Exponent®
Engineering & Scientific Consulting

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Professional Profile

Dr. Gorji's expertise focuses on the theoretical, experimental, and numerical aspects of material forming under quasi-static and dynamic conditions. His area of expertise includes material characterization, failure and damage analysis, finite element modeling, and computational mechanics. Applications include sheet metal forming, impact and crashworthiness, additive manufacturing, lithium-ion batteries, and structural modeling of metallic stents as well as the polymer bioabsorbable vascular scaffolds. Dr. Gorji's recent interest is leveraging artificial neural network modeling for industrial applications, manufacturing processes, and engineering practices.

Through his research on aluminum alloy composites at ETH Zurich—in collaboration with Daimler AG, Novelis, AutoForm, and GOM mbH—Dr. Gorji is a recognized expert in the sheet metal forming community. His research encompassed developing new experimental techniques to calibrate a fracture model that predicts crack initiation in deep drawing operations. The models were then implemented in a finite element code for industrial applications. During his Ph.D., he also made significant advancements in the study of friction phenomena that occurs during extrusion processes by designing an environmentally dependent experiment.

During a postdoctoral appointment at MIT within Professor Wierzbicki's Impact and Crashworthiness Lab, Dr. Gorji was a member of the MIT Industrial Fracture Consortium, which is supported by the worldwide automotive and steel/aluminum industries. He was responsible for designing a new experimental technique, characterizing plasticity, and fracture prediction for many industrial applications, including weldments, cold and hot forming of steels and aluminum sheets. During his subsequent appointment as Research Scientist at MIT, Dr. Gorji demonstrated that neural networks provide a very powerful modeling framework suitable for data-driven constitutive modeling, such as capturing temperature and strain rate dependent behavior of metallic alloys and polypropylene materials. His research also highlighted the potential of machine learning algorithms to describe the elastoplastic response of lithium-ion batteries and composite structures.

Academic Credentials & Professional Honors

Sc.D., Mechanical Engineering, ETH Zurich, Switzerland, 2016

Academic Appointments

Research Scientist, Massachusetts Institute of Technology (MIT), 2018 – 2020

Postdoctoral Fellow, Massachusetts Institute of Technology (MIT), 2016 – 2018

Lecturer, Mechanical Engineering, Massachusetts Institute of Technology (MIT), 2018

Publications

Maysam B. Gorji, Mojtaba Mozaffar, Julian N. Heidenreich, Jian Cao, Dirk Mohr. On the Potential of Recurrent Neural Networks for Modeling Path Dependent Plasticity. Journal of the Mechanics and Physics of Solids, p.103972.

Wei Li, Juner Zhu, Y Xia, Maysam B. Gorji, Tomasz Wierzbicki, Data-driven safety envelope of Lithium-Ion batteries for electric vehicles. Joule 3 (11), 2703-2715, 2019.

Emeric Plancher, Ke Qu, Niels H. Vonk, Maysam B. Gorji, Thomas Tancogne-Dejean, C. Cem Tasan, Tracking Microstructure Evolution in Complex Biaxial Strain Paths: A Bulge Test Methodology for the Scanning Electron Microscope. Experimental Mechanics, pp.1-16, 2019.

Project Experience

On the potential of machine learning algorithms to predict the plasticity of sheet metal. MIT-ETH Industrial Fracture Consortium project.

Develop micro-testing approach by designing the new tools for the miniaturized specimens to characterize the plasticity and fracture locus of weld fusion and heat affected zones. MITie project with ExxonMobil Corporate Strategic Research.

Develop a new instability and fracture models to optimize the metal forming and bending crack behavior of Al-Alloy composites. Switzerland Commission for Technology and Innovation (CTI) with Daimler AG, Novelis Switzerland SA, AutoForm Engineering GmbH and GOM mbH.

Analyze the tribological phenomena in hot extrusion processes by designing a new torsion-tribo test. Industrial project with WEFA Singen GmbH.

Peer Reviews

International Journal of Solids and Structures

International Journal of Impact Engineering

Journal of Materials Processing Technology

The Journal of Strain Analysis for Engineering Design

Engineering Fracture Mechanics

International Journal of Material Forming

International Journal of Mechanical Sciences