ISHAN JHA

Structural Engineering Researcher | Steel–Concrete Composite Structures | Shape Optimisation |
Nonlinear FEM (ABAQUS) | ML for Structural Prediction

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Google Scholar: h-index 7, 155 citations

Website: www.solve-structures.com

Research Focus

- Steel-concrete composite columns: concrete-filled single- and double-skin steel tube members and a proposed concrete-filled quadruple steel-tube configuration; confinement mechanics, confinement-focused optimisation and multi-action load response.
- Gradient-free shape optimisation of civil engineering structural members (e.g., beams, plates with openings, prestressed members, and steel-concrete sections) under multiple criteria; implemented through an in-house code framework.
- Nonlinear finite element modelling in ABAQUS; integration with machine learning for strength/damage prediction and structural assessment.

Academic Appointments

Postdoctoral Fellow , Indian Institute of Technology (ISM) Dhanbad, India	Mar 2024 – Present
Project Associate , Indian Institute of Technology (BHU) Varanasi, India	Dec 2023 – Mar 2024

Education

Ph.D. in Structural Engineering , Indian Institute of Technology (BHU) Varanasi, India   Jan 2019 – Oct 2023
Thesis: Multi-criteria driven integrated zero-order shape optimization of structural elements.
Coursework GPA: 8.80/10.00

M.Tech in Structural Engineering , National Institute of Technology (NIT) Patna, India   Jul 2016 – Jun 2018
Thesis: Buckling analysis of laminated composite plates with cut-outs.
Cumulative GPA: 8.85/10.00

B.E. in Civil Engineering , Nagpur University, Nagpur, India   Jul 2011 – Jun 2015
Thesis: Optimal design of lined trapezoidal channel section.
Cumulative Percentage: 75.8% (Distinction)

Research and Professional Summary

- **Postdoctoral research (IIT (ISM) Dhanbad)**: Developed the concrete-filled quadruple steel tubular (CFQST) column; performed experimental and numerical investigations; optimized key parameters (confinement thickness, hollow ratio, radial distance, tube shapes) and studied behaviour under axial and lateral loads. Funding: €28,860 (IIT Dhanbad).
- **Doctoral research (IIT (BHU) Varanasi)**: Developed a zero-order (gradient-free) heuristic framework for multi-criteria shape optimization of beams, plates with cut-outs, and prestressed beams; implemented an in-house FORTRAN tool. Funding: Government of India MHRD Scholarship (€21,050).
- **Masters research (NIT Patna)**: FEM-based buckling study of laminated composite plates with varying cut-out shape, ply orientation, aspect ratio and skewness using ABAQUS. Funding: Government of India MHRD Scholarship (€2,970).
- **Industry engagement (parallel to PhD)**: Contributed to 70+ projects covering institutional buildings (residential schools, medical colleges, forensic labs), rehabilitation and strengthening, and assessment of bridges/culverts/ROBs and new elevated roads; total project cost approximately €1 billion.

Industry Training

- 30-day training on construction of high-rise buildings and villas at Apollo db City under Divya Dev Developers Pvt. Ltd., Indore (Dec 2013).

Publications

*Note: * denotes corresponding author.*

Peer-Reviewed Journal Articles (Published/Accepted)

A. Steel-concrete composite columns, FEM, and ML

1. **Jha, I.**, Dutta, S.C.*, and Kumar, V. (2025). Structural behaviour and performance assessment of proposed concrete-filled quadruple steel tubular (CFQST) cross-sections under compressive loading: Experimental and numerical study. *Journal of Building Engineering*, 113828. https://doi.org/10.1016/j.jobe.2025.113828 [Q1].

2. Shen, F., **Jha, I.**, Isleem, H.F.*, Almoghayer, W.J., Khishe, M., and Elshaarawy, M.K. (2025). Advanced predictive machine and deep learning models for round-ended CFST column. *Scientific Reports*, 15(1), 6194. https://doi.org/10.1038/s41598-025-90648-2 [Q1].

3. Qiong, T., **Jha, I.**, Bahrami, A.*, Isleem, H.F., Kumar, R., and Samui, P. (2024). Proposed numerical and machine learning models for fiber-reinforced polymer concrete-steel hollow and solid elliptical columns. *Frontiers of Structural and Civil Engineering*, 18(8), 1169–1194. https://doi.org/10.1007/s11709-024-1083-1 [Q2].

4. Ali, L., Isleem, H.F., Bahrami, A.*, **Jha, I.**, Zou, G., Kumar, R., Sadeq, A.M., and Jahami, A. (2024). Integrated behavioural analysis of FRP-confined circular columns using FEM and machine learning. *Composites Part C*, 13, 100444. https://doi.org/10.1016/j.jcomc.2024.100444 [Q2].

B. Structural optimization

5. **Jha, I.***, and Pathak, K.K. (2023). Synergetic concrete shape and cable layout optimization of pre-stressed concrete beams. *Structural and Multidisciplinary Optimization*, 66, 87. https://doi.org/10.1007/s00158-023-03545-5 [Q1].

6. **Jha, I.***, Pathak, K.K., Jha, M., and Ranjan, A. (2022). A comparative study of gradient descent method and a novel non-gradient method for structural shape optimization. *International Journal of Mathematical, Engineering and Management Sciences*, 7(2), 258–271. https://doi.org/10.33889/IJMEMS.2022.7.2.017 [Q2].

7. **Jha, I.***, and Pathak, K.K. (2021). Fuzzy-based integrated zero-order shape optimization of steel–concrete–steel sandwich beams. *Current Science*, 121(7), 941–949. https://doi.org/10.18520/cs/v121/i7/941-949 [Q3].

C. Other structural engineering publications

8. Patel, S.B., Pathak, K.K., and **Jha, I.*** (2025). Statistical Fatigue Life Forecasting of Steel rail-cum-road Bridge with Impact of Stress Band Selection on Damage Accumulation and Residual Life. *Journal of Vibration Engineering & Technologies*, 14(1), 9. [Q2].

9. Patel, S.B.*, Srivastava, A., Pathak, K.K., and **Jha, I.** (2025). Fuzzy based Bridge Rating System (FBRS) for condition assessment of existing railway bridges. *International Journal of Steel Structures*. https://doi.org/10.1007/s13296-025-00989-x [Q3].

10. Ansari, M.G., Dutta, S.C.*, Dwivedi, A.S., and **Jha, I.** (2024). Impact of incidence angle of seismic excitation on vertically irregular structures. *Earthquakes and Structures*, 27(3), 227. https://doi.org/10.12989/eas.2024.27.3.227 [Q3].

11. Agrahari, R.*, **Jha, I.**, and Pathak, K.K. (2022). Seismic acceleration amplification factor for pin supported moment resisting RC framed structures: A case study for Chi-Chi earthquake. *Indian Journal of Engineering & Materials Sciences*, 29(2), 189–200. http://nopr.niscpr.res.in/handle/123456789/59747 [Q3].

12. Chaubey, A.K., **Jha, I.**, Kumar, A.*, Demirbas, M.D., and Dey, S. (2018). Dual-axis buckling of laminated composite skew hyperbolic paraboloids with openings. *Journal of the Brazilian Society of Mechanical Sciences and Engineering*, 40, 490. https://doi.org/10.1007/s40430-018-1406-z [Q2].

Manuscripts (Submitted/Under Review)

a) Kumar, V., Dutta, S.C., and **Jha, I.*** (2025). Assessment of the cyclic behaviour of CFQST columns as compared to conventional column systems. *Structures*, Elsevier (Submitted) (Corresponding author) SCI [Q1].

b) Kumar, V., Dutta, S.C., and **Jha, I.*** (2025). Investigation of structural behaviour of proposed quadruple steel-tube composite columns under varying load eccentricity. *Steel and Composite Structures*, Techno Press (Under review) (Corresponding author) SCI [Q1].

Conference Proceedings

1. **Jha, I.***, Dutta, S.C., Prakhya, G.K.V., and Kumar, V. (2025). Comparative assessment of CFQST vs traditional columns under lateral loads. In *Proceedings of the 10th International Conference on Civil Structural and Transportation Engineering (ICCSTE 2025)*, Imperial College London Conference Center, London, UK, July 2025.

2. Singh, J.*, Pathak, K.K., Prakhya, G.K.V., and **Jha, I.** (2025). Numerical investigation of optimized chamfered concrete-filled steel tubular columns under axial and lateral loads. In *Proceedings of the 10th International Conference on Civil Structural and Transportation Engineering (ICCSTE 2025)*, Imperial College London Conference Center, London, UK, July 2025. [Best Paper Award].

3. **Jha, I.***, Singh, J., and Pathak, K.K. (2025). Effect of neglecting and considering frictional loss during optimization of pre-stressed beams and its aftermath post-optimization: A comparative study. In *Proceedings of the International Conference on Advances in Structural and Geotechnical Engineering*, IIT Patna, India, February 6–8, 2025.

4. **Jha, I.***, Pathak, I., Dutta, S.C., Sadana, A., and Bhowmik, B. (2025). CNN-based approach for structural damage detection using time-series sensor data. In *Proceedings of the International Conference on Smart Resilient and Sustainable Infrastructure (SRISTI)*, IIT (ISM) Dhanbad, India, January 24–25, 2025.

5. Singh, J.*, **Jha, I.**, Varaprasad, K.V.G.S., and Pathak, K.K. (2025). Efficiency of ensembled ML algorithms in predicting the axial load-carrying capacity of circular CFST columns. In *Proceedings of the International Conference on Smart Resilient and Sustainable Infrastructure (SRISTI)*, IIT (ISM) Dhanbad, India, January 24–25, 2025.

6. **Jha, I.***, and Pathak, K.K. (2022). Effect of span length on the doubly optimized prestressed concrete beams. In *International Conference on Recent Advances in Civil Engineering, RACE 2022*, pp. 697–709. Singapore: Springer Nature Singapore.

7. **Jha, I.***, and Pathak, K.K. (2023). Shape optimization of structures considering varying geometrical and material parameters. In *Advanced Engineering Optimization Through Intelligent Techniques: Select Proceedings of AEOTIT 2022*, pp. 147–164. Singapore: Springer Nature Singapore.

8. **Jha, I.***, Patel, S.B., Pathak, K.K., and Jain, A. (2021). Finite element analysis of ferrocement pumphouse. In *Proceedings of the 6th National Convention on Ferrocement*, Pune, India, 2021.

Patents and Books

Patents

1. Dutta, S.C., **Jha, I.**, Kumar, V., and Sahu, S.K. (2024). A concrete-filled quadruple steel tubular (CFQST) column for enhanced strength and ductility in seismic condition and the process of construction. Indian Patent Application No. 202431097321, Indian Patent Office. Published Dec 20, 2024.

2. Narsing, R., Prabath, N.V.N., Bobade, S.S., Reddy, G.S., Krishna, N.S., **Jha, I.**, Soujanya, M.M., Sekhar, R.C., and Sreekanth, D.V. (2024). Lightweight glass fiber reinforced gypsum (GFRG) hollow bricks. Indian Design Patent Application No. 202441064451, Indian Patent Office. Published Aug 30, 2024.

3. Prajapati, M.K., **Jha, I.**, Sahu, S.K., Ansari, M.G., Kumar, V., and Singh, J. (2024). Geotechnical pressure monitoring device. Indian Design Patent No. 435997-001, Indian Patent Office. Registered Oct 29, 2024.

Books

1. Debnath, P., **Jha, I.**, Deep, K., and Sahu, S.K. (2025). *Cement and concrete: Design, performance, and structure* (1st ed.). Scientific International Publishing House. ISBN: 978-93-6674-005-8.

Peer Review and Editorial Service

Aug 2025 – Present	Reviewer, *International Journal of Concrete Structures and Materials* (Springer)
Aug 2025 – Present	Reviewer, *Journal of Building Engineering* (Elsevier)
Jun 2025 – Present	Reviewer, *Construction and Building Materials* (Elsevier)
Nov 2024 – Present	Reviewer, *Journal of The Institution of Engineers (India): Series A* (Springer)
Jun 2024 – Present	Reviewer, *Scientific Reports* (Nature)
Sep 2023 – Present	Reviewer, *Mechanics of Time-Dependent Materials* (Springer)
Jul 2022 – Present	Reviewer, *Structures* (Elsevier)
Nov 2021 – Present	Reviewer, *International Journal of Mathematical, Engineering and Management Sciences*

Workshops and Short Courses (Attended)

- 9-day workshop on Laboratory Testing and Characterization of Construction Materials (Karyashala), sponsored by SERB, IIT (BHU) Varanasi, India, 22–30 May 2023.
- 1-day seminar on Offshore Structures and Offshore Wind Energy, IIT (BHU) Varanasi, India, 25 Feb 2023.
- 5-day workshop on Smart Manufacturing & Heavy Industries 4.0, sponsored by Ministry of Heavy Industries (MHI), Government of India, IIT (BHU) Varanasi, India, 11–15 Oct 2022.
- 1-week short-term training program on Research Methodology: Tools and Techniques, SVNIT Surat, India, 05–09 Sep 2022.
- 1-week DST-STUTI training program on Uses of Advanced Instruments in Civil Engineering Projects, IIT (BHU) Varanasi, India, 11–17 Jul 2022.
- 3-day Indo-UK Workshop on Valorisation of agri-waste for energy and Nutrient Recovery, IIT (BHU) Varanasi, India, 15–17 Jan 2020.

Awards and Achievements

2019	MHRD Merit Scholarship (€21,050) for 5 years – IIT (BHU) Varanasi
2016	MHRD Merit Scholarship (€2,970) for 2 years – NIT Patna
2016	Qualified Graduate Aptitude Test in Engineering (GATE) Exam – national-level post-graduation exam by IITs/IISc
2013	1st College rank and 8th University rank – Kavikulguru Institute of Technology and Science, Ramtek / Nagpur University
2013	1st College rank – Kavikulguru Institute of Technology and Science, Ramtek

Administrative Responsibilities

2014–15	Student Coordinator for Training and Placement Cell – Kavikulguru Institute of Technology and Science, Ramtek
2014	Organized INVENIO'2k14 (National Level Event) under Indian Society of Technical Education (ISTE) – Kavikulguru Institute of Technology and Science, Ramtek
2011–15	Organized various events for college under ISTE – Kavikulguru Institute of Technology and Science, Ramtek
2013–15	Technical Head, ISTE Students' Chapter – Kavikulguru Institute of Technology and Science, Ramtek

Other Fellowships and Offers

2023	Institute Postdoctoral Fellowship (IPDF), Department of Civil Engineering, IIT Madras (IIT-M) – Offer accepted but not joined.

Professional Membership

- American Society of Civil Engineers (ASCE) – Member
- Indian Structural Health Monitoring Society (ISHMS) – Member
- Institution of Engineers (India) (IEI) – Associate Member
- Indian Society of Earthquake Technology (ISET) – In process

References

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Dr. Kasi Viswanadh Ganga Prakhya, Director of Design Group, Sir Robert McAlpine, Hemel Hempstead, United Kingdom. Email: kvgprakhya@gmail.com