Dr. **Sushobhan Sen**
AB-9/312, Indian Institute of Technology Gandhinagar, Palaj, Gandhinagar - 382355, Gujarat, India
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EDUCATION

University of Illinois at Urbana-Champaign (UIUC) Urbana, IL, USA
Doctor of Philosophy in Civil Engineering December, 2019
Thesis topic: Role of Pavements in Urban Energetics *GPA: 4.0/4.0*
Committee members: Dr. Jeffery Roesler (UIUC, Chair), Dr. Imad Al Qadi (UIUC), Dr. Arif Masud (UIUC), Dr. Jeremy Gregory (MIT), and Dr. John Harvey (UC Davis)

University of Illinois at Urbana-Champaign (UIUC) Urbana, IL, USA
Master of Science in Civil Engineering August, 2015
Thesis Topic: Impact of Concrete Pavements on the Urban Heat Island *GPA: 4.0/4.0*
Thesis adviser: Dr. Jeffery Roesler (UIUC)

Indian Institute of Technology Roorkee Roorkee, India
Bachelor of Technology May, 2013
Major: Civil Engineering *GPA: 9.5/10.0*
Awarded the Institute Silver Medal

WORK EXPERIENCE

Indian Institute of Technology Gandhinagar
Assistant Professor December, 2022 - Present
Assistant professor of civil engineering and PI at the Built Environment Lab. Part of the team that started a new Infrastructure Engineering masters and doctoral program at IIT Gandhinagar.

University of Pittsburgh
Postdoctoral Associate January, 2020 - December, 2022
Conducted research in fracture mechanics, finite element modeling, bonded concrete overlays, urban heat islands, and viscoelastic modeling. Supervisors: Dr. Lev Khazanovich and Dr. Julie Vandenbossche.

ePAVE, LLC
Technical Intern June, 2018 - August, 2018
Prepared material specifications for a cool pavement coating, co-authored a white paper on cool pavements, and assisted in writing an NSF SBIR proposal.

TEACHING EXPERIENCE

University of Pittsburgh
Course Assistant in Finite Element Method September - December, 2020
Taught ABAQUS and trained 17 seniors and graduate students on writing custom MATLAB code for FEM analysis.

University of Illinois at Urbana-Champaign
CEE Transportation Instructional Fellow January - May, 2017, January - May, 2019
Instructor-of-record in a senior design class on roadway geometric design, consisting 50-70 of juniors, seniors, graduate, and online students. Responsible for the entire life cycle of the course.

Graduate Teaching Assistant January - May, 2016, January - May, 2018, August - December, 2018, March - May, 2018
Teaching assistant for classes on roadway geometric design (50-70 students), disaster impact assessment in Puerto Rico (12 students), and teaching and leadership (55 students).

Python Workshop Instructor April & October, 2019
Conducted Python programming workshops for about 20 graduate students, hosted by various student organizations.

REPORTS AND PUBLICATIONS

Peer-Reviewed Journal Articles

(J1) **Sen, S.**, and Roesler, J. (2023) *D-SPARC: Rapid field albedo measurement.* Climate, Vol. 11, No. 3, p. 64, doi: 10.3390/cli11030064

(J2) **Sen, S.**, Li, H., and Khazanovich, L. (2022) *Effect of climate change and urban heat islands on the deterioration of concrete roads.* Results in Engineering, Vol. 16, p. 100736, doi: 10.1016/j.rineng.2022.100736

(J3) DeSantis, J.W., **Sen, S.**, and Vandenbossche, J.M. (2022) *Mechanistic-empirical model to predict transverse joint faulting of bonded concrete overlays of asphalt.* Road Materials and Pavement Design, Available online, doi: 10.1080/14680629.2022.2061371

(J4) Mainieri, J.G., **Sen, S.**, Roesler, J., and Al Qadi, I.L. (2022) *Albedo change mechanism of asphalt concrete surfaces.* Transportation Research Record, Vol. 2676, No. 7, pp. 763–772, doi: 10.1177/03611981221082567

(J5) **Sen, S.**, and Khazanovich, L. (2022) *Reconsidering the strength of concrete pavements.* International Journal of Pavement Engineering, Available online, doi: 10.1080/10298436.2021.2020270

(J6) **Sen, S.**, and Khazanovich, L. (2021) *Limited application of reflective surfaces can mitigate urban heat pollution.* Nature Communications, Vol. 12, No. 3491, pp. 1-8, doi: 10.1038/s41467-021-23634-7

(J7) **Sen, S.**, and Khazanovich, L. (2021) *A self-contained element for modeling crack propagation in beams.* Engineering Fracture Mechanics, Vol. 242, pp. 107460, doi:

10.1016/j.engfracmech.2020.107460

(J8) **Sen, S.**, Fernandéz, J.P.R.M., and Roesler, J. (2020) *Reflective Parking Lots for Microscale Urban Heat Island Mitigation.* Transportation Research Record: Journal of the Transportation Research Board, Vol. 2674, No. 8, pp. 663-671, doi: 10.1177/0361198120919401

(J9) **Sen, S.**, and Roesler, J. (2020) *Wind direction and cool surface strategies on microscale urban heat island.* Urban Climate, Vol. 31, p. 100548, doi: 10.1016/j.uclim.2019.100548

(J10) **Sen, S.**, Roesler, J., Ruddell, B., and Middel, A. (2019) *Cool pavement strategies for urban heat island mitigation in suburban Phoenix, Arizona.* Sustainability, Vol. 11, No. 16, 4452, doi: 10.3390/su11164452

(J11) **Sen, S.**, and Roesler, J. (2019) *Thermal and optical characterization of asphalt field cores for microscale urban heat island analysis.* Construction and Building Materials, Vol. 217, pp. 600-611, doi: 10.1016/j.conbuildmat.2019.05.091

(J12) Baral, A., **Sen, S.**, and Roesler, J. (2018) *Use-phase assessment of photocatalytic cool pavements.* Journal of Cleaner Production, Vol. 190, pp. 722-728, doi: 10.1016/j.jclepro.2018.04.155

(J13) **Sen, S.**, Roesler, J., and King, D. (2019) *Albedo estimation of finite-sized concrete specimens.* Journal of Testing and Evaluation, Vol. 47, No. 2, pp. -, doi: 10.1520/JTE20170059

(J14) **Sen, S.**, and Roesler, J. (2017) *Microscale heat island characterization of rigid pavements.* Transportation Research Record: Journal of the Transportation Research Board, No. 2639, pp. 73-83, doi: 10.3141/2639-10

(J15) **Sen, S.**, and Roesler, J. (2016) *Aging albedo model for asphalt pavements.* Journal of Cleaner Production, Vol. 117, pp. 169-175, doi: 10.1016/j.jclepro.2016.01.019

(J16) **Sen, S.**, and Roesler, J. (2016) *Contextual heat island assessment for pavement preservation.* International Journal of Pavement Engineering, Vol. 19, No. 10, pp. 865-873, doi: 10.1080/10298436.2016.1213842

Peer-Reviewed Conference Papers

(C1) Stolte, S., Pierce, L., Weitzel, N., Medina, J., **Sen, S.**, Scott, G., and Roesler, J. (2022) *Field and laboratory evaluation of in-service bonded concrete overlays on asphalt.* 101st Annual Meeting of the Transportation Research Board, Washington, DC.

(C2) **Sen, S.**, Roesler, J., Ruddell, B., and Middel, A. (2021) *Cool pavements for sustainable urban development.* 12th International Conference on Concrete Pavements, virtual conference, ISBN 978-0-578-33418-9, pp. 623-627, doi: 10.33593/xx1hzrq3

(C3) **Sen, S.**, and Roesler, J. (2021) *Heat island impact of chip seals.* Airfield and Highway Pavements 2021: Pavement Materials and Sustainability, virtual conference, pp. 320-331, doi: 10.1061/9780784483510.029

(C4) **Sen, S.**, and Roesler, J. (2021) *Human-centered geometric design of roads using an autonomous vehicle problem.* American Society of Engineering Education Middle Atlantic Section Spring 2021 Conference, Villanova, PA, link: peer.asee.org/36302

(C5) **Sen, S.**, and Roesler, J. (2020) *Rapid ground-based measurement of pavement albedo.* Pavement, Roadway, and Bridge Life Cycle Assessment 2020, Sacramento, CA, ISBN 9781003092278, pp. 533-540, doi: 10.1201/9781003092278-55

(C6) **Sen, S.**, and Roesler, J. (2019) *Coupled pavement-urban canyon model for cool pavements assessment.* Airfield and Highway Pavements 2019: Innovation and Sustainability in Highway and Airfield Pavement Technology, Chicago, IL, USA, pp. 207-215, doi: 10.1061/9780784482476.022

(C7) Baral, A., **Sen, S.**, and Roesler, J. (2018) *Environmental design concept for multifunctional concrete overlays.* 9^{th} International DUT-Workshop on Research and Innovations for Design of Sustainable and Durable Concrete Pavements, Potsdam, Germany

(C8) **Sen, S.**, and Roesler, J. (2017) *Pavement geometry in microscale urban heat islands.* Conference of the Transportation Association of Canada, St. John's, NL, Canada (link)

(C9) **Sen, S.**, Baral, A., and Roesler, J. (2017) *Use-phase sustainability through preservation.* 10^{th} International Conference on Road and Airfield Pavement Technology, Hong Kong

(C10) **Sen, S.**, and Roesler, J. (2017) *An uncoupled pavement-urban canyon model for heat islands.* International Symposium on Pavement Life Cycle Assessment, Champaign, IL, ISBN 978-1-315-15932-4, pp. 111-120, doi: 10.1201/9781315159324-13

(C11) **Sen, S.**, and Roesler, J. (2016) *Albedo as an engineering property of concrete pavements.* 11^{th} International Conference on Concrete Pavements, San Antonio, TX, ISBN 978-0-9860291-2-7, pp. 59-71 **(awarded best paper by a young author)**

(C12) King, D., Roesler, J., and **Sen, S.** (2016) *Emissions reducing benefits of multifunctional photocatalytic concrete inlays.* 11^{th} International Conference on Concrete Pavements, San Antonio, TX, ISBN 978-0-9860291-2-7, pp. 72-81

(C13) **Sen, S.**, King, D., and Roesler, J. (2015) *Structural and environmental benefits of concrete inlays for pavement preservation.* Airfield and Highway Pavements 2015, Miami, FL, pp. 697-707, doi: 10.1061/9780784479216.062

(C14) **Sen, S.**, and Roesler, J. (2014) *Assessment of concrete pavement structure on urban heat island.* International Symposium on Pavement Life Cycle Assessment, Davis, CA, pp. 191-200 (link)

Theses

(T1) **Sen, S.** (2019) *Role of pavements in urban energetics.* University of Illinois at Urbana-Champaign, Urbana, IL. Doctoral dissertation

(T2) **Sen, S.** (2015) *Impact of concrete pavements on the Urban Heat Island.* University of Illinois at Urbana-Champaign, Urbana, IL. Master's Thesis

Reports

(R1) Pierce, L.M., Stolte, S.E., Weitzel, N., Medina, J., Van Dam, T., Senn, K., Roesler, J., Scott, G.M., **Sen, S.**, Jadallah, O.A., Maser, K., Carmichael, A., Smith, K., and Smith, K. (2022) *NCHRP Research Report 1007: Evaluation of Bonded Concrete Overlays on Asphalt Pavements*, National Cooperative Highway Research Program (NCHRP) Project 01-61, National Academies of Sciences, Engineering, and Medicine (NASEM), Washington, DC, doi: 10.17226/26760

(R2) Vendenbossche, J.M., Donnelly, C.A., Buettner, N., **Sen, S.**, and Brody, Z.A. (2022) *Effect of Superloads on Pavement Life*. Pennsylvania Department of Transportation Report No. FHWA-PA-2022-001-PITT WO 019, University of Pittsburgh, Pittsburgh, PA (link)

(R3) Khazanovich, L., Vandenbossche, J.M., Salles, L., **Sen, S.**, Donnelly, C.A., and Kosar, K. (2021) *Faulting model improvements for MEPDG*. Pennsylvania Department of Transportation Report No. FHWA-PA-2021-005-PITT WO 001, University of Pittsburgh, Pittsburgh, PA (link)

(R4) Zhou, Q., Okte, E., **Sen, S.**, Ozer, H., Al-Qadi, I. L., Roesler, J. R., and Chatti, K. (2019) *Development of a Life-cycle Assessment Tool for Pavement Preservation and Maintenance on Flexible and Rigid Pavement Vol I*. Illinois Center for Transportation Series No. ICT-19-010, Illinois Center for Transportation, UIUC, Rantoul, IL (link)

(R5) Zhou, Q., Okte, E., **Sen, S.**, Rajaei, S., Ozer, H., Al-Qadi, I. L., Roesler, J. R., and Chatti, K. (2019) *Development of a Life-cycle Assessment Tool for Pavement Preservation and Maintenance on Flexible and Rigid Pavement Vol II*. Illinois Center for Transportation Series No. ICT-19-011, Illinois Center for Transportation, UIUC, Rantoul, IL (link)

(R6) **Sen, S.**, and Moradian, K. (2018) *Better pavements make better communities: the promise of cool pavements.* White paper for ePAVE, LLC, Los Angeles, CA (link)

Proposals

(P1) *Optislab: Interior slab design software* (2021). Proposal to PNA Construction Technologies, Inc. PI: Khazanovich, L.

(P2) *A community-enabled machine learning tool to mitigate heat pollution in Pittsburgh* (2020). Proposal to the Mascaro Center for Sustainable Innovation at the University of Pittsburgh. PI: Khazanovich, L., Co-PI: Sen, S.

(P3) *A machine learning tool for climate-resilient pavement management in urban areas* (2020). Proposal to the Federal Highway Administration. PI: Khazanovich, L., Co-PI: Sen, S.

(P4) *Multi-Functional Concrete Inlays* (2014). Proposal to the University Transportation Center for Highway Pavement Preservation at Michigan State University. PI: Roesler, J.

(P5) *Fatigue and Fracture of Fiber Reinforced Cementitious Bonded Overlay for Asphalt Pavement Preservation* (2015). Proposal to BASF GmbH. PI: Roesler, J.

(P6) *SBIR Phase I: An Environmentally Sustainable Surface Treatment for Pavement Preservation: Research & Development Study* (2018). Proposal to the National Science Foundation. PI: Moradian, K.

(P7) *Best Practice Guidelines for Cool Pavements* (2019). Proposal to RMC Research & Education Foundation. PI: Roesler, J.

Intellectual Property

(IP1) **Sen, S.**, Li, H., and Khazanovich, L. *A scalable adaptive sampling method for surrogate modeling using active machine learning.* Disclosure filed (2022).

(IP2) Khazanovich, L. and **Sen, S.** *A quasi-elastic finite element method program for analysis of the effect of concrete solidification on the long-term behavior of beams-on-grade.* Disclosure filed (2021).

(IP3) **Sen, S.**, Roesler, J., and Dahal, S. *D-SPARC: A Discrete Spectral Reflectometer for Rapid Albedo Measurement.* Disclosure filed (2020).

HONORS AND AWARDS

Illinois Center for Transportation

PhD Student Symposium Award October, 2017

Awarded second place among a cohort of 50 top international PhD students in pavement engineering.

11^{th} *International Conference on Concrete Pavements*

Bengt F. Friberg Award for Best Paper by a Young Author August, 2016

Awarded best paper out of over 100 peer-reviewed manuscripts from around the world.

University of Illinois at Urbana-Champaign

Mavis Future Faculty Fellowship August, 2017 - July, 2018

Awarded a fellowship among engineering PhD students to be trained for a career in academia.

CEE Transportation Instructional Fellowship January, 2017 & 2019

Awarded a fellowship to teach a senior design course in the Department of Civil and Environmental Engineering.

Teacher Scholar Certificate May, 2018

Earned a certificate in pedagogical scholarship by designing teaching materials, engaging with the literature, and gaining extensive teaching experience.

Graduate Teacher Certificate May, 2018

Earned a certificate in teaching based on teaching experience and participation in teacher

training activities.

Ravindar K and Kavita Kinra Fellowship August, 2013 - July, 2014
Earned a competitive private fellowship to engage in research for 1 year as an MS student.

Indian Institute of Technology Roorkee
Institute Silver Medal and Other Honors October, 2013
Earned several awards for finishing at the top of the Civil Engineering class of 2013.

German Academic Exchange Service (DAAD)
Working Internships in Science and Engineering (WISE) Scholarship May, 2012
Awarded a scholarship to engage in summer research at Technical University Munich (TUM).

INVITED TALKS

(N1) *Advanced topics in finite element modeling.* Invited talk to Introduction to the Finite Element Method class (CEE 2333), Department of Civil and Environmental Engineering, University of Pittsburgh (2022)

(N2) *Climate change adaptation of pavements at local scale.* Invited talk to the Department of Civil Engineering, Indian Institute of Technology Gandhinagar (2021)

(N3) *Adapting neighborhood pavements for climate change.* Invited talk to the Department of Civil Engineering, Indian Institute of Technology Kanpur (2021)

(N4) *Pavement materials in the context of the urban heat island.* Invited talk at the short term course on Advances in Pavement Engineering, Indian Institute of Technology Bhubaneswar (2021)

(N5) *Microscale urban heat islands: cooling your neighborhood.* Invited talk to the Department of Civil and Environmental Engineering, Carnegie Mellon University (2020)

(N6) *Phase change materials for urban heat island mitigation.* Invited talk at webinar organized by the Transportation Research Board Committee on Sustainable and Resilient Pavements (2020)

MEDIA COVERAGE

(M1) *Betongveier rammes hardt av klimaendringene.* Byggeindustrien, December 27, 2022. (link) [In Norwegian]

(M2) *Cambio climático deteriora el pavimento de concreto.* SciDevNet, December 12, 2022. (link) [In Spanish]

(M3) *Concrete roads could deteriorate faster because of climate change.* Pittsburgh Union Progress, November 22, 2022. (link)

(M4) *Estratégias de resfriamento urbano usando superfícies reflexivas.* EcoDebate, Decem-

ber 12, 2021. (link) [In Portuguese]

(M5) *Creating cooler cities.* EurekAlert! American Association for the Advancement of Science, June 21, 2021. (link)

(M6) *Research Update: A Few Changes to Mitigate UHI Effect and Cool Cities.* International Society for Concrete Pavements, June 15, 2022. (link)

(M7) *Civil engineers examine urban cooling strategies using reflective surfaces.* Science Daily, June 21, 2021. (link)

(M8) *Engineers examine urban cooling strategies using reflective surfaces.* Phys.org, June 22, 2021. (link)

(M9) *UIUC grad has the remedy for surging urban temps.* Illinois Center for Transportation, February 3, 2020. (link)

(M10) *Urban heat islands studied within a pavement LCA framework.* Illinois Center for Transportation, May 1, 2018. (link)

(M11) *Student spotlight: Sushobhan Sen.* Illinois Center for Transportation, February 1, 2018. (link)

(M12) *Wired In: Sushobhan Sen.* The News-Gazette, December 23, 2016. (link)

LEADERSHIP AND SERVICE

Transportation Research Board

TRB Sustainable and Resilient Pavements Subcommittee January 2014 - Present
Presented in annual meetings and sessions as a friend of the committee, helped organize a widely-attended webinar on urban heat islands and pavements, and co-authored a technical circular on cool pavements.

International Society for Concrete Pavements

Co-Director of Communications May, 2021 - Present
Webmaster and student member July, 2015 - December, 2019

12th International Conference on Concrete Pavements

Organizing Team Member June - October, 2021
Organized The Student Pitch networking event and maintained the conference website.

University of Pittsburgh Postdoctoral Association (UPPDA)

University Senate Bylaws and Procedures Committee September, 2020 - May, 2022
Postdoctoral representative to the committee

UPPDA Gender and Racial Equity Sub-committee September, 2020 - August, 2021
Coordinator for the affinity group for postdocs from under-represented backgrounds

University of Illinois at Urbana-Champaign

ITE UIUC Student Chapter August, 2015 - August, 2017

Secretary of the Institute of Transportation Engineers (ITE) Student Chapter.

IGSA at UIUC August, 2013 - August, 2019

President of the Indian Graduate Students Association (IGSA) at UIUC from August, 2014 - August, 2015 and webmaster from August, 2015 - 2018

Peer Reviewer

Provided peer-review for manuscripts submitted to the International Journal of Pavement Engineering, International Journal of Life Cycle Assessment, Solar Energy, Environmental Research Letters, Atmospheric Environment, Journal of Transportation Engineering: Part B (Pavements), Journal of Cleaner Production, Transportation Research Record, Urban Science, Measurement, Journal of Nondestructive Evaluation, Urban Climate, Energies, Sustainability, Sustainable Energy Technologies and Assessments, Sustainable Cities and Society, Case Studies in Construction Materials, Construction and Building Materials, Ain Shams Engineering Journal, and the International Journal for Heat and Mass Transfer