Center for Extreme Events Research

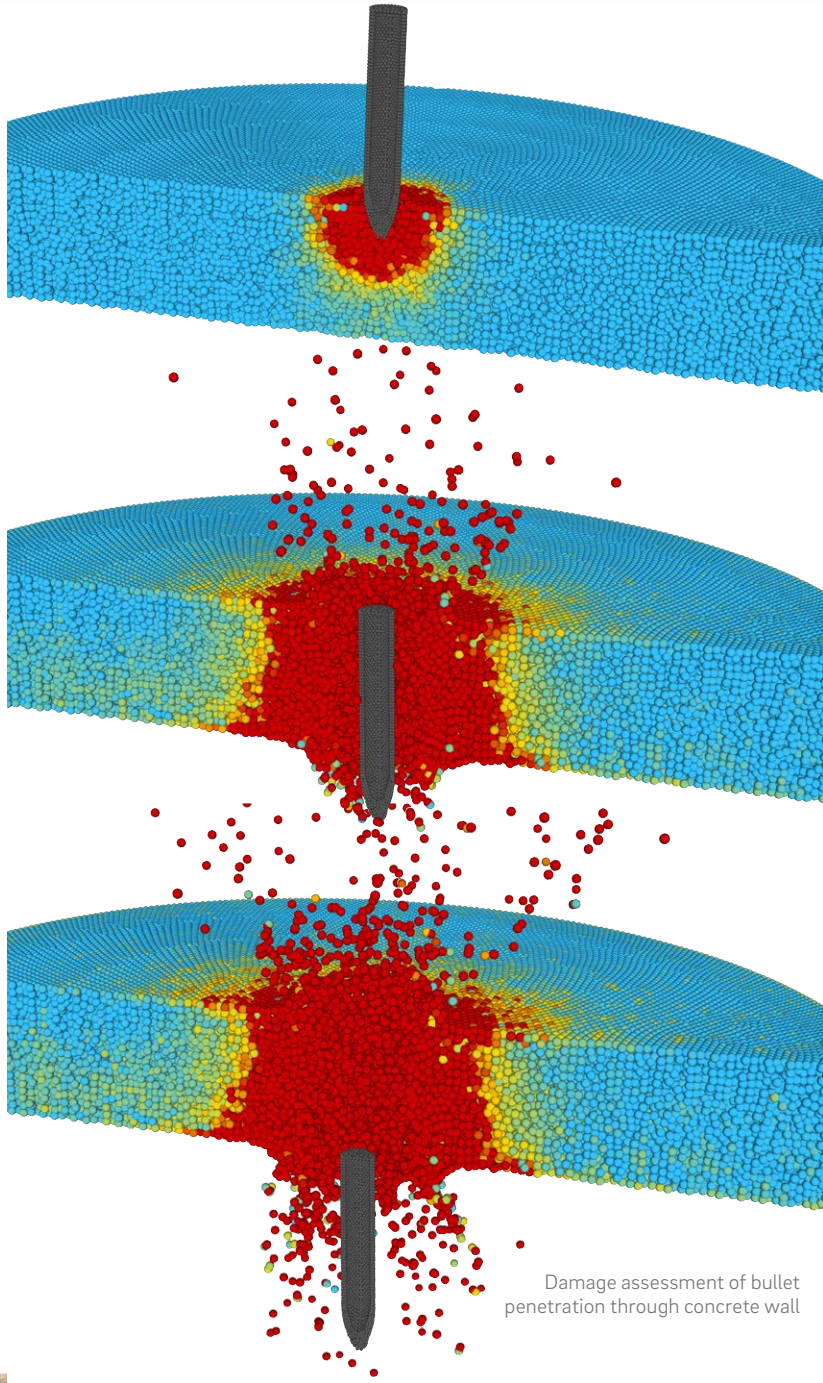
UC San Diego
JACOBS SCHOOL OF ENGINEERING

PREPARE. PROTECT. RESPOND.

We help prepare for extreme events. We protect entire built infrastructures, as well as humans, from extreme events such as blasts from terrorist attacks and mining explosions, car crashes, sports collisions, and natural disasters including earthquakes and landslides. After an extreme event, we provide rapid damage and vulnerability assessments.

At the Center for Extreme Events Research, we have world-renowned expertise in both experimental and computational investigation methods. We leverage this expertise to develop the assessment tools and experiments our research partners need to prepare, protect and respond.

Join us.



Damage assessment of bullet penetration through concrete wall

OUR COMPETITIVE ADVANTAGES

WORLD'S BEST TESTING FACILITIES

Blast / extreme-events simulator | Gas gun and impact testing facilities | Large-scale soil box seismic testing

UNRIVALED COMPUTATIONAL EXPERTISE

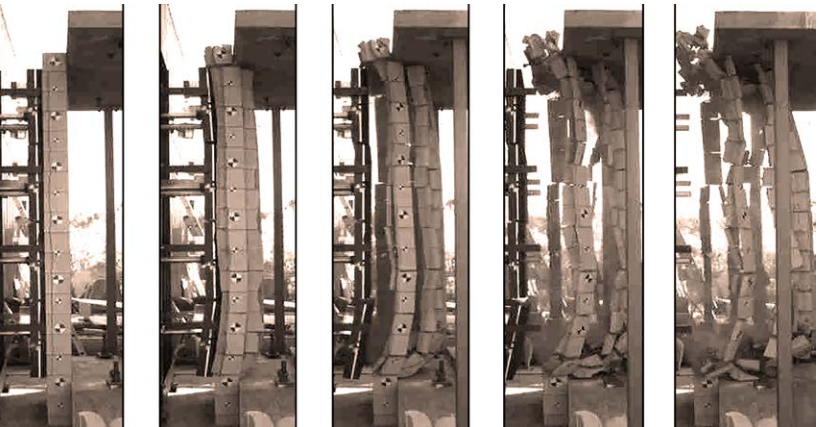
Advanced finite elements | meshfree methods | Isogeometric analysis

Our software systems empower research partners to solve otherwise intractable simulation challenges.

WE COMBINE EXPERIMENTAL AND COMPUTATIONAL TECHNOLOGIES

We validate large-scale computational simulations using our unparalleled testing facilities. Validated computational capabilities can be fully integrated to provide fast damage assessment of structures in recovery efforts.

Image sequence: masonry wall subjected to blast load



MEMBERSHIP OPPORTUNITIES

Access to multidisciplinary innovation through workshops, short courses, visiting-scholar opportunities for research staff, and one-on-one collaborations.

Student recruiting: access to the most promising students. **Connect with emerging technical talent.**

Gain insight into the future of the field.

WHO WE ARE and WHAT WE DO

Buildings. Bridges. Power plants. Cars. Human bodies. When it comes to extreme events, both natural and human caused, we prepare, protect and assess these structures, and many more.

STRUCTURAL ENGINEERING

Jiun-Shyan (J.S.) Chen
Meshfree based computational techniques and machine learning enhanced data-driven computing for multi-scale multi-physics modeling of solids and structures subjected to extreme loadings such as shocks, fluid-structure interaction, and manufacturing processes.

Gilbert Hegemier
Hazard mitigation engineering using advanced materials and design to retrofit critical infrastructure systems and components.

Tara Hutchinson
Earthquake and geotechnical engineering, performance assessment of structural/nonstructural components, and machine learning and computer vision methods for damage estimation.

H. Alicia Kim
Topology optimization for structures and materials, level set method, design of tow-steered fiber composites, multiscale and multifunctional designs.

Hyonny Kim
Impact effects on composite materials and structures with aerospace and other applications, multifunctional materials, nano-materials, and adhesive bonding.

Falko Kuester
Scientific visualization, including distributed and remote visualization of large data sets.

Ken Loh
Stimuli-responsive materials, wearable sensors, metamaterials, soft material actuators, non-contact sensing, physics- and data-driven tomographic inverse methods, human performance assessment, and the human digital twin.

John McCartney
Innovative experimental techniques to develop constitutive relationships for soils under a range of stress states, temperatures, and strain rates that may be encountered in extreme events.

Mehran Tehrani
Design and Manufacturing of Advanced Multifunctional Composites: high damping and stimuli responsive composites, additive manufacturing of thermosetting and thermoplastic composites, in-situ consolidation via automated fiber placement (AFP)

Michael (Mike) Todd
Structural health monitoring strategies, nonlinear vibrations, time series analysis, probabilistic modeling/uncertainty quantification, structural health prognostics, and digital twin modeling strategies.

Georgios Tsampras
Integrated numerical, manufacturing, and experimental research to enhance the safety, reliability, and efficiency of structural cotmponents, connections, and systems.

MECHANICAL AND AEROSPACE ENGINEERING

Boris Kramer
Multifidelity and data-driven modeling, optimization and control, uncertainty quantification, reliability-based design and design under uncertainty in fluid flows.

Vitali Nesterenko
New experimental capabilities for dynamic testing. Physics and mechanics of shock and high strain, strain rate deformation, instability and fragmentation of heterogeneous solid materials.

Albert P. Pisano
MEMS, manufacturing, wireless sensors for harsh environments, low-cost sensors.

Sutanu Sarkar
Computational fluid dynamics, turbulence, environmental flows.

Oliver Schmidt
Hydrodynamic stability, computational fluid mechanics, intermittency and rare events, modal decomposition, model order reduction

RADIOLOGY

Shantanu Sinha
Medical physics, biomedical imaging and modeling of the musculoskeletal system under normal and diseased conditions.

MATHEMATICS

Randolph Bank
Scientific computing, numerical partial differential equations.

Li-Tien Cheng
Scientific computing, image processing, level set methods, numerical partial differential equations.

Michael Holst
Scientific computing, numerical analysis, applied analysis, mathematical physics, partial differential equations.

SAN DIEGO SUPERCOMPUTER CENTER (SDSC)

Amitava Majumdar
Director of SDSC's Data Enabled Scientific Computing division which includes High Performance Computing Systems, User Services, and Scientific Computing. Scientific applications on HPC machines.

Mahidhar Tatineni
Parallelization, scaling analysis and performance optimization of HPC applications on multi-petaflop supercomputers. Data-intensive high performance computing.

SHORT COURSES

We provide technical short courses to our partners in various topics including:

- » Meshfree Computational Methods
- » Topology Optimization for Additive Manufacturing
- » Advanced Composites for Aerospace Structures
- » Joining of Composite Structures

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