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## Master's Thesis

# Eurocode-Based Seismic Design and Performance-Based Assessment of Multi-Story, Multi-Bay Steel and/or Reinforced Concrete Buildings under Bidirectional Ground Motion Excitation

### Motivation

Earthquakes remain one of the most damaging natural hazards to the built environment, motivating closer scrutiny of the gap between code-based seismic design and seismic performance. This thesis addresses that gap with an automated, Eurocode-based seismic design pipeline for steel and/or reinforced concrete buildings: given a building's geometry, location, and site conditions, it delivers the member sizing and a ready-to-run finite element model of the code-compliant structure. This model, implemented using the open-source software OpenSeesPy, then serves directly for nonlinear response-history assessment under bidirectional ground motions.

### Tasks

- Literature review: Eurocode-based design of steel/RC buildings (EN 1991-1-1, EN 1993-1-1, EN 1992-1-1, EN 1998-1)
- Software implementation and verification of the Eurocode design procedures
- Nonlinear response-history analyses of the designed buildings under bidirectional ground motions
- One or more of the following topics will be investigated:
  - Life-cycle cost-risk assessment: how design choices drive construction cost and seismic risk
  - Uncertainty quantification: seismic risk sensitivity to mass, stiffness, material quality and load distribution
  - Machine learning algorithms for data-driven, rapid seismic response assessment

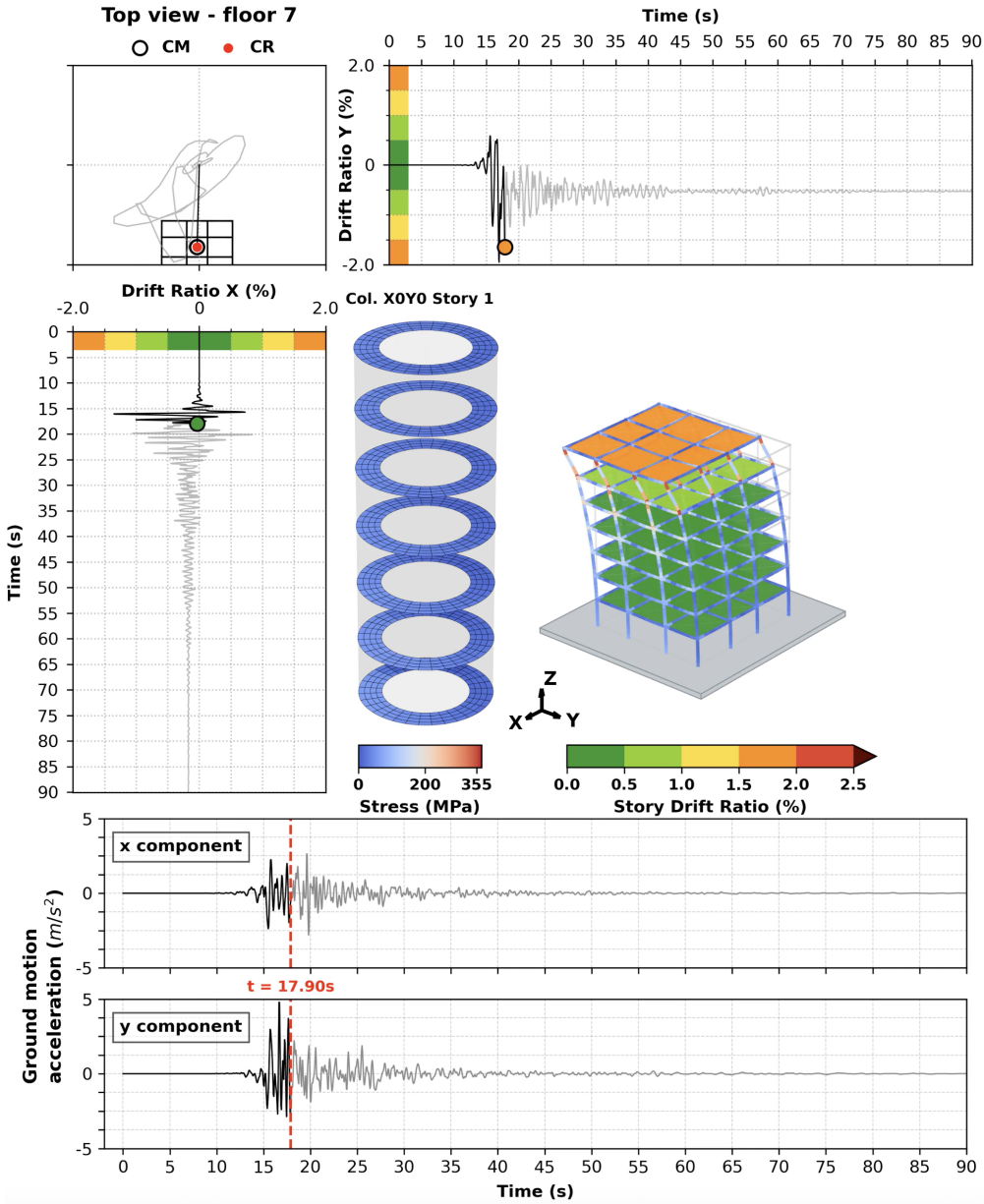


*Figure: Nonlinear response-history analysis dashboard under bidirectional ground motion*

### Requirements

Curiosity about the seismic risk assessment of buildings; willingness to work with Python.

### Supervisors

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