Devasmit Dutta

B.Tech Hons. - Civil Engineering
School of Infrastructure
Indian Institute of Technology Bhubaneswar

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Education

Degree/Certificate	Institute/Board	CGPA/Percentage	Year
B.Tech. Honours	Indian Institute of Technology (IIT), Bhubaneswar	8.52/10	2022
Senior Secondary	Kendriya Vidyalaya, Khanapara, Guwahati	89.6/100	2018
Secondary	Kendriya Vidyalaya, Khanapara, Guwahati	10/10	2016

Secured Department rank 8^{th} position

Research Interest

Partial Differential Equations, Numerical methods, **Finite-element method** based packages like Gridap.jl, linear and non-linear PDE systems, **Scientific Machine Learning, Physics Informed Neural-Networks (PINNs)**, coupled-interaction and physics based systems, **Computational Mechanics**, dynamical systems in Structural Vibration, Structural Health Monitoring and **Mechanics of Solids**.

Relevant Coursework

Alphabet in the bracket indicates the grade (EX =10/10, A =9/10, B =8/10 and so on till F)

- Math Courses: Mathematics {Part II : Linear Algebra, Complex Analysis} (A), Probability, Statistics & Stochastic Process (A)
- Core Courses: Advanced Structural Analysis (A), Finite Element Methods in Engineering (A), Structural Health Monitoring (B), Theory of Plates & Shells (A), Hydraulics (A), Soil Mechanics (EX), Solid Mechanics (A), Water Resources Engineering (EX), Design of RC structures (A), Soil Dynamics (B)
- Lateral: Digital Logic Systems (B), Programming & Data-Structures (A), Control Systems Technology (B), Satellite Communication Engineering (A)
- Breadth: Managerial Economics (A), Banking Theory and Practices (Ex)
- Labs: Structural Design & Detailing Lab (A), Computer Aided Design (CAD) Lab (EX), Water Resources Engineering Lab (A), Industrial Training Defence (A)

Publications

- **To be Submitted Papers**

[1] **Devasmit Dutta**, Dr. Mohammed M. Rahman, Akash K. Behera, An open source-implementation of a phase-field model for dynamic brittle-fracture using Gridap in Julia. *Journal of Mathematics and Mechanics of Solids.*

[2] **Devasmit Dutta**, Dr. Ravi Prakash, Dr. M. Z. Naser, Fire Resistance Analysis of Steel Members through Artificial Intelligence. *Journal of Engineering Structures.*

Research Experience

- **B.Tech Thesis** *Aug. 2021 - Apr. 2022*
  under the supervision of Dr. Mohammad Masiur Rahman, Assistant Professor at IIT Bhubaneswar

  Development of Open-Source Codes for Elasto-Dynamics and Dynamic-Brittle Fracture Using **Gridap.jl** in Julia

  - Secured nomination among the top 5 candidates from the respective department schools at IIT Bhubaneswar, for the prestigious B. K. De Memorial Award, for the "Most Innovative Bachelor's Project".
  - Simulated dynamic brittle-fracture using a regularised phase-field model based on staggered algorithm using high-level API of **Gridap.jl** library.
  - Incorporated **Spectral Decomposition Method** into the strain field for simulating brittle-fracture degradation.
  - Utilised the **GridapODEs.jl** package, a sub-library of the Gridap.jl package, to solve the dynamic states PDE^s using the explicit time-integration solver, the Newmak-Beta Scheme.
  - Bench-marked the model's out-put of evolution of crack-tip velocity with time with respect to the Rayleigh's Wave speed of a material.

- **INAE (Summer Research Intern)** *May 2021 – July 2021*
  under the supervision of Dr. Vinay K. Gupta, Professor at Indian Institute of Technology (IIT), Kanpur

  Modeling of Non-Stationary Peak-factor Ratio for Relative Displacement Response.

  – Selected for the INAE (Indian National Academy of Engineering) Summer Research Fellowship Program, that is awarded to top 60 students across India every year, who are mentored by INAE Fellows.
  – Developed a mathematical model that can describe the mean-trend characteristics of the actual normalized displacement non-stationary peak-factors for any oscillator, corresponding to any strong earthquake ground-motion.
  – Predictive modeling for the estimation of non-stationarity peak factors, that can be extremely useful in scenarios where there are some complicated computational limitations involvement, that can be applied to take into account the non-stationary characteristics for any real time strong-motion earthquake duration.

- **SIP (Summer Research Intern)** *May 2021 – July 2021*
  under the supervision of Dr. P. Ravi Prakash, Assistant Professor at IIT Jodhpur

  Fire Resistance Analysis of Steel Members through Machine Learning.

  – Developed a **Multi-layer Perceptron** (MLP), neural-network model, for predicting the structural steel-columns fire-resistance, and compared its performance metrics to the state of the art libraries like **X-gboost** and **Deep-neural Network (DNN)**, on the steel-columns specifications data-set comprising of 296 data-points.
  – Fine-tuning of hidden-layers framework, to obtain accuracy of 83.9% on test data, using the gradient-boosted library, X-gboost.
  – Numerical simulations to generate additional synthetic data using **Open-Sees for Fire** computational software.
  – Explaining the machine-learning model's architecture by quantifying the sensitivity of the model's fire-resistance output with respect to the steel-column specification's feature-space by using the **SHAP** library for generating the partial dependence plots (PDP) and individual conditional expectation (ICE) plots.

Professional Experience

- **Modeling and Simulation Engineer, at JuliaSIM** *Aug. 2022 – Current*
  Julia Computing Inc., Bangalore

  – **Role:-** Developing a surrogate model with Message Passing Interface (MPI) back-end integration, for a customer-engagement project with the Williams F1 (Formula-1) company for WilliamsTyreFEM.jl project, for solving both quasi-static as well as dynamic states tyre PDE^s, using Gridap.jl framework in Julia.

- **Modeling and Simulation Intern, at JuliaSIM** *May 2022 – July 2022*
  Julia Computing Inc., Bangalore

  – **Role:-** Developed a tyre FEM model for a customer-engagement project with the Williams F1 (Formula-1) company for WilliamsTyreFEM.jl project, for solving the quasi-static and dynamic states partial differential equations in determining its deformation profiles that can be used for post-processing and visualisation purposes using the ParaView software for analysing the force and bending moment distribution on the contact-patch, when subjected to input-parameters like normal reaction load from the ground like inflation pressure, modulli of elasticity, slip-angles & slip-ratios, for the Williams F1 racing car tyre mesh, using the Gridap.jl framework.

– **Winter Intern (Training)** *Dec. 2020 - Jan. 2021*
  Oil and Natural Gas Corporation (ONGC) Academy, Dehradun, Uttarakhand

  Methodologies of Roof-top water-proofing techniques, for structural stability of buildings

  * Prepared a comparative study highlighting the several parameters that affects the cost-estimation during implementation of a particular water-proofing methodology and compared its advantages and implementation challenges for the modern and primitive roof-top water-proofing techniques.

Technical Certifications

– **Python Self-Learning Certification** *Sept. - 2020*
  by FOSSEE, at IIT Bombay

– **Data-Analytics with Lean-Six Sigma Certification** *Sept. - 2020*
  by University of Amsterdam, at Coursera

– **Indian Society of Earthquake Technology (ISET), Webinar Series** *July. - 2020*
  by IIT Roorkee

  * Attended lecture-talks by professors from IITs/IISc on the several aspects of earthquake-resistance and its research and modern advancement.

– **Machine Learning Certification** *May. - 2021*
by Prof. Andrew Ng, at Stanford University, by Coursera

– **International Seminar on Steel-Structures** *May. - 2021*
by Dept.of Civil Engineering, at Imperial College London, in collaboration with IIT Guwahati

– **Amazon Web Services (AWS) Machine Learning Certification** *June. - 2021*
by Amazon, at Coursera

Technical Skills and Softwares

–**Programming**: Python, C/C++, Julia

–**Computational Tools & Libraries** : Flux.jl, NeuralPDE.jl, Gridap.jl, STAAD.Pro, MATLAB, Open-Sees, Minitab, ABAQUS, COMSOL Multi-Physics (pre-processing, analysis and post-processing), LaTeX

Positions of Responsibility

– **Mentor**, at Academic Undergraduate (UG) Council, IIT Bhubaneswar *2020 - 2021*
– **Associate Member**, of Publicity Team, at ALMA Fiesta, the Socio-Cultural Fest, at IIT Bhubaneswar *2018 - 2019*

Achievements

– **Secured 95.74 percentile and All India Rank 4263, in GATE (2022)**, by IIT Kharagpur. *2022*
– **Runner-up Position**, on the Case Study - "Rejuvenation of the River Ganga", as a part of the IIT Bhubaneswar Team in the Civil-Conclave, an Inter-IIT Competition, hosted by IIT Roorkee. *2020*
– **Secured 185th Rank in International Ranking List and**, 3rd in North-Eastern Zonal Ranking List in India, in the 12th International Mathematics Olympiad by Science Olympiad Foundation (SOF). *2018*
– **Secured 31st Rank**, in State Engineering Entrance Exam, Assam (CEE), India. *2018*
– **Secured 2nd Rank**, in B.Sc.-B.Ed Mathematics-Major, in the Tezpur Central University Entrance Exam (TUEE), India. *2018*
– **Secured 572nd Rank**, in the Indian Institute of Space-Science and Technology, Ranking List. *2018*
– **Recipient of offer for admission in the 5 year BS-MS course**, in IISER, Trivandrum, India. *2018*
– **Secured 97.35 percentile**, in the National Entrance Screening Test (NEST), by NISER, Bhubaneswar, India. *2018*

Hobbies

–**Painting**: Participated and secured prizes in several Art competitions

–**Football**: Actively participated in intra-school level and intra-college tournaments among the departments, at IIT Bhubaneswar.

–**Music**: Secured Distinction in Vocal Classical under the Institute Pracheen Kala Kendra, Chandigarh, India.

References

– Dr. Mohammed M. Rahman, Assistant Professor at School of Infrastructure, IIT Bhubaneswar
email : masiur@iitbbs.ac.in

– Dr. Ravi Prakash, Assistant Professor at Department of Civil and Infrastructure Engineering, IIT Jodhpur
email : rp@iitj.ac.in

Link to my B. Tech Thesis :- https://bit.ly/3ycJVhr