsylvania.

Non-refereed Conference Presentations:

1. Ayer, S. (2015). "Building information modeling: Collaboration for engineering buildings redefined." Presented at the Vietnam Engineering Education Conference 2015, Danang, Vietnam.

2. Ayer, S. (2013). "Sustainability education of engineering students using augmented reality and simulation games: An overview of dissertation research." Ph.D. research presented at BIM workshop at University of Reading, England.

PROFESSIONAL ACTIVITIES AND SERVICE

SUMMARY OF PROFESSIONAL ACTIVITIES AND SERVICE
Editor/Associate Editor for 1 peer-reviewed journals
18 International/national conferences committees
7 International/national conference sessions chaired
Peer Reviewer for 12 Journals, 11 Conferences
1 External Program Reviewer
6 Proposal Review Services for 1 Funding Agency
5 Engineering School-level Committees and 11 Unit-level Committees.
4 Faculty Search Committee

Editor or Associate Editor Positions:

1. 2019 – Present – Associate Editor, American Society of Civil Engineering's Journal of Architectural Engineering.
    a. Guest Editor for Special Collection: "The future of education in Architectural Engineering."

International/National Conference Committees:

1. 2026 - International Conference on Computing in Civil Engineering (I3CE) 2026, Co-Chair for Technical Committee, Songdo, Korea
2. 2026 – Construction Research Congress 2026, Track Chair: Construction Education, Workforce, Diversity, and Inclusion, San Antonio, Texas.
3. 2025 – European Conference on Computing in Construction (EC3), Program Committee Reviewer: Virtual and Augmented Reality Track, Porto, Portugal.
4. 2024 – Construction Research Congress 2024, Co-Chair Track 3: Computer Applications, Information Modeling and Simulation, Des Moines, Iowa.
5. 2023 – 2023 ASCE International Conference on Computing in Civil Engineering (i3CE 2023), Track Chair: Technology Enriched Engineering Pedagogy and Workforce Training. Corvallis, Oregon.
6. 2022 – The 22nd International Conference on Construction Applications of Virtual Reality (CONVR) – Program Committee Member, Seoul, South Korea.
7. 2021 – The 21st International Conference on Construction Applications of Virtual Reality (CONVR) – Program Committee Member, Middlesbrough, U.K.

8. 2021 – International Conference on Computing in Civil Engineering 2021 (i3ce2021) – IT for Smart Infrastructure and Communities, International Scientific Committee Member, Orlando, Florida.
9. 2021 – CIB W78 and LDAC 2021, Scientific Committee Member, Luxembourg Institute of Science and Technology (LIST)
10. 2020 – Construction Research Congress 2020, Communications and Logistics Chair, Tempe, AZ.
11. 2020 – The 18th International Conference on Computing in Civil and Building Engineering (ICCCBE 2020)
12. 2019 – The 36th CIB W78 2019 Conference, Program Committee Member, Northumbria University at Newcastle, UK.
13. 2019 – The 2019 ASCE International Conference on Computing in Civil Engineering, Program Committee Member, Atlanta, GA.
14. 2018 – 18th International Conference on Construction Applications of Virtual Reality, Program Committee Member, Auckland, New Zealand.
15. 2017 – Lean & Computing in Construction Congress (LC^3), Heraklion, Crete, Greece.
    a. Virtual and Augmented Reality Program Committee Member
    b. Enabling Lean with IT Committee Member
16. 2017 – International Workshop on Computing for Civil Engineering, Program Committee Member, Seattle, WA.
17. 2016 –International Conference on Sustainable Design, Engineering, and Construction, Building Information Modeling Chair, Tempe, AZ.
18. 2015 – 15th International Conference on Construction Applications of Virtual Reality, Program Committee Member, Banff, Alberta, Canada.

International/National Conference Sessions Chaired:

1. 2019 – 2019 ASCE International Conference on Computing in Civil Engineering (i3CE 2019), Atlanta, Georgia. (Human-Technology Frontier)
2. 2018 – 18th International Conference on Construction Applications of Virtual Reality, Auckland, New Zealand. (AR-VR: Knowledge and theory frameworks session chair)
3. 2018 – ASU Safety Leadership in Planning Design and Construction Workshop. (Hazard reduction through pre-construction planning session moderator)
4. 2018 – Construction Research Congress, New Orleans, LA. (Data Sensing, BIM, Simulation Session)
5. 2017 – Lean & Computing in Construction Congress (LC^3), Heraklion, Crete, Greece. (Learning Session)
6. 2016 – International Conference on Sustainable Design, Engineering, and Construction, Tempe, AZ. (BIM Track Sessions)
7. 2015 – The 15th International Conference on Construction Applications of Virtual Reality, Banff, AB, Canada. (Session 1D: Design and Construction Visualization)

Peer-Reviewer for Journals:

1. Advanced Engineering Informatics
2. Advances in Engineering Education

3. Automation in Construction
4. Engineering Construction and Architectural Management
5. Engineering Project Organization Journal
6. Facilities
7. Journal of Architectural Engineering
8. Journal of Civil Engineering Education
    a. Selected to be “2024 Outstanding Reviewer”
9. Journal of Computing in Civil Engineering
    a. Selected to be “2016 Outstanding Reviewer”
10. Journal of Construction Engineering and Management
11. Journal of Professional Issues in Engineering Education and Practice
12. Sustainable Cities and Society

Peer-Reviewer for Conferences:

1. Associated Schools of Construction (ASC) Conference
2. Academic Interoperability Coalition (AiC) BIM Academic Symposium
3. ASCE Architectural Engineering Institute (AEI)
4. ASCE Construction Research Congress
5. ASCE International Conference on Computing in Civil Engineering (I3CE)
6. Innovative Technologies in Construction Conference (ITC)
7. International Conference on Sustainable Design, Engineering, and Construction (ICSDEC)
8. International Workshop on Computing for Civil Engineering (IWCCE)
9. International Conference on Construction Applications of Virtual Reality (CONVR)
10. Lean & Computing in Construction Congress (LC^3)
11. Penn State’s College of Engineering Research Symposium (CERS)

Proposal Review Service for Funding Agencies:

1. 2023 Ad-Hoc Reviewer for National Science Foundation’s (NSF) Directorate for Computer & information Science & Engineering (CISE)

2. 2021 Ad-Hoc Reviewer for National Science Foundation’s (NSF) Engineering Education and Centers (EEC) Directorate

3. 2021 Review Panelist for National Science Foundation’s (NSF) Education and Human Resources (EHR) Directorate

4. 2019 Review Panelist for National Science Foundation’s (NSF) Education and Human Resources (EHR) Directorate

5. 2018 Review Panelist for National Science Foundation’s (NSF) Engineering Directorate

6. 2017 Review Panelist for National Science Foundation’s (NSF) Education and Human Resources (EHR) Directorate

External Program Reviews:

1. 2023 External reviewer for Brigham Young University's Civil and Construction Engineering Program.

Engineering School-Level Committees:

1. 2024 – 2025 Integrated Business and Engineering Degree Proposal Committee – Invited to serve on committee to expand on prior IB&E Degree exploration efforts and develop proposal for new degree.

2. 2024 Business Engineering Undergraduate Degree Committee – Invited to serve on committee to explore the development of a new degree that merges business and engineering to address emerging industry demands.

3. 2022 – 2023 School of Sustainable Engineering and the Built Environment Personnel Committee

4. 2016 – 2018 Ira A. Fulton Schools of Engineering, New Faculty Advisory Committee (NFAC)

5. 2014 – 2017 School of Sustainable Engineering and the Built Environment Laboratory Committee

Unit-Level Committees:

1. 2025 – Presents CEAE Executive Committee Member

2. 2025 – Present Created HirEd (pronounced "higher ed") group for construction graduate students interested in pursuing academic careers (i.e., for those who want to get "hired" in "higher ed").

3. 2025 – Present CEM Group Coordinator

4. 2025 PUEC Committee Member for Review of Prof. Amelia Celoza

5. 2024 – Present CEAE Pathways Committee Member

6. 2024 – Present CEAE AI Taskforce

7. 2023 – Present CEAE Civil Engineering Faculty Director

8. 2023 – 2024 CEAE JEDI Committee Member

9. 2018 – 2021 Del E. Webb School of Construction, Academic Affairs Committee

10. 2017 – 2019 Del E. Webb School of Construction, Scholarship Committee

11. 2014 – 2017 Del E. Webb School of Construction, Curriculum Committee

Faculty Search Committees:

1. 2024-2025 Search Committee Member, CEAE. (This search related to the opportunity hire of Chris Senseney)
2. 2022 – 2023 Search Committee Member, Del E. Webb School of Construction. (This search successfully led to a new tenure-track hire – Ricardo Eiris.)
3. 2019 – 2020 Search Committee Member, Del E. Webb School of Construction. (This search successfully led to a new tenure-track hire – Thomas Czerniawski.)
4. 2017 – 2018 Search Committee Member, Del E. Webb School of Construction. (This search successfully led to a new tenured hire – Elham Fini.)

Additional Professional Activities

Member of National or International Committees:

2021 – Present ASCE's Task Force Steering Committee Member: Computing in Civil Engineering for All.

This task force is led by Dr. Burcu Akinci (Carnegie Mellon University) and Dr. Fernanda Leite (University of Texas, Austin) with the aim of identifying opportunities and strategies towards development and fostering of a community within which all of its members feel they belong and thrive in, and towards promoting Computing in Civil Engineering and opportunities around it to attract and retain the best minds to our field.

2020 – 2024 ASCE Construction Research Congress Executive Committee. Elected as Secretary in 2020.

This group organizes professional initiatives for ASCE's Construction Research Congress, which is the preeminent construction research organization in the United States. Over the coming years, Ayer will transition from Secretary to Vice Chair to Chair to Past Chair of this Executive Committee.

2019 - Present ASCE Visualization Information Modeling and Simulation (VIMS) Committee

This group aims to explore new and emerging visualization research related to civil engineering. More specifically, the group is developing a discipline-specific technology evaluation system to help researchers accurately define new and emerging technologies in terms of their maturity.

2019 - Present ASCE Computing Division's Education Committee

Elected Member-At-Large (2019). Will transition to secretary, vice-chair, chair, and past chair in coming 10 years. This group aims to promote and disseminate innovative research in support of the development and implementation of information technologies and computational methods in civil engineering education. Activities include dissemination of innovative education models and uses of information technologies in education through: workshops, conferences, journal publications, and webinars; showcases of stories of successful pedagogical models and student projects; promotion of partnerships among educators and industry members; and collaborations with national and international societies and organizations.

2019 Autodesk

Served as reviewer on “Construction Career Skill Tree” initiative aimed at defining levels of BIM competency for various construction roles.

Served as judge for Autodesk’s 2019 AEC Excellence Awards.

2014 – 2024 Construction Industry Institute’s (CII) FIATECH Sector

Horizon 360 Team Co-Chair (2018-2022) and member (2014-present): This group is comprised of both industry and academic members. This group identifies and studies new and emerging technologies that may offer potential benefits to the building industry. The documents developed in this group are shared with all CII FIATECH member organizations across the nation and internationally.

Celebration of Engineering and Technology Innovation (CETI) awards jury member: The CETI awards are given annually to academics and practitioners who do innovative work that relates to the FIATECH mission.

Productivity Advancement Target (PAT) 1 – Change Readiness, Co-Chair: This group aims to enable sustained innovation in companies by identifying best practices related to preparing for and sustaining the use of new technologies in practice.

Productivity Advancement Target (PAT) 12 – Emerging Systems and Technologies Member: This group aims to identify new technologies and processes for adopting

technologies to enable companies in the building industry to increase their productivity.

2014 – Present Academic Interoperability Coalition Member (Formerly of BuildingSMART)

This group is comprised of industry and academic members. The group is currently focused on identifying necessary attributes for building industry professionals using Building Information Modeling (BIM). The goal of this work is to define a baseline set of skills that educators may use to target BIM learning objectives and industry members may use for recruiting individuals with specific levels of BIM competencies. When the results are compiled and documented, they will be made publically available.

2015 – 2016 Construction Industry Institute Academic Committee Member

The Academic Committee (AC) was the primary forum for the academic community within CII to provide its wisdom and expertise to CII. Among its duties were designating subject matter experts, providing input to the research process, identifying and grooming new academics to serve as effective CII researchers, integrating CII research and products into the undergraduate and graduate curricula, and offering insights for new directions for CII.

Professional Memberships:
Associate Member of the American Society of Civil Engineers (ASCE)

Member of ASCE's Construction Research Congress

Additional Service and Leadership Activities

2024 – Present ACUMent Mentor, Office of Faculty Affairs, University of Colorado Boulder.

2023 – Present Faculty Director, Civil Engineering, University of Colorado Boulder. This leadership position involves outreach and recruiting for the department, supporting first-year orientations, and encourage student engagement with departmental initiatives.

2020 – Present Developed a podcast ("Professerror") with Prof. Bryan Franz (University of Florida) in order to share candid experiences about "failures" in academia and the powerful lessons that these provide to eventually enable success. Available on: Apple Podcasts; Spotify; Google Podcasts; or searchable by name on other podcasting platforms.

2017 – 2022 Construction Management Association of America (CMAA) Student Chapter Faculty Advisor.

2015 – 2017 ASC Student Competition Coach. Assisted students in preconstruction teams with BIM strategies for competition.

2015 – Present Published interviews / quotations

1. Placer Solutions (2023). "Augmented Reality and Mixed Reality in Construction." Technology Excellence in Construction Report Series – Vol. 1. (Interviewed for report seeking expertise on AR/MR in Construction.)
2. Williams, Monica. (2022). "Using Augmented Reality to Teach Real Construction." ASU's Full Circle. https://fullcircle.asu.edu/faculty/using-augmented-reality-to-teach-real-construction/
3. Inglesby, Tom. (2020). "The future of construction work and workers." Constructech.
4. O'Shea, Patrick. (2016). "Versitalist with Steven Ayer." Audio blog post. The Versitalist Podcast. http://versatilist.podomatic.com/entry/2016-03-20T12_37_34-07_00
5. Barnes, Johnathan. (2015). "ARC taps facilities, emergency management as growing markets." Builtworlds. http://www.builtworlds.com/news/2015/11/11/arc-taps-facilities-management-as-growing-market
6. Fishler, Meryl. (2015). "AZRE Source: Sundt's moves into different dimension." AZ Big Media. http://azbigmedia.com/blogs/azre-source-sundts-moves-dimension

2015 - 2018 K-12 Outreach

-Engaging high school students with construction technology through presentations in DEWSC outreach efforts
-"STEM Role Model" for Maricopa County Education Service Agency. Discussed my career path and reason for interest in STEM fields.

2014 – 2021 E2 Camp

Served as faculty volunteer for a session each year

2013 – 2014 Undergraduate Advising, The Department of Architectural Engineering, The Pennsylvania State University

Advised 9 undergraduate students

2013 – 2014 Co-Advisor, The United States Department of Energy's Challenge Home Student Design Competition Team

Advised graduate and undergraduate students with other Penn State faculty members to create a net-zero residential home design

2012 – 2013 Graduate Advisor/Representative, The Student Chapter of the Partnership for Achieving Construction Excellence (S:PACE)

2011 – 2012 Graduate Advisor/Representative, United States Green Building Council Students (USGBC Students)

PERSONNEL: STUDENT SUPERVISION / MENTORING, TEACHING, DISSERTATION COMMITTEES, RESEARCHERS, AND OUTREACH

SUMMARY OF MENTORING:
Ph.D. Students Graduated: 7
Ph.D. Students Current: 2
M.S. Thesis Students Graduated: 3
M.S. Thesis Students Current: 1
M.S. Project Students Graduated: 6
M.S. Project Students Current: 0

Undergraduate Students and Student Teams (Research): 24
Student Fellowships and Awards: 0 currently. 1 PhD was supported through external fellowship (graduated)
SUMMARY OF TEACHING:
Undergraduate Courses Taught, including New Course Development: 2
Graduate Courses Taught, including New Course Development: 2

Mentoring

Ph.D. Students Graduated:

No.	Name	Role	Dissertation	Graduation Date	Degree	Current Position
1.	El Kassis, Rita	Co-Chair with M. El Asmar	Mixed Reality for Remote Project Assistance in Civil Infrastructure Projects	December 2023	PhD (Construction Management)	Real Estate and Construction Project Manager, Discount Tire
2.	Patil, Karan	Chair	Virtual Reality for Construction Safety Education	August 2023	PhD (Construction Management)	Co-Founder and CEO, MurMur

3.	McCord, Kieren	Chair	Mixed Realty to Support Construction Education **(Was awarded one of six Dean's Dissertation Awards across all Fulton Schools of Engineering)**	May 2022	PhD (Construction Management)	Researcher, Pacific Northwest National Laboratory
4.	Chalhoub, Jad	Chair	Benefits of using augmented reality in planning, construction, and post-construction phases in specialty contracting	May 2019 (Started August 2017)	PhD (Construction Engineering)	BIM Technology Solutions Implementation Lead, Rosendin Electric
5.	Beauregard, Michael	Chair	Maintaining performance: Evidence-based educational facility management through a decision support tool leveraging prior empirical research	May 2019 (Started August 2015)	PhD (Construction Management)	Facilities / MRO at IBM
6.	Rahman, Rahimi	Chair	Teaching the non-technological skills for successful building information modeling (BIM) projects	May 2018 (Started August 2015)	PhD (Construction Engineering)	Senior Lecturer, Faculty of Civil Engineering and Earth Resources, University Malaysia Pahang

7.	Alsafouri, Suleiman	Chair	Information technology and human factors to enhance design and constructability review processes in construction	May 2017 (Started at ASU January 2015)	PhD (Construction Engineering)	Project Manager, Corbins Electric

Ph.D. Students Current:

No.	Name	Role	Dissertations	Expected Graduation Date	Degree
1.	Kline, Andrew	Chair	Visualization Technologies to Support Construction Scheduling Education	December 2025	PhD (Construction Management – Arizona State University)
2.	Mehran Mahmoudi Motahar	Chair	VR to Influence Safe Construction Behaviors	May 2029	PhD (Civil Engineering, Construction Engineering and Management)
3.	Ronald G. Duren Jr.	Chair	VR for Supporting Leadership Training in High Arousal Scenarios	May 2028	PhD (Engineering Education)

M.S. Thesis Students Graduated:

No.	Name	Role	Theses	Graduation Date	Degree
1.	Sara El Gamal	Chair	Virtual Reality for facilitating realistic construction learning experiences.	August 2023	MS (Construction Management)
2.	El Kassis, Rita	Co-Chair with M. El As-mar	Mixed Reality for Remote Project Assistance in Civil Infrastructure Projects	May 2021	MS (Construction Management)
3.	Perikamana, Aparna	Chair	Assessing the impact of BIM process mapping activities in construction education	May 2017	MS (Construction Management)

M.S. Thesis Students Current:

No.	Name	Role	Theses	Graduation Date	Degree
1.	Luísa Lopes de Freitas Guilherme	Chair	VR for Professional Safety Education	May 2026	MS (Civil Engineering, Construction Engineering and Management)

M.S. Project Students Graduated:

No.	Name	Role	Applied Project Paper Title	Graduation Date	Degree
1.	Harikrishnan, Archana	Chair	Augmented reality for contextually relevant communication in civil infrastructure	May 2020	MS (Construction Management)
2.	Palekar, Ayaz	Chair	Leveraging automotive industry strategies to define a new paradigm for BIM for operation information handover	May 2020	MS (Construction Management)
3.	Patil, Karan	Chair	Mixed reality for simulating construction planning education	December 2019	MS (Construction Management)
4.	Khalek, Imad	Chair	Designing for maintainability with augmented reality	December 2019	MS (Construction Management)
5.	Kathula, Nishanth	Chair	Automation to Enable Construction Project Managers	May 2018	MS (Construction Management)
6.	Chalhoub, Jad	Chair	Using mixed reality for electrical construction design communication	May 2017	MS (Construction Management)

M.S. Project Students Current:

No.	Name	Role	Thesis	Expected Graduation Date	Degree

Undergraduate Students (Research):

No.	Name(s)	Dissertations/Theses/ Project Report	Graduation Date	Degree

1.	Szeto, Joshua; Huhn, Harry; Gilson, Michael; Ramirez, Luis; Fitzgerald, Matthew	Development of a construction safety training simulation using Virtual Reality + Haptic Feedback for NSF project "Collaborative Research: Immersive virtual reality with haptic feedback to improve safety hazard recognition, assessment and decision-making among construction professionals". CSE capstone project.	May 2023	BS
2.	Tan, Malin; Perry, Niklas; Ratnam, Oliver; Kannan, Shyam	Development of a construction safety training simulation using Virtual Reality + Haptic Feedback for NSF project "Collaborative Research: Immersive virtual reality with haptic feedback to improve safety hazard recognition, assessment and decision-making among construction professionals". CSE capstone project.	May 2023	BS
3.	Olson, Hunter; Wilcox, Sydney; Talamantes, Kevin; Snyder, Scott; Fought, Jacob	Development of a mixed reality construction scheduling application to support education of construction management students.	May 2023	BS
4.	Porter, Austin; Werner, Isabella; Sun, Xiaoxun; Stewart, Austin; Dominguez, Cristion	Development of a construction safety training simulation using Virtual Reality + Haptic Feedback for NSF project "Collaborative Research: Immersive virtual reality with haptic feedback to improve safety hazard recognition, assessment and decision-making among construction professionals". CSE capstone project.	December 2022	BS

5.	Alem Castillo, Joseph; Jiang, Liuboxuan; Murwin, Andrew; Turnage, Samantha; Zalewski, David	Development of a mixed reality construction scheduling application to support education of construction management students.	December 2022	BS
6.	Foster, Nevin; Hardy, Adam; Triet Huynh, Nguyen Minh	Development of a construction safety training simulation using Virtual Reality + Haptic Feedback for NSF project “Collaborative Research: Immersive virtual reality with haptic feedback to improve safety hazard recognition, assessment and decision-making among construction professionals”. CSE capstone project.	December 2021	BS
7.	Hilliker, Jacob; Meyers, Jack; Zhuang, Yuqian; Patel, Kumal; Zimmerman, Kenna	Development of a prototype for expansion to previously developed NSF project “Mixed Reality to Cultivate Apprenticeship Learning for Architecture, Engineering, and Construction”. CSE capstone project.	December 2021	BS
8.	Bock, Claudia; Miller, Samuel; Kinney, Cameron; Said, Samira	Development of a prototype for NSF project “Mixed Reality to Cultivate Apprenticeship Learning for Architecture, Engineering, and Construction”. CSE capstone project.	December 2021	BS

9.	Losifescu, Andrei; De La Cruz, Albert; Osborne, Daucen; Vo, Khang; Le, Kenny; Hoffman, Garrett	Development of a prototype for NSF project “Mixed Reality to Cultivate Apprenticeship Learning for Architecture, Engineering, and Construction”. CSE capstone project.	May 2021	BS
10.	Richardson, Rustin; Kaley, Ashton; Griffieth, Alan; Jeong, Byung; Ratliff, Unique	Development of a construction safety training simulation using Virtual Reality + Haptic Feedback for NSF project “Collaborative Research: Immersive virtual reality with haptic feedback to improve safety hazard recognition, assessment and decision-making among construction professionals”. CSE capstone project.	May 2021	BS
11.	Yee, Matthew	Independent Study Report: Addiction on the job site: Investigating strategies for treating addiction in construction	August 2020	BS
12.	Hibler, Benedetto; Larsen, Nicholas; Finger, Patrick; Oller, Robert; Jenkins Jr., William	Development of a construction safety training simulation using Virtual Reality + Haptic Feedback for NSF project “Collaborative Research: Immersive virtual reality with haptic feedback to improve safety hazard recognition, assessment and decision-making among construction professionals”. CSE capstone project.	December 2020	BS

13.	Hampton, Andrew; Ethington, Timothy; Bright, Beau; Akhand, Abrar; Mowery, Angelique	Development of a prototype for NSF project “Mixed Reality to Cultivate Apprenticeship Learning for Architecture, Engineering, and Construction”. CSE capstone project.	December 2020	BS
14.	Wilson, Jeff	Undergraduate research assistant hired for NSF:REU Supplement: CRII: Cyberlearning: Mobile Computers to Enhance the Building Industry and Education	December 2019	BS
15.	Gorrie, Andrew; Hornacek, Derek; O’Callaghan, Joshua; Pineda-Pirez, Jerry; and Saroya, Eisher.	Development of a prototype for NSF project “Mixed Reality to Cultivate Apprenticeship Learning for Architecture, Engineering, and Construction”. Computer science capstone students developed functioning mobile, augmented reality-based, STEM education application prototype to support this NSF project.	December 2019	BS
16.	Bevier, Adam	Undergraduate research assistant hired for NSF:REU Supplement: CRII: Cyberlearning: Mobile Computers to Enhance the Building Industry and Education	May 2019	BS
17.	Talley, Alex	Undergraduate research assistant hired for NSF:REU Supplement: CRII: Cyberlearning: Mobile Computers to Enhance the Building Industry and Education	May 2018	BS
18.	Unruh, Isaiah	Independent study: Development of a Virtual Reality plus haptic technology environment	May 2018	BS
19.	Patil, Karan	Independent study: Virtual reality plus haptic technology for safety training	May 2018	BS

20.	Varkalaite, Migle	Barrett honors study: Creation of virtual reality development guide using Unity 3D	May 2018	BS
21.	Hartless, Justin	Undergraduate research assistant hired for NSF:REU Supplement: CRII: Cyberlearning: Mobile Computers to Enhance the Building Industry and Education	December 2017	BS
22.	Hebel, Natasha	Barrett honors project: Leveraging Building Information modeling to Support Building Portfolio Management: A Case Study	May 2017	BS
23.	Kenney, Ryan; Melitante, Marvin; Ong, Derek; Pollack, Eric; Shah, Rushab; Tezera, Abeal	Development of CommonAR prototype. Computer science capstone students developed functioning mobile, augmented reality-based, STEM education application prototype	December 2016	BS
24.	Marris, Kelsey	Barrett honors study: Identification of high-performance building systems in ASU's College Avenue Commons	May 2015	BS

Student Fellowships and Awards:

No.	Name	Role	Graduation Date	Fellowship or Award Title	Description
1.	Rahman, Rahimi	PhD Chair	May 2019 (Started August 2017)	University Malaysia Pahang Fellowship Scheme, 2015	This was awarded to 3 fellows in Malaysia to complete PhD studies in the USA. It provided full support to this student throughout his PhD.

Additional Student Advising and Mentoring Activity:

Current Committee Memberships:

No.	Name	Role	Dissertations/Theses/ Project Report	Graduation Date	Degree

1.	Lopez Alvarez de Neyra, Paula	Committee	From Deconstruction to Construction: A Systemic Study of End-of-Life Decision-Making, Causal Dynamics, and Organizational Learning in Reverse Logistics in the Architecture, Engineering and Construction Industry	May 2026	PhD
2.	Alazzam, Malek	Committee	Masters Exam Committee	December 2025	MS
3.	Raheemy, Yaqoob	Committee	Defining and Assessing Safety, Energy Controls, and Safety Clutter	May 2026	PhD
4.	Shirey, Will T.	Committee	Improving facilities maintenance activities with Lean and subsequent opportunities for creation of BIM value	TBD	MS

Committee Memberships for Graduated Students:

No.	**Name**	**Role**	**Dissertations/Theses/ Project Report**	**Graduation Date**	**Degree**
1.	Han, Soonhee	Committee	A Comparison of Embodied Greenhouse Gas (GHG) Emissions (A1–A4) from Stationary and Portable Asphalt Plants in Colorado	May 2025	MS
2.	Raeisinafchi, Roya	Committee	Enhancing the Quality of Safety Training in the Construction Industry	December 2024	PhD
3.	Lopez, Jazmin	Committee	Evaluating the value proposition of adopting Virtual Reality (VR) for safety training within the Construction Industry	May 2024	PhD
4.	Chang, Gerardo	Committee	Defining an “Index of Complexity” to predict job task challenges	TBD	PhD (Construction Engineering)

5.	MennatAllah Hammam	Committee	A New Look at Designing Electrical Construction Processes A Case Study of Cable Pulling and Termination Process on Data Center Construction Sites	May 2020	MS (Construction Management)
6.	Sun, Zhe	Committee	Technology for automatically capturing human behavior in construction	August 2020	PhD (Construction Engineering)
7.	Chen, Jiawei	Committee	Assessment of reality capture technologies for construction	August 2020	PhD (Construction Engineering)
8.	Fenais, Amr	Committee	Augmented reality for trenchless construction	May 2020	PhD (Construction Engineering)
9.	Ghosh, Arunabho	Committee	Analyzing the Distribution and Variations in Construction Costs for Commercial Tenant Improvement Projects	December 2016	MS (Construction Management)
10.	Cribbs, John	Committee	PrefaBIM – Framework for using BIM to improve prefabrication efforts	May 2016	PhD (Construction Management)

Financial Support for Graduate Students:

No.	Name	Expected Graduation Date	Field of Study	Financial Support
1.	El Kassis, Rita	December 2023	Civil Engineering (PhD)	External Funds: Nevada DOT
2.	McCord, Kieren	May 2022	Construction Management (PhD)	External Funds: National Science Foundation
3.	Patil, Karan	December 2022	Construction Management (MS), Anticipating completing a Construction Management PhD after MS	External Funds: National Science Foundation
4.	Khalek, Imad	December 2019	Construction Management (MS)	External Funds: National Science Foundation

5.	Hartless, Justin	August 2019	Construction Management (MS)	External Funds: National Science Foundation
6.	Beauregard, Michael	August 2018	Construction Management (PhD)	Internal: RA (Startup Funds)
7.	Chalhoub, Jad	May 2019	Construction Management (MS) Civil Engineering (Construction) (PhD)	External Funds: National Science Foundation
8.	Rahman, Rahimi	May 2018	Civil Engineering (Construction) (PhD)	External Funds: 4-Year GRA Fellowship from Malaysian Government
9.	Alsafouri, Suleiman	May 2017	Civil Engineering (Construction) (PhD)	External Funds: Hensel Phelps Grant, and Internal: RA (Startup funds)

Teaching

Courses Taught at CU Boulder:
One undergraduate course (AREN 4506) has been taught since joining CU. One graduate course (CVEN 5836 – Researching Information Technologies in Construction) has been developed related to Ayer's research interests.

Detailed course ratings are listed in responses to Ayers' Faculty Course Questionnaires (FCQ)

Course prefix, Number, Title (No. of Credit Hours)	Term/Year	No. of Students
AREN4506: Pre-construction Estimating and Scheduling (3 Credit Hours)	Fall 2025	26
CVEN 5836: Researching Information Technology in Construction (3 Credit Hours)	Spring 2025	15
AREN4506: Pre-construction Estimating and Scheduling (3 Credit Hours)	Fall 2024	26
AREN4506: Pre-construction Estimating and Scheduling (3 Credit Hours)	Spring 2024	40
AREN4506: Pre-construction Estimating and Scheduling (3 Credit Hours)	Fall 2023	30

Courses Taught at ASU:
One undergraduate course (CON 453) at ASU.

One graduate course (CON 575) has been taught at ASU, which has been substantially modified to incorporate Ayer's research interests.

(Description of Unit Rating Scale: 1 – 5 where 5 is best)

Course prefix, Number, Title (No. of Credit Hours)	**Term/ Year**	**No. of Students**	**Student Eval Average (for course)**	**Student Eval Average (for instructor)**
CON/CNE 453 Construction Technology (3)	SP 2023	35	4.46	4.7
CON/CNE 453 Construction Technology (3)	FA 2022	45	4.02	4.4
CON 575 Information Technology in Construction (3)	FA 2022	31	4.36	4.66
CON/CNE 453 Construction Technology (3)	SP 2022	44	4.29	4.74
CON/CNE 453 Construction Technology (3)	FA 2021	52	4.38	4.7
CON 575 Information Technology in Construction (3)	FA 2021	29	4.59	4.81
CON/CNE 453 Construction Technology (3)	SP 2021	41	4.47	4.69
CON/CNE 453 Construction Technology (3)	FA 2020	43	4.54	4.86
CON 575 Information Technology in Construction (3)	FA 2020	27	4.5	4.79
CON/CNE 453 Construction Technology (3)	SP 2020	44	4.30	4.59
CON 575 Information Technology in Construction (3)	FA 2019	30	4.61	4.77
CON/CNE 453 Construction Technology (3)	FA 2019	42	4.21	4.51
CON/CNE 453 Construction Technology (3)	SP 2019	44	4.22	4.55
CON 575 Information Technology in Construction (3)	FA 2018	28	4.37	4.76
CON/CNE 453 Construction Technology (3)	FA 2018	48	4.04	4.42
CON/CNE 453 Project Management I (3)	SP 2018	47	4.29	4.57
CON/CNE 453 Project Management I (3)	FA 2017	47	4.16	4.57
CON 575 Information Technology in Construction (3)	FA 2017	28	4.56	4.7
CON/CNE 453 Project Management I (3)	SP 2017	47	4.03	4.56

CON 575 Information Technology in Construction (3)	FA 2016	30	4.15	4.62
CON/CNE 453 Project Management I (3) *GRA (Michael Beauregard) Teaching for Practicum	FA 2016	47	4.00*	4.39*
CON/CNE 453 Project Management I (3)	SP 2016	49	4.00	4.39
CON/CNE 453 Project Management I (3)	FA 2015	43	4.09	4.53
CON/CNE 453 Project Management I (3)	SP 2015	40	4.24	4.24
CON/CNE 453 Project Management I (3)	FA 2014	41	3.98	4.37

Courses Taught Prior to Joining ASU:

Course prefix, Number, Title (No. of Credit Hours)	**Term/ Year**	**No. of Students**	**Student Eval Average (for course)**	**Student Eval Average (for instructor)**
[The Pennsylvania State University] AE124S – Architectural Engineering Orientation (1)	Sp 2014	48	5.25 (out of 7)	6.38 (out of 7)
[The Pennsylvania State University] AE124S – Architectural Engineering Orientation (1)	Fa 2013	78	5.62 (out of 7)	5.78 (out of 7)
[The Pennsylvania State University] AE124S – Architectural Engineering Orientation (1)	Sp 2013	45	5.54 (out of 7)	5.93 (out of 7)
[The Pennsylvania State University] AE124S – Architectural Engineering Orientation (1)	Fa 2012	87	5.15 (out of 7)	5.50 (out of 7)
[The Pennsylvania State University] AE124S – Architectural Engineering Orientation (1)	Sp 2012	37	5.73 (out of 7)	6.05 (out of 7)
[The Pennsylvania State University] AE124S – Architectural Engineering Orientation (1)	Fa 2011	88	5.39 (out of 7)	5.93 (out of 7)
[The Pennsylvania State University] AE124S – Architectural Engineering Orientation (1)	Sp 2011	32	5.44 (out of 7)	5.44 (out of 7)
[The Pennsylvania State University] AE124S – Architectural Engineering Orientation (1)	Fa 2010	92	5.45 (out of 7)	5.80 (out of 7)
[The Pennsylvania State University] AE124S – Architectural Engineering Orientation (1)	Sp 2010	17	5.67 (out of 7)	5.67 (out of 7)

The Pennsylvania State University] AE124S – Architectural Engineering Orientation (1)	Fa 2009	99	5.43 (out of 7)	5.47 (out of 7)

RESEARCH SUPPORT

Funded proposals:

No.	Year (Research Period)	Sponsor	Title	Role	Funding Amount
1.	April 2025	FEDERAL -	NCHRP 10-122 - Update of the AASHTO Practical Guide to Cost Estimating (PGCE)	Co-PI, with PI Jennifer Shane (Iowa State University)	$250,000 with $50,460 subcontract to Ayer
2.	January 2024	INDUSTRY - ELECTRI International	Artificial Intelligence for the Electrical Construction Industry	PI, with Co-PI's Amelia Celoza and Amir Behzadan	$45,194
3.	July 2022	INDUSTRY – Construction Industry Institute	CII RT 403 - Defining a Path for the Digital Transformation of the Capital Project Industry	PI, with Co-PI Yong Cho (Georgia Institute of Technology)	$240K Total, $57,835 to ASU recognized to Ayer
4.	July 2021	INTERNAL- Arizona State University, Fulton Schools of Engineering Seed Funding	Virtual Reality with Realistic Human Interactions for Construction Safety	PI, with Co-PI Rachel Finley (ASU, School of Theatre)	$25,000
5.	August 2019	FEDERAL- National Science Foundation	Collaborative Research: Immersive virtual reality with haptic feedback to improve safety hazard recognition, assessment and decision-making among construction professionals	PI, with Co-PI's Jeremi London (Virginia Tech) and Matthew Hallowell (University of Colorado, Boulder)	$750K Total, $500K to ASU with $250K subcontract to CU Boulder.

6.	August 2019	STATE – Nevada Department of Transportation	Human-Augmented Technology Interaction (HATI) for Improving Construction Quality Control and Task Monitoring – An Application of Augmented Reality (AR) for Visualization and Remote Project Management Support	PI with Co-PI's Mounir El Asmar and Pingbo Tang	$250,000 total, with $175,000 recognized funding to Ayer
7.	February 2017	FEDERAL-National Science Foundation	EXP: Collaborative Research: Mixed Reality to Cultivate Apprenticeship Learning for Architecture, Engineering, and Construction	PI, with Co-PI's Jeremi London (Virginia Tech) and Wei Wu (California State University, Fresno)	Total project: $550,000 ASU's portion: $410,635
8.	July 2017	INDUSTRY – ELECTRI International	Early Career Award: Augmented Reality for Electrical Construction Tasks	PI	$9,000
9.	January 2017	INDUSTRY-Hensel Phelps (HP) Construction	Modification: Markerless mixed reality visualization for design and constructability review sessions	PI	$20,000
10.	October 2016	FEDERAL-National Science Foundation	REU Supplement: CRII: Cyberlearning: Mobile Computers to Enhance the Building Industry and Education	PI	$37,000
11.	August 2016	INDUSTRY-Hensel Phelps Construction	Markerless mixed reality visualization for design and constructability review sessions	PI	$20,000
12.	Fall 2016 – Spring 2018	FEDERAL-National Science Foundation	CRII: Cyberlearning: Mobile Computers to Enhance the Building Industry and Education.	PI	$175,000

13.	Fall 2014 – Spring 2015	INTERNAL - Barrett the Honors College's Bidstrup Foundation Fellowship	Analysis of ASU's College Avenue Commons building to identify and organize noteworthy high-performance building elements	Faculty Advisor	$1,500