Pranay Singh, EIT

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Biosketch

Pranay Singh is a Ph.D. candidate in Civil Engineering at the University at Buffalo, specializing in advanced cementitious materials, 3D concrete printing, and prestressed concrete bridge systems. His research focuses on performance-driven material development, linking structural performance requirements to material design, characterization, and integration into structural systems through analytical modeling, numerical simulations, and multiscale experimental investigations.

Education

University at Buffalo, State University of New York Aug 2023 – May 2027 (expected)
Ph.D. in Civil Engineering (Structural Engineering, Mechanics and Materials) *Buffalo, New York*

Indian Institute of Technology (IIT) Patna Aug 2019 – Jul 2021
M.Tech. in Civil Engineering *Patna, India*

Bhagalpur College of Engineering Aug 2015 – Jul 2019
B.Tech. in Civil Engineering *Bhagalpur, India*

Professional Licensure & Examinations

Fundamentals of Engineering (FE) Exam *Passed*

Principles and Practice of Engineering (PE) Exam *Scheduled*

Technical Skills

Structural & Bridge Engineering: Prestressed and Reinforced Concrete, Bridge Girder Analysis, Nonlinear Finite Element Analysis (ABAQUS), Structural Dynamics, Structural Control

Advanced Concrete Materials: ECC/SHCC, Fiber-Reinforced Concrete, UHPC, Rheology, Mechanical Testing, Fracture and Post-Cracking Characterization, Accelerated corrosion testing

Additive Manufacturing: 3D Concrete Printing, Mix Design, Printability, Fresh-State Characterization

Scientific Computing & Data Analysis: Python, MATLAB, NumPy, Pandas, SciPy, Data Processing and Visualization

Machine Learning: Regression, Classification, Decision Trees, Random Forests, Artificial Neural Networks (ANN), Convolutional Neural Networks (CNN)

High-Performance Computing: Linux, SLURM, Parallel Computing

Research & Professional Experience

University at Buffalo, State University of New York Aug 2023 – Present
Doctoral Researcher, Institute of Bridge Engineering *Buffalo, New York*

- Developing and characterizing 3D-printable SHCC/ECC for crack control in pretensioned bridge girder end zones.
- Evaluating conventional-concrete and ECC beams with unbonded and hybrid prestressing through four-point bending tests and nonlinear ABAQUS analysis.

Indian Institute of Technology (IIT) Delhi Aug 2022 – Jul 2023
Senior Project Scientist *New Delhi, India*

- Developed and analyzed a self-centering, friction-based sliding base-isolation concept using nonlinear earthquake-response simulations.
- Evaluated isolation-system design parameters and structural-control effectiveness under seismic loading.

National Council for Cement and Building Materials (NCCBM) Aug 2021 – Aug 2022
Project Engineer *Ballabgarh, Faridabad, India*

- Investigated ultra-high-performance, fiber-reinforced, and geopolymer concretes using mechanical, fracture, flexural, and shear testing.
- Supported research on roller-compacted concrete and thermal monitoring and control of mass concrete in construction.

Selected Research Projects

ECC Girders with Unbonded and Hybrid Prestressing | *University at Buffalo*

- Compared the influence of tensile strain-hardening on cracking, flexural resistance, deformation, and strand stress development using beam tests and calibrated numerical models.

3D-Printed SHCC for Prestressed Girder End Zones | *University at Buffalo*

- Developed printable SHCC mixes and permanent cover concepts for prestressed girder ends; assessed fresh-state printability, tensile performance, and prestress-transfer cracking.

Steel-Wool-Reinforced Concrete for Crack Mitigation | *University at Buffalo*

- Characterized tensile fracture and residual post-cracking resistance of steel-wool-reinforced concrete for crack-control applications.

Seismic Isolation and Shape Memory Alloy Dampers | *IIT Delhi / IIT Patna*

- Numerically assessed sliding isolation strategies and SMA-based dampers to reduce seismic response and pounding between adjacent buildings.

Advanced and Sustainable Concrete Materials | *NCCBM*

- Developed and characterized UHPC, high-strength fiber-reinforced concrete, and alkali-activated geopolymer concrete; studied ductility and flexural, shear, and fracture performance.
- Additional projects: roller-compacted concrete for dams; field temperature control and monitoring of mass concrete.

Honors, Awards & Fellowships

American Concrete Institute (ACI) Travel Stipend | ACI Concrete Convention, Fall 2025	2025
3D Printing of Concrete Workshop Travel Grant | ASU–Swinburne Workshop, Australia	2025
GRK 2250 International Summer School Selection | TU Dresden, Germany – Accommodation Support	2024
Institute Silver Medal | IIT Patna – Highest CGPA in Civil & Environmental Engineering	2021
MHRD Fellowship, Government of India | Master's Studies, IIT Patna	2019–2021

Academic & Professional Service

Journal Reviewer | *Automation in Construction* (Elsevier); *Construction and Building Materials* (Elsevier); *Journal of Building Engineering* (Elsevier); *Transportation Research Record* (SAGE Publications); *Journal of Materials in Civil Engineering* (American Society of Civil Engineers, ASCE)

Conference Reviewer | Transportation Research Board (TRB) Annual Meeting; Conference on Advancing Additive Manufacturing and Construction in Transportation (AAMCT); Digital Concrete (3DPCMS) Conference

Scientific Committee (Reviewer) | Digital Concrete (3DPCMS) Conference, Nanjing, China | 2026

Session Moderator | Conference on Advancing Additive Manufacturing and Construction in Transportation (AAMCT), Irvine, CA | 2024

Professional Memberships

American Concrete Institute (ACI): Member; Associate Member of Committees 363 (High-Strength Concrete), 374 (Performance-Based Seismic Design of Concrete Buildings), and 564 (3-D Printing With Cementitious Materials).

RILEM: Member; Observer Member of Technical Committees 303-PFC (Performance Requirements and Testing of Fresh Printable Cement-Based Materials), 304-ADC (Assessment of Additively Manufactured Concrete Materials and Structures), and 305-PCC (Pumping of Concrete).

Other Memberships: ASCE (SEI), PCI, fib, MRS, and USACM.

Publications & Research Impact

Research Impact: 146 citations | h-index: 8 | i10-index: 4 | Google Scholar

Selected Technical Presentations: TRB Annual Meeting (2024,2025 and 2026); ACI Fall Convention (2025); BEFIB (2024); TRB Conference on Advancing Additive Manufacturing and Construction in Transportation (2024); TRANSIPIC Annual Workshops and Webinars.