One Week Short-Term Course on

Vision-based Condition Assessment of Civil Infrastructure

Sponsored by Ministry of Education (MoE), Government of India, New Delhi,
Under the program 'Global Initiative of Academic Networks' (GIAN)

6th – 11th January 2025

Course overview:

Computer vision techniques, in conjunction with acquisition through remote cameras and unmanned aerial vehicles (UAVs), offer promising non-contact solutions to civil infrastructure condition assessment. The ultimate goal of such a system is to automatically and robustly convert the image or video data into actionable information regarding the health of the civil infrastructure asset. The significant improvements and successful applications of computer vision techniques in many fields provide increasing motivation for scholars to develop computer vision solutions to the civil engineering problems.

This lecture series provides an overview of recent advances in computer vision techniques as they apply to the problem of civil infrastructure condition assessment. In particular, relevant research in the fields of computer vision, machine learning, and structural engineering are synthesized for delivery of a novel course. The topics covered are classified into three main categories: monitoring applications, spatial measurement applications, and inspection applications. The monitoring applications discussed include static measurement of strain and displacement, as well as dynamic measurement of displacement for modal analysis. The spatial measurement applications include structure from motion and photogrammetry for 3D reconstruction of assets. The inspection applications covered include computer vision and deep learning methods for identifying context such as structural components, characterizing local and global visible damage, and detecting changes from a reference image.

The aim of the lecture is to inspire the future civil engineers and scientist to out-of-the-box thinking as encouragement for discovering the exciting yet widely unexplored potential of computer vision and artificial intelligence for infrastructure applications. An internationally acclaimed academic professional Prof. Vedhus Hoskere from USA will deliver all the lectures in this course. The course will be planned and offered by School of Infrastructure, Indian Institute of Technology Bhubaneswar.

The primary objectives of this course are to create understanding the followings amongst the participants:

a) Advances in computer vision enabling condition assessment of civil infrastructure
b) Vision-based displacement measurement techniques and applications
c) Spatial measurement of infrastructure assets using computer vision
d) AI-based autonomous inspection of civil infrastructure

Course content:

- Introduction to vision-based condition assessment
- Computer vision and image primers, image sampling, interpolation, transformations
- Image basics lab, linear filters and edges, feature extraction
- Vision-based vibration measurement and structural monitoring
- Vision-based spatial measurement and 3D representation
- Vibration measurement and 3D reconstruction lab
- AI-based autonomous inspections
- Data acquisition for assessment
- Applications of DL and CNN for vision-based inspection of civil infrastructure
- Deep learning, Data acquisition and processing lab

Who can attend?

- Practicing civil engineers, researchers, and executives in the areas of civil, structural and transportation engineering from various private and government organizations.
- Faculty members of academic institutions and R&D centres.
- UG, PG. and Ph.D. students working in the areas of civil, structural & transportation engineering.

Course period and venue:

Duration: 6th – 11th January 2025
Venue: School of Infrastructure
              Indian Institute of Technology Bhubaneswar
              Argul, Jatni, Khurdha-752050, Odisha, India

Course fee:

- Students: 1000/-
- Participants from academic/technical institutions and R&D units: Rs. 2000/-
- Participants from industries: Rs, 5000/-
- Participants from abroad: US$ 100

The fee includes all instructional materials, computer use for tutorials and assignments, and laboratory equipment usage charges. The course fee does not include accommodation. However, the participants will be provided accommodation on payment basis in the institute guest house based on availability.

This Payment can be made via NEFT transfer, in favour of **"CEP IIT Bhubaneswar", A/C. No: CEP, IIT Bhubaneswar, A/c No. 24282010001960, Canara Bank, IFSC: CNRB0017282** or through Demand Draft, in favour of "CEP IIT Bhubaneswar" payable at Bhubaneswar.

Registration:

Register for the course online at:
https://docs.google.com/forms/d/e/1FAIpQLScpmNShFqoUyqgJ-UtrrLtMq9ZOBrp4n1_QH5zqQxS4ZDkV0A/viewform?usp=sf_link
The last date of registration is 20th December 2024.
Number of participants for the course is limited to 100.

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Dr. Vedhus Hoskere is the Director of the Structures and Artificial Intelligence Laboratory. He is currently an Assistant Professor in the Department of Civil and Environmental Engineering at the University of Houston (UH) and holds a joint appointment in Electrical and Computer Engineering. Dr. Hoskere received his Ph.D. in Civil Engineering in 2020, after an MS in Computer Science in 2020, and an MS in Structural Engineering in 2016, all from the University of Illinois at Ubana-Champaign. Dr. Hoskere's research expertise is interdisciplinary, at the intersection of structural engineering, machine learning, computer vision, and robotics. His research looks to advance systems and approaches for autonomous infrastructure management including incorporation of computer vision-based information extraction, deep learning-based data to decision frameworks, and autonomous robotic data acquisition and manipulation systems for infrastructure maintenance, repair, and management.

Dr. Hoskere serves on several national and international committees including the IABSE task group on remote inspections of bridges, and the ASCE EMI Structural Health Monitoring and Control Committee. Dr. Hoskere is active in organizing international conferences as a co-chair in venues including ASCE EMI conference. Dr. Hoskere has organized special journal issues on advances in computer vision for civil infrastructure and earthquake engineering including in journals such as smart structures and systems, and the journal of earthquake engineering and engineering vibration. Dr. Hoskere currently leads a project from the Texas Department of Transportation on developing guidelines for digitizing Texas bridges to next generation assessment and management of bridge assets. He currently leads $1.5M in projects with several agencies in the US including NSF, NASA, Department of Defense, and Texas Department of Transportation. Dr. Hoskere's research been published in over 25 journal papers and 33 conference papers and has received awards for his research at prestigious avenues including best paper awards at SHMII-9 and at the ASCE EMI Conference.

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