Mohit Gupta

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Research Areas: Computer vision, Deep learning, Digital twin, Building Information Modeling, Human-centric design

EDUCATION

Ph.D. Civil and Environmental Engineering Aug 2021 - May 2025
Arizona State University, United States (*GPA: 4.0/4.0*)
Advisors: Dr. Thomas Czerniawski and Dr. Ricardo Eiris
Dissertation: Digitization, Analysis, and Compliance of Engineering Drawings Using AI and Knowledge Graphs

M.Tech. in Design Engineering (*GPA: 9.62/10*) Aug 2019 - May 2021
Birla Institute of Technology and Science (BITS) Pilani, India

B.E.(Hons.) in Civil Engineering (*GPA: 9.19/10*) Aug 2011 - May 2015
BITS Pilani, India
Dissertation: Automated BIM compliance with Indian Seismic standards

RESEARCH EXPERIENCE

Converting Engineering Drawings into a Graph Data Structure (Project Link) 2023 - Present
Advisor: Dr. Ricardo Eris and Dr. Thomas Czerniawski, ASU | Industrial Partner: Sundt Construction

Aim: To automate the digitization of engineering drawings shared in non-CAD formats; build information retrieval systems; perform compliance checks. (Papers - J1, J3, C5)

Solution: Devised a novel approach to identify topological relationships among elements (symbols, lines, and texts) shown on an engineering drawing (P&ID) and created a graph-like structure. Graph facilitated interoperability with CAD systems, information retrieval (using LLMs), and automated compliance checking with safety standards.

Technology: Object detection, OCR, line segmentation, graph-based linking, RAG agents, Cypher queries.

Multimodal Condition Monitoring of Hydro-Electric Power Stations (Project Link) 2023 - 2024
*Advisor: Dr. Ricardo Eiris, **CWT Lab, ASU** | Industrial Partner: Salt River Project*

Aim: To adopt an efficient Predictive Maintenance (PdM) approach for Hydroelectric power plants instead of traditionally expensive Reactive or Preventive Maintenance practices.

Solution: Developed Forecasting and Anomaly Detection modes for monitoring turbine vibrations using pseudo-sensing, based on historical operation data.

Technology: Time-series forecasting, Signal reconstruction, Anomaly Detection

Turbine defects inspection 2023 - 2024
*Advisor: Dr. Ricardo Eiris, **CWT Lab, ASU** | Industrial Partner: Salt River Project (SRP)*

Aim: To reduce physical exposure of workers to hazardous areas inside turbine casings and standardize the turbine inspection with computer vision. (Paper - C1)

Solution: Developed an automated system to detect defects such as cavitation, corrosion, and cracking by integrating 360-imagery and LiDAR scans of hydro-turbines. Also, conducted a feasibility study on using synthetic images to augment the training dataset for enhanced model performance.

Technology: 3D Point-cloud Segmentation, Stable Diffusion (ControlNet), Semantic Segmentation

Spatio-geometrical accuracy of learned 3D point clouds from NeRF 2022 - 2022
*Advisor: Dr. Andre Borrmann, **TU Munich,** Germany | Industrial Partner: Openspace*

Aim: To evaluate the feasibility of using video imaging as an alternative to LiDAR scanning for monitoring construction site progress, focusing on accuracy, scalability, and cost-effectiveness. (Paper - C4)

Solution: Designed an experiment comparing 3D reconstruction using - Neural Radiance Fields (NeRF) and Structure-from-Motion (SfM) against LiDAR sensing.

Technology: NerfStudio, Colmap, CloudCompare

2D Building Plans to 3D Digital Models (Project Link) 2021 - 2022
Advisor: Dr. Thomas Czerniawski, ***Edifice Lab, ASU***

Aim: To automatically convert 2D floor plans into semantically richer 3D models in Autodesk-Revit. (Papers - J4, C6)

Solution: Developed a floorplan segmentation module to localize structural elements such as walls, doors, and columns in CAD images, followed by their conversion into an IFC structure for seamless import in Revit.

Technology: Semantic Segmentation, Dynamo API

Automated BIM compliance with Indian Seismic standards (Undergraduate Thesis) 2014 - 2015
Advisor: Dr. Rajiv Gupta, ***BITS Pilani****, India*

Built an Autodesk-Revit plugin incorporating earthquake-resistant provisions from Indian Standard codes IS-1893 and 4326. (Paper - M1)

PUBLICATIONS

J1. M. Gupta, T. Czerniawski, R.Eiris, PiD2Graph: Convert P&IDs into Graphs *(submitted to Automation in Construction)*.

C1. M. Gupta, C.Wei, R.Eiris, T. Czerniawski Automating Hydroturbine Inspections Through Generative Image Synthesis *(submitted to ASCE I3CE 2025)*.

J2. C. Wei, **M.Gupta**, R.Eiris, City-Scale Bike Lane Facility Management through LiDAR, Weakly Supervised Learning, and Dimensionality Reduction *(accepted in Journal of Computing in Civil Engineering)*.

C2. M.Gupta, S.Jain, S.Billington, J.weinold, M.Andersen, Deep learning model for discomfort glare detection based on occupants' facial analysis, ASCE, I3CE 2024.

C3. C. Wei, **M.Gupta**, R.Eiris, A Feasibility Investigation of Bike Lane Width Estimation on LiDAR Point Cloud Using Dimensionality Reduction and Weakly Supervised Learning, ASCE, I3CE 2024.

J3. M. Gupta, C.Wei, T. Czerniawski, Semi-supervised symbol detection for piping and instrumentation drawings, Automation in Construction, 2024.

C4. M. Gupta, A. Borrmann, T. Czerniawski, Comparison of 3D reconstruction between Neural Radiance Fields and Structure-from-Motion based Photogrammetry from 360°videos, ASCE I3CE 2023.

J4. C.Wei, **M. Gupta**, T. Czerniawski, Interoperability between Deep Neural Networks and 3D Architectural Modeling Software Affordances of Detection and Segmentation, Buildings, MDPI, 2023.

C5. M. Gupta, C. Wei, T. Czerniawski, Automated valve detection in Piping & Instrumentation drawings, ISARC 2022.

C6. C. Wei, **M. Gupta**, Automated wall detection in 2D CAD drawings to create digital 3D models, ISARC 2022.

C7. S.B. Singh, S. Awasthi, **M. Gupta**, P. Kiran, A. Garg, In-Plane Strengthening of Masonry Walls with Fibre-Reinforced Polymer, NCSID, NITTTR, Chandigarh, India, 2014.

C8. S.B. Singh, S. Awasthi, **M. Gupta**, P. Kiran, A. Garg, In-Plane Study on Improving the Resistance of Masonry Walls Subjected to Out of Plane Loads, NCSID, NITTTR, Chandigarh, India, 2014.

M1. R. Gupta, **M. Gupta**, A. Gupta, Is India BIM Ready? The MasterBuilder, 2014. (Magazine Article)

TEACHING EXPERIENCE

Teaching Assistant, ASU, USA Spring 2023
CON 453: Construction Technology
Lecturing, designing lab sessions, creating, and grading exercises.
Level: Undergraduate students (≈80 students)

Teaching Assistant, ASU, USA Spring 2023
CON 598: Computer Vision for Builders
Lecturing, designing lab sessions, and creating exercises.
Level: Graduate students (≈30 students)

Curriculum Development, BITS Pilani, India Spring 2015
CE F242: Construction Planning and Technology
Designed a new curriculum integrating Building Information Modeling (BIM) and related software workflows for undergraduate capstone projects.
Level: Undergraduate students(≈60 students)

Teaching Assistant, BITS Pilani, India Fall 2014
CE F312: Hydraulic Engineering
Assisted with laboratory demonstrations, held weekly office hours, and graded assignments.
Level: Undergraduate students (≈60 students)

MENTORING EXPERIENCE

Semester Project Supervisor, ASU Spring 2022
Students: Adam Kocharan, Kasandra Sanchez, Keun Park (MS Computer Science)
Project: Deep learning-based polyp detection in Colonoscopy videos

Semester Project Supervisor, ASU Spring 2023
Students: Dheeraj Kumar, Rohith Bachu, Debanjlee (MS Robotics and Autonomous Systems)
Project: Snoring Detection with Audio Signal Frequency Analysis. (Project Link)

INDUSTRY EXPERIENCE

Research Intern, TU Munich, Germany May 2022 - Aug 2022
Evaluated the 3D reconstruction from panoramic images using an open-source Colmap library (SfM) and a deep learning-based method, Neural Radiance Fields at the Chair of Computational Modeling & Simulation.

Senrior Engineer, THDC India Limited, India *June 2016 - July 2021*
A core member in developing the Detailed Feasibility Report for Bokang-Baling hydro dam (565 MW) with seismological analysis, rainfall prediction, slope stability analysis, and dam-break studies. Also responsible for managing the instrumentation assets of Tehri Dam (2400 MW), crucial for monitoring a dam's health.

BIM Engineer, Vconstruct Private Limited, India May 2015 - July 2016
Worked as a team leader for BIM coordination, quality assurance, facility management, 4D simulations, and virtual mock-ups for construction projects.
Key Projects- Lucile Packard Children's Hospital Stanford, Facebook data center.

Intern, Techture Private Limited, India Dec 2014 - Feb 2015
Contributed to early-stage development in this startup by evaluating and testing software such as Tekla, AutoCAD 3D, and Revit to build optimal solutions for the BIM workflows. Also assisted in project coordination, focusing on clash detection, model updates, and cross-discipline collaboration.

Intern, Civil-Aid Technoclinic Private Limited, India May 2013 - July 2013
Involved in the testing and data analysis of soil samples for an underground railway track project.

HACKATHONS

Kaggle: Predict CO2 Emissions in Rwanda August 2023
Ranked 6^{th} among 1453 teams in developing a time-series forecasting model for predicting CO_2 emissions.

Kaggle: ICR-Identifying Age-Related Conditions June 2023
Ranked among the Top 5% out of 6430 teams in developing a multi-class health classifier for a class-imbalanced dataset.

FELLOWSHIPS & AWARDS

Recipient, Student Conference Travel Grant, ASU, 2024 ($1500).

Rank 1 in Masters' program at BITS Pilani, India (CGPA 9.62/10.0).

All India Rank (AIR) 88 in GATE 2018(Graduate Aptitude Test in Engineering) – Among the top 0.05% of over 153,000 total candidates nationwide in Civil Engineering.

Recipient of Merit scholarship (Full funding for undergraduate education at BITS Pilani) for ranking in the top 1% of the class.

Rank 1 in the Krazy Bridge competition at APOGEE 2013 where my team built the lightest and strongest bridge with a load capacity of more than 400 lbs.

Rank 1 in Smart 2008, an Olympiad of Mathematics and Science.

GRANTS

Zimin Foundation, "City-scale Active Road Users Counting" 2024 - 2025
PI Dr. Deborah Salon, $70,000
A core contributor to the ideation, preliminary data analysis, and grant writing. (Papers - J2, C3)

Salt River Project, "Digital Twin for Hydroelectric Dams" 2023 - 2024
PI Dr. Thomas Czerniawski, $102,000
Helped plan and execute project.

Zimin Foundation, "Transforming Tempe into a Bicycling Oasis Through Data-Driven Planning" 2023 - 2024
PI Dr. Thomas Czerniawski, $75,000
Helped plan and execute project.

Dhiti, Nirmaan Organization, India 2012 - 2013
Co-PI, $10,000
I built a platform, Dhiti to provide solutions for technical problems faced by non-profit organizations working in India in the sectors of farming, education, and women-employment.

SERVICES & LEADERSHIP

Reviewer for Scientific Journals & Conferences 2021-Present
Automation in Construction, ISARC, IEEE ICARCV, ASCE I3CE

Organizer for a workshop - "Interactive and Multimedia Biking Experience" Spring 2024
To raise awareness about road safety for vulnerable road users in Tempe, Arizona. (Project Link)

Assistant Project Leader, Gyan Bodh, Nirmaan Organization 2011-2015
Led Gyan Bodh, an education project of Nirmaan, making efforts to improve the quality of education in rural communities around Pilani, India.

INVITED TALKS

"Artificial Intelligence in Construction: Enhancing Efficiency and Experiential Learning", TUM Georg Nemetschek Institute Artificial Intelligence for the Built World, May 2023.

"Digital Twins for Electric Power Utilities", School of Building Construction, College of Design, Georgia Institute of Technology, January 2024.

TRANSFERABLE SKILLS

Simulation & modelling	BIM modelling, Autodesk Revit, AutoCAD, Dynamo, Navisworks, Sketchup
Languages	Python, MATLAB, C++, Shell Script
ML Frameworks	Pytorch, Fastai, Tensorflow, Keras