SOMDATTA GOSWAMI

EDUCATION

2017-2020 Ph. D. (Structural Engineering)
Bauhaus University Weimar, Germany
Thesis: *Phase-field modeling of fracture with isogeometric analysis and machine learning methods.*

2011 – 2013 Master of Engineering (Structural Engineering)
Bengal Engineering and Science University, Shibpur (Presently known as Indian Institute of Engineering Science and Technology, Shibpur)
Thesis: *Efficient Response Surface Method in Structural Reliability Analysis*
Overall percentage: 87.89%

2007 – 2011 Bachelor of Technology (Civil Engineering)
Birla Institute of Technology, Mesra, India
Thesis: *Neural network model to determine the pollution levels*
Overall CGPA: 8.32

EXPERIENCE

2021-Present Post-Doctoral Research Associate at the Department of Applied Mathematics in Brown University, U.S.A

2015 –2017 Assistant Manager (Structural Engineering), Cement business unit, Tata Consulting Engineers Limited, New Delhi, India.
Jobs Handled:

- Working Engineer of Detailed Engineering project of ACC Jamul Interconnection Project.
- Project Manager for Silo Rehabilitation Project. Job involved Project Management, Invoicing and Project and Revenue forecast. Also focus was on customer client relations and feedback.
- Project Engineer for Usher Eco Power Plant for a project to extract Silica Precipitate from Rice Husk. Jobs include Tendering for soil investigation, topographic surveying, civil and structural works. Detail design and engineering for the entire process (Support arrangement for roller press, RCC buildings, Sumps, Platforms).

2014 – 2015 Senior Structural Engineer, Cement business unit, Tata Consulting Engineers Limited, Mumbai, India.
Jobs Handled:

- Project Engineer of Detailed Engineering project of ACC Jamul Packing Plant. Structures: Designing and detailing of various Steel and Concrete structures. (Conveyor Galleries, Trestles, Load Centre Building and other Packing Plant Buildings (RCC))

2013 – 2014 Post Graduate Engineering Trainee, Nuclear business unit, Tata Consulting Engineers

Limited, Jamshedpur, India.

Jobs Handled:

- Working Engineer for the detail design of Steel Platforms and Embedded Plates in Atomic Power Plants. The design followed AERB code.

AWARDS AND GRANTS

2017 - 2020 DAAD Fellowship for pursuing Ph.D. at Bauhaus University Weimar, Germany.

2011 - 2013 MHRD scholarship for pursuing Master of Engineering at Indian Institute of Engineering Sciences and Technology, Shibpur (Formerly known as Bengal Engineering and Science University).

RESEARCH INTEREST

Phase-field based modeling, Fracture Mechanics, Isogeometric Analysis, Machine learning, Reliability analysis, Design under uncertainty

RESEARCH PROJECTS

Physics informed machine learning approach

Overview: Over the last few years, use of machine learning is various domains has increased tremendously. However, conventional data driven machine learning techniques are not robust and hence, not suitable for sophisticated applications. In this project, I have developed physics informed deep learning techniques for solving brittle fracture problems using phase field modeling approach. The developed approach minimizes the variational energy of the system defined using non-linear PDEs.

✓ Three articles have been published.

Phase field-based fracture modeling using isogeometric analysis

Overview: In this project, efficient phase field-based fracture modeling approaches have been developed using PHT-splines within the framework of isogeometric analysis. An adaptive refinement scheme and a dual mesh approach are developed to solve the coupled problem efficiently and with less computational effort.

✓ Two articles have been published.

Robust topology optimization

Overview: In topology optimization, the goal is to determine the optimum topology so that some redefined cost function is minimized. However, most of the work on topology optimization ignores the presence of uncertainty. In this project, a novel approach for topology optimization uncertainty will developed.

✓ One article has been published.

Reliability and robust design optimization of structural systems

Overview: In this work, a novel approach, referred to as the “threshold shift method” (TSM), for reliability-based design optimization is developed. In TSM, we propose to shift the threshold of the constraints and determine the new thresholds for all the constraints by solving a single optimization problem.

✓ One article has been published.

Response surface method in structural reliability analysis	**Overview:** This project was part of my M.Tech work. In this work, an iterative response surface method is developed for structural reliability analysis. To improve the accuracy of the developed approach, moving least square method is employed. ✓ One journal has been published.

LIST OF PUBLICATIONS

(A) JOURNALS

1) **Goswami, S.**, Anitescu, C., and Rabczuk, T. (2020) "Adaptive fourth-order phase field analysis for brittle fracture", Computer Methods in Applied Mechanics and Engineering, **361**:112808, 2020.

2) **Goswami, S.**, Anitescu, C., and Rabczuk, T. (2020) "Adaptive fourth-order phase field analysis using deep energy minimization", Theoretical and Applied Fracture Mechanics, **107**: 102527.

3) Samaniego, E., Anitescu, C., **Goswami S.**, Nguyen-Thanh, V.M., Guo, H., Hamdia, K., Zhuang, X., and Rabczuk, T. (2020) "An energy approach to the solution of partial differential equations in computational mechanics via machine learning: Concepts, implementation and applications", Computer Methods in Applied Mechanics and Engineering, **362**: 112790.

4) **Goswami, S.**, Anitescu, C., Chakraborty, S. and Rabczuk, T. (2020) "Transfer learning enhanced physics informed neural network for phase-field modeling of fracture", Theoretical and Applied Fracture Mechanics, **106**:102447.

5) **Goswami, S.**, Anitescu, C., and Rabczuk, T. (2019) "Adaptive phase field analysis with dual hierarchical meshes for brittle fracture", Engineering Fracture Mechanics, 218:106608.

6) **Goswami, S.,** Chakraborty, S., Chowdhury, R. and Rabczuk, T. (2019) "Threshold shift method for reliability-based design optimization", Structural and Multidisciplinary Optimization, **60**(5), 2053-2072.

7) **Goswami, S.**, Chakraborty, S. and Rabczuk, T. (2019) "A surrogate assisted adaptive framework for robust topology optimization", Computer Methods in Applied Mechanics and Engineering, **346,** 63 – 84**.**

8) **Goswami S.**, Ghosh, S., and Chakraborty, S. (2016) "Reliability analysis of structures by iterative improved response surface method", Structural Safety, **60**:56-66.

(B) CONFERENCES

1) **Goswami, S.**, Anitescu, C., and Rabczuk, T. (2018) "An efficient framework for fracture analysis of brittle materials (SEC 2018), 19th December – 21st December 2018, Kolkata, India.

2) Chakraborty S. and **Goswami, S.** (2018) "Topology optimization under uncertainty", Structural Engineering Convention (SEC 2018), 19th December – 21st December 2018, Kolkata, India, **Best Paper Award from Springer.**

3) **Goswami, S.**, Chakraborty, S. (2014) “Adaptive Response Surface Method based efficient Monte Carlo Simulation robust design optimization”, 2nd International Conference on Vulnerability & Risk Analysis & Management (ICVRAM2014), 13th – 16th July 2014, University of Liverpool, United Kingdom.

4) **Goswami, S.**, Chakraborty, S. and Ghosh, S. (2013) “Adaptive Response Surface Method in Structural Approximation under Uncertainty", International Conference on Structural Engineering and Mechanics, Dec. 20-22, 2013, Rourkela.