Shahmeer Baweja, Ph.D., E.I.T.

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Mechanical Engineer (Ph.D.) with 7+ years of experience in structural simulation, material modeling, and durability performance evaluation. Converts high-fidelity analysis and testing insights into practical design decisions that improve strength, reliability, and production readiness.

Skills

DFMA, FEA, Fatigue & Life Prediction, Creep and Damage Modeling, CPFEM, MOOSE, Abaqus/CAE, Ansys, COMSOL, SolidWorks, CATIA V5, PTC Creo, Inventor, GD&T, Neper, DREAM.3D, Sculpt, Gmsh, ParaView, FlexPDE, FEniCS, LAMMPS, MATLAB, Python, C/C++, FORTRAN, Linux, Bash, HPC, PyTorch, AI/ML, Deep Learning

Work Experience

Postdoctoral Appointee, **Argonne National Laboratory, Lemont, IL** ***January 2024 – January 2026***

- Ran 125+ high-fidelity MOOSE CPFE simulations with NEML constitutive models on advanced steels (Alloy 709, 316H) to predict stress relaxation and multiaxial creep, directly supporting ASME Section III, Division 5 Code qualification.
- Developed a new model using symbolic regression using PySR for Alloy 709 creep rupture, improving predictive accuracy by ~70% over the Huddleston model; journal article submitted.
- Optimized the Hu–Cocks precipitation model for 316H in NEML, achieving a 95% match to experimental data and enabling direct comparisons with Alloy 709 for Code adoption.
- Authored 2 DOE technical reports and 1 peer-reviewed journal publication, contributing to the DOE Advanced Reactor Technologies (ART) program effort to qualify Alloy 709 as a Code Class A material
- Applied Gaussian Process–based machine learning surrogate with batch-mode uncertainty sampling for LPBF 316H creep data, achieving an ~85% reduction in error

Graduate Research Assistant, **UH Cullen College of Engineering, Houston, TX** ***August 2019 – August 2023***

- Validated 4 Fortran user subroutines for Abaqus CAE implementing advanced crystal plasticity models.
- Developed and refined FEA models, from Neper microstructures to full setup in Abaqus.
- Calibrated 350+ CPFEM parameters and analyzed results using MATLAB and Python.
- Performed 935 FEA simulations on ductile metal damage tolerance, contributing to 6 peer-reviewed publications.

Mechanical Engineering Intern, **Lumen Motors, Houston, TX** ***June 2016 – August 2016***

- Crafted a high-performance electric luxury car chassis in Solidworks, achieving 45kN resistance through FEA analysis.
- Picked two metal manufacturing suppliers for front/rear chassis inaugurating manufacturing phase of frames.
- Replicated designs of two shock absorbers and control arms for master assembly within Solidworks.
- Assembled two suspension systems with both front and rear chassis per design specifications.

Education

Ph.D., Mechanical Engineering, University of Houston, Houston, TX ***August 2023***
Dissertation: *Multi-Scale Mechanics of Magnesium Alloys*

M.S., Mechanical & Aerospace Engineering, University of Houston, Houston, TX ***May 2019***
Thesis: *Statistical Analysis of HCP Polycrystals using Crystal Plasticity Modeling and Simulation*

B.S., Mechanical Engineering, University of Houston, Houston, TX ***May 2016***
Minor: Mathematics; Member of the Honors College

Projects

Mechanical Team Member, **UH SpaceX Hyperloop Pod Competition** ***September 2018 – November 2018***

- Designed energy efficient suspension system inside pod frame within Solidworks allowing for ease of assembly.
- Initiated improved shell design for hyperloop within Inventor allowing for improvement in aerodynamic performance.
- Collaborated to devise propulsion by rocket thrusters instead of electric motors, achieving 130% increase in top speed.

Powertrain Team Member, **Formula SAE** ***May 2015 - June 2016***

- Fabricated 8 mpg fuel-efficient intake manifold, exhaust manifold and fuel tank within Solidworks for combustion system.
- Revised designs for plenum and tank, boosting horsepower by more than 300% and improving endurance.
- Facilitated manufacturing a full carbon fiber plenum, achieving over 20% weight reduction.
- Managed inventory of 150+ parts and prices through eBoM for future teams' convenience.

Publications

- **Baweja, S.**, & Messner, M. C. (2026). Development of predictive model for accurate rupture time from multi-axial creep in alloy 709 with physics-based simulations. *CMS, 263, 114427*
- **Baweja, S.** et al. (2024). Predicting long-term stress relaxation on Alloy 709 using the crystal plasticity finite element method. DOE, 2556846
- Bhatt, S., **Baweja, S.** et al. (2024) Simulating the effect of grain structure and porosity on creep for powder bed fusion 316H. DOE, 2440432
- **Baweja, S.**, & Joshi, S. P. (2024). Microstructural effects in rate-dependent responses of smooth and notched magnesium bars. *MECMAT, 104877*
- **Baweja, S.,** & Joshi, S. P. (2023). Three-dimensional computational characterization of grain size and texture effects in magnesium. *JMA, 3657-3652*
- **Baweja, S**. et al. (2021). On the role of crystallographic anisotropy and texture in damage tolerance of magnesium and its alloys. *MgTech, 81-89*
- **Baweja, S.** et al. (2020). A numerical study of strain-rate and triaxiality effects in magnesium alloys. *JDBM 6, 459–471*
- Indurkar, P. P., **Baweja, S.** et al. (2020a). Mapping anisotropy and triaxiality effects in magnesium alloys. *MgTech, 321-328*
- Indurkar, P. P., **Baweja, S.** et al. (2020b). Predicting textural variability effects in the anisotropic plasticity and stability of hexagonal metals: Application to magnesium and its alloys. *IJP, 102762*