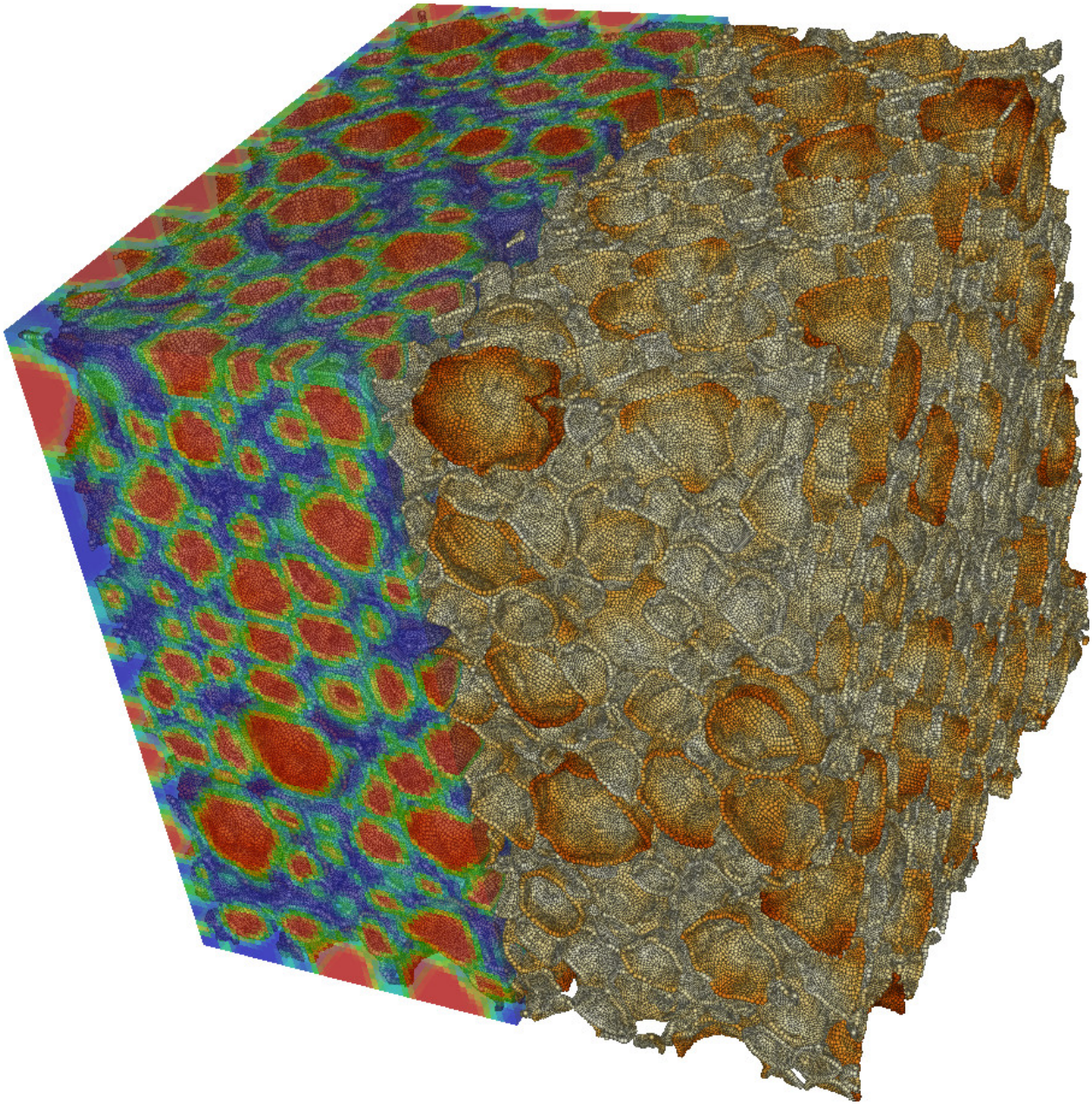
Parresia

SIMULATION • ANALYSIS • INSIGHT

ENGINEERING MECHANICS SIMULATIONS AND RESEARCH

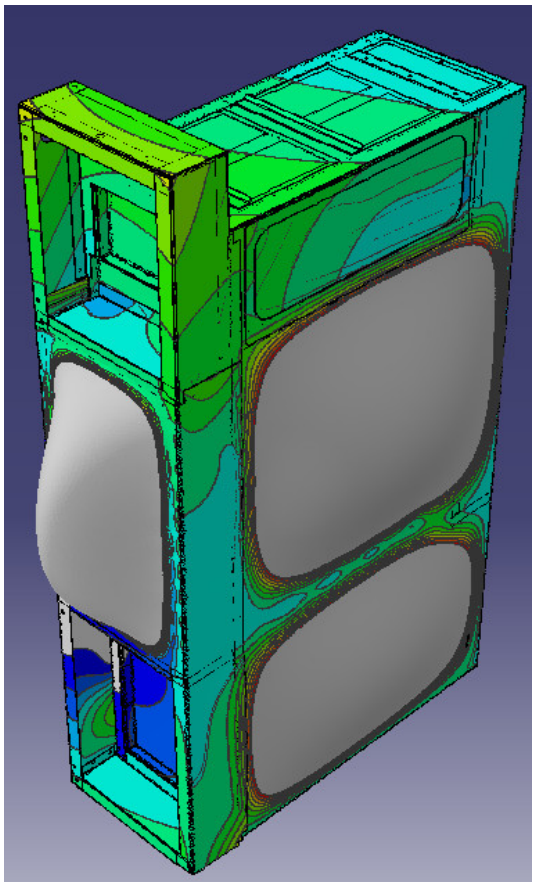


www.parresianz.com

WHAT WE DO

Find solutions for difficult engineering mechanics problems

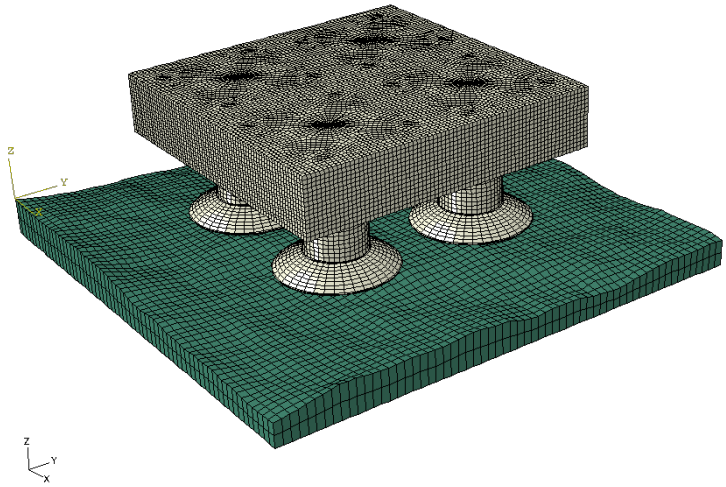
Engineers in industry may not have the mechanics expertise to solve problems that require complex analysis of mechanical designs, metal and composite structures, rock and soil geomechanics, and the development of new material models.



We solve such problems using a combination of modern numerical methods and analysis of experimental data.

We use:
finite element analysis for small deformations,
the material point method for large deformations,
peridynamics for fracture, and
the discrete element method for particulate flows.

We develop appropriate constitutive models using convex optimization methods, data mining, and machine learning.



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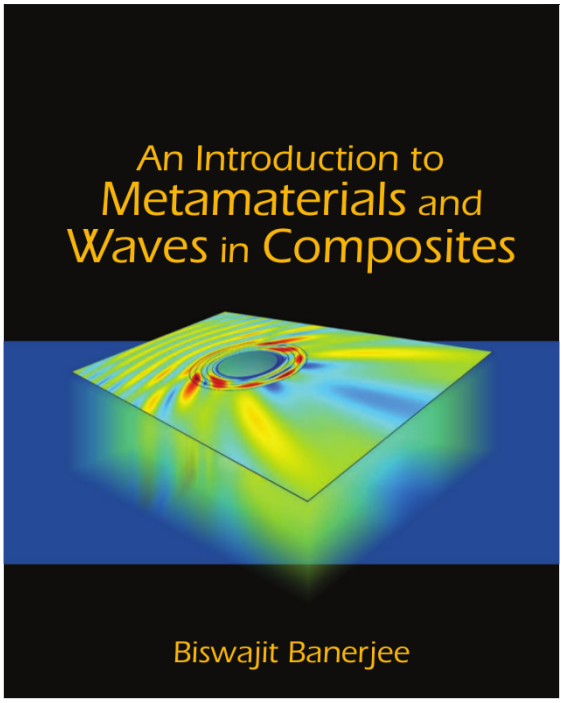
OUR STORY

Parresia Research was established in 2014 to provide mechanics research and data analytics services, and to develop new parallel computing software for mechanics.

Since then we have completed successful multi-year projects developing, implementing, and validating new constitutive models for partially saturated soils for explosive loading conditions.

The team is led by Dr. Biswajit Banerjee who has a BS and MS in Mining Engineering (Rock Mechanics) and a PhD in Mechanical Engineering (Computational Mechanics). Dr. Banerjee has more than 25 years of experience in academia and industry and has authored a popular textbook on Metamaterials and Waves in composite materials.



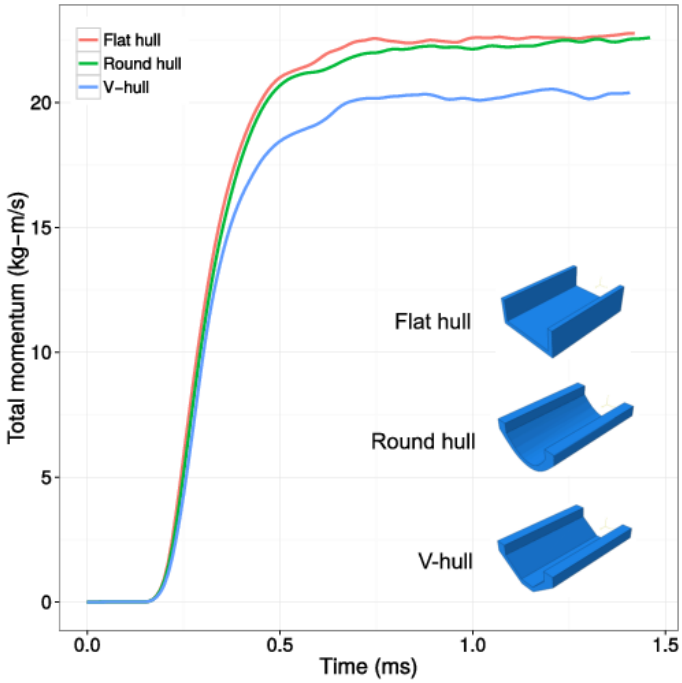
Our work includes a strong research component and we have ongoing collaborations with research teams at the University of Utah (Mechanical Engineering) and the Unversity of Colorado, Boulder (Civil Engineering).

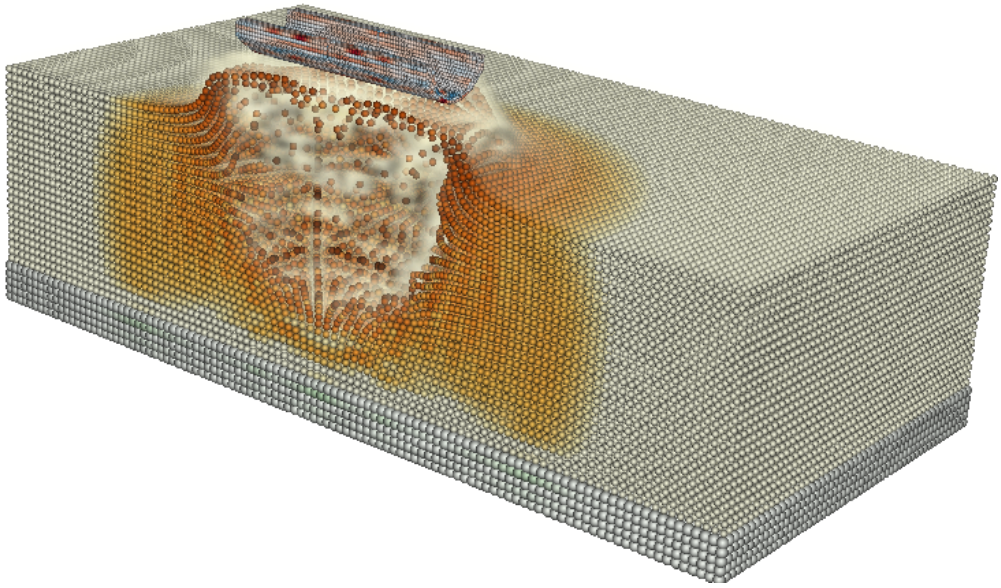
SOILS AND ROCKS

We specialize in the dynamic behavior of soils (earthquake loading, rapid pile driving, explosions) and rocks. We also analyze complex three-dimensional quasistatic problems of slope stability, subsidence, and multi-scale problems such as bolting and caving.

We perform simulations at many different length scales depending on the requirements of the problem. Fully and partially saturated soils and rocks are our current area of focus in this field.

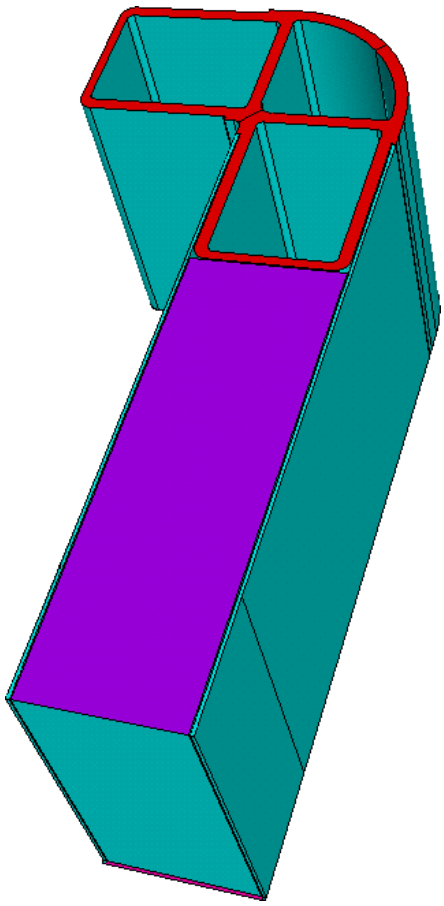
The primary expertise of the team is in large deformation mechanics, plasticity, and fracture under dynamic conditions. We use commercial finite element software or our in-house material point method/peridynamics/discrete element codes depending on the complexity of the deformation and the material model.





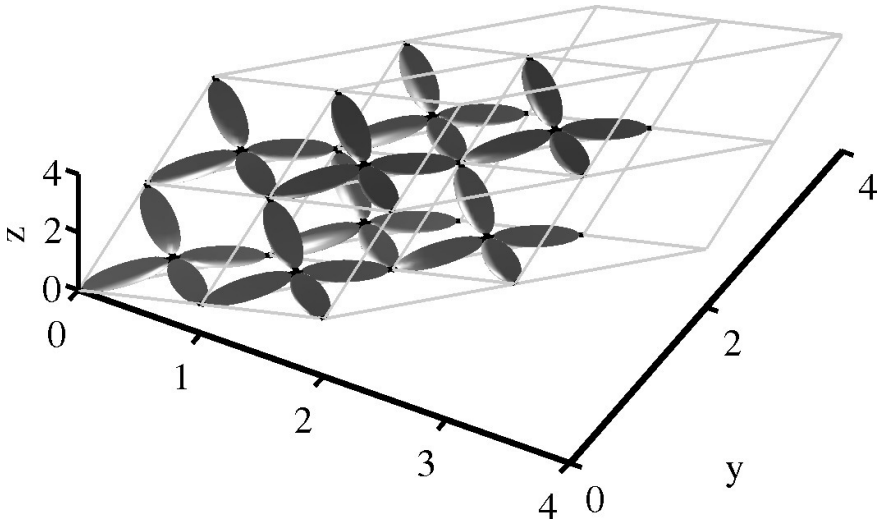
ARCHITECTED COMPOSITES

We simulate a large variety of anisotropic composite materials including structural composite (carbon and glass fibre/polymer), filled foams (polymer and metal), and architected materials and metamaterials.



Our commercial customers typically provide industrial composite designs that we analyze for nonlinear buckling, fracture, and plastic deformation.

Our research projects involve the design of new architected materials and metamaterials that have unusual properties such as negative Poisson's ratio and large bulk to shear modulus ratios.



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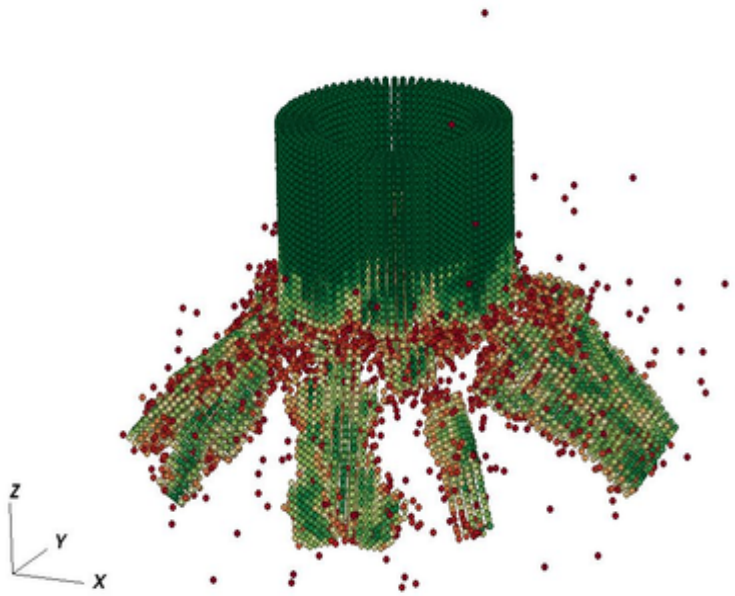
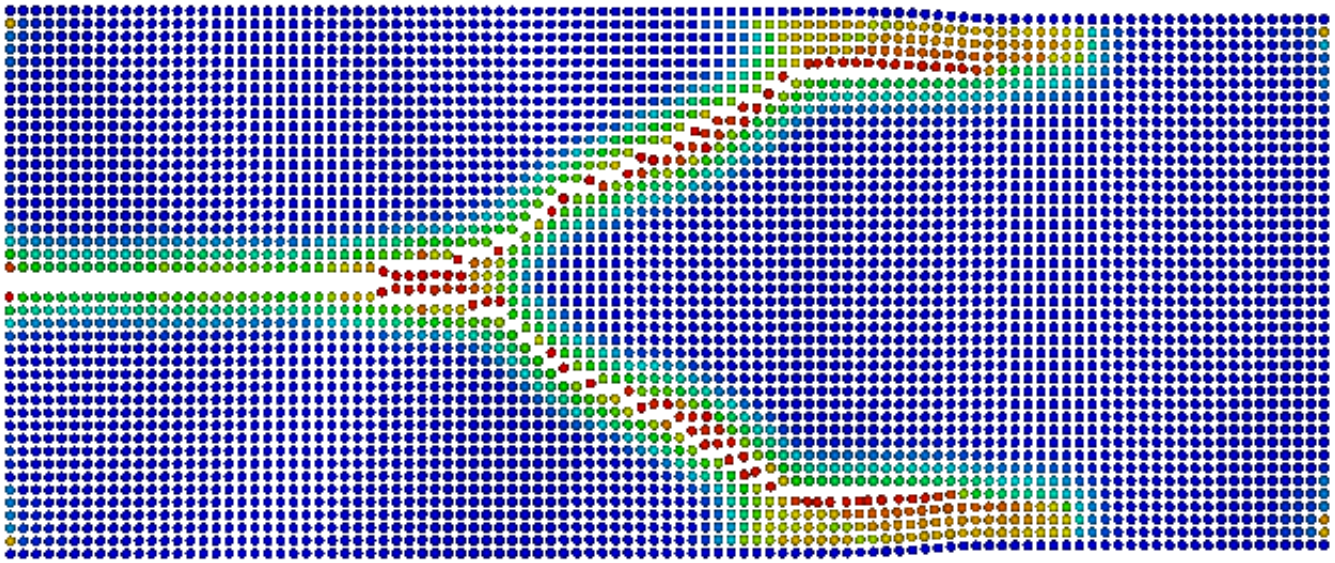
FRACTURE

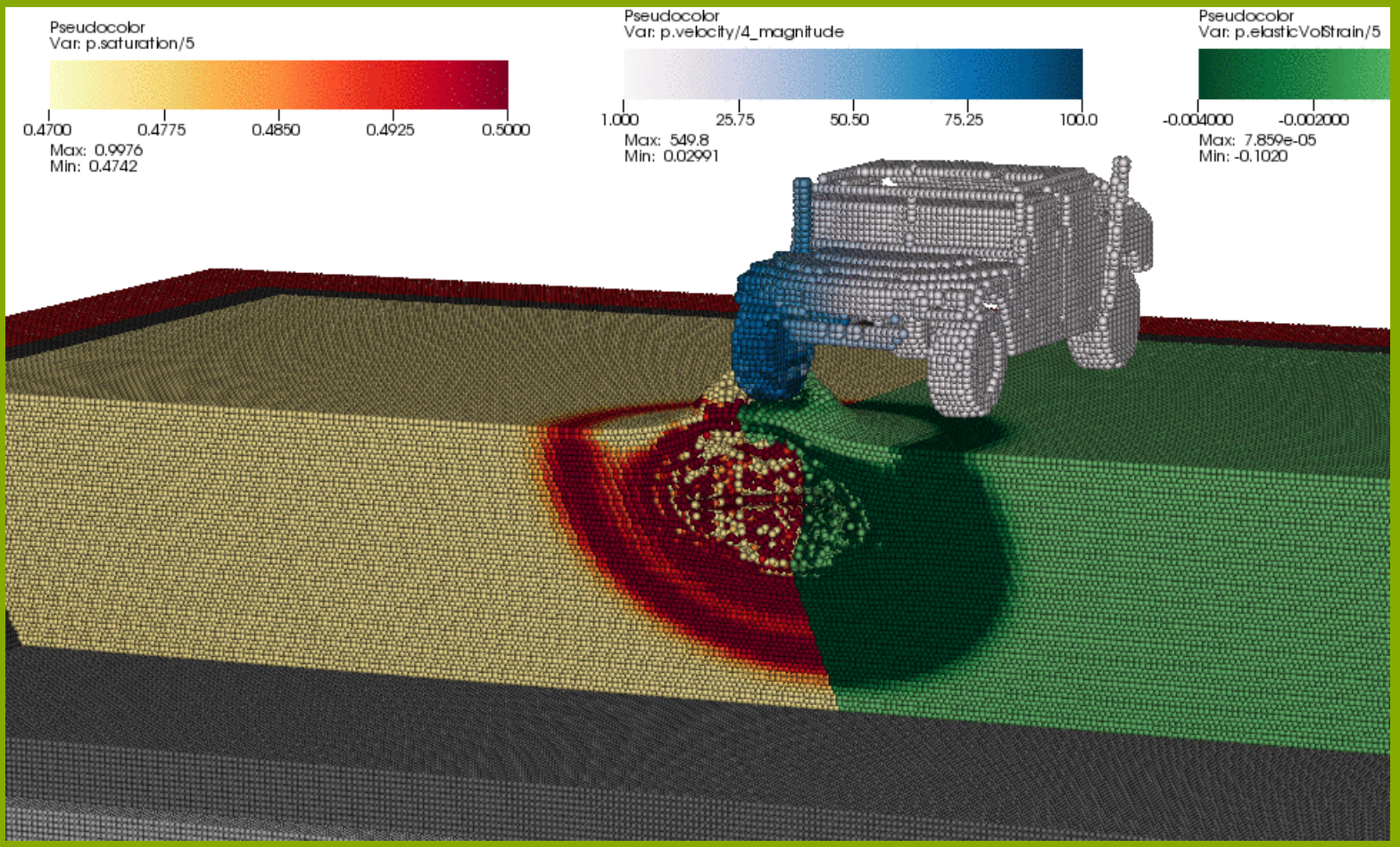
For quasistatic problems we use J-integral based fracture mechanics and extended finite elements (X-FEM) for fracture simulation. Commercial software tools with in-house pre- and post-processing are typically used for our analyses.

For dynamic problems, we use a combination of the material point method, damage mechanics, loss of hyperblocity conditions, and peridynamics to predict fracture initiation and propagation.

A large component of our in-house research work is geared towards developing improved predictive capabilities for dynamic fracture and long-term fracture effects. We also investigate fracture algorithms for complex visual effects.







Get in touch today
to discuss your project

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