

ACCELERATING NATURAL HAZARDS RESEARCH THROUGH SHARED COMPUTATION: APPLICATIONS IN EARTHQUAKE AND WIND ENGINEERING

Speaker

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Abstract

The SimCenter provides next-generation software tools to the natural hazards engineering research community with the goal of advancing simulation of the impact of natural hazards on structures, lifelines, and communities. One major goal of this effort is to enable more comprehensive computational workflows through shared software tools. This talk will briefly highlight the capabilities of SimCenter software and then demonstrate how these tools can be leveraged to accelerate research progress.

Two computational dynamics research projects will be considered. The first project involves a network seismic risk assessment of the BART rail network. A surrogate model, developed using quoFEM, was used to automatically generate structural models for all elevated structures in the network, accelerating model generation. Regional simulations were then executed using R2D and involved nonlinear time history analysis of all structures in the network, including train-structure interaction simulation. Results demonstrate the ability of the workflow to provide network impact predictions. The second project aims to create a new stochastic wind generation method for use in the dynamic analysis of large solar module arrays. WE-UQ was utilized for CFD simulations to generate pressure load time histories, which provide the input for finite element simulations. The proposed workflow demonstrates the importance of including spatially correlated variability in the wind field to properly capture potential dynamic response.

Biography

Prof Matthew DeJong is the Ray & Shirley Clough Presidential Chair in Structural Engineering at UC Berkeley, PI and Co-Director of the NHERI SimCenter (<https://simcenter.designsafe-ci.org/>), and Co-Director of the UC Berkeley Center for Smart Infrastructure (<https://smartinfrastructure.berkeley.edu/>).

His research interests include earthquake engineering, infrastructure sensing and modeling, historic structures, and excavation-induced settlement of structures. He earned his BS from UC Davis and his MS and PhD from MIT. He served as a faculty member at Cambridge University (UK) for 9 years prior to his current appointment.



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