EurocodePy: A Python-Based Package for Structural Analysis with the Eurocodes

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Abstract:

The increasing demand for automation and reproducibility in structural engineering has led to the growing adoption of computational tools for design and analysis. In this context, an open-source Python package developed to support structural calculations in compliance with the Eurocodes EurocodePy is presented. EurocodePy, is developed to support structural calculations in compliance with the Eurocodes — a comprehensive set of European standards (EN 1990–EN 1999) for structural design. EurocodePy aims to bridge the gap between computational mechanics and standardized engineering practice by offering a flexible, modular, and extensible framework that enables users to perform code-compliant calculations with transparency and accuracy. The package integrates core structural mechanics with code-based checks, including limit states, serviceability criteria, and material specifications for concrete, steel, and timber structures. Designed with modularity and transparency in mind, EurocodePy facilitates both automation and reproducibility in structural design tasks. This presentation will provide an overview of EurocodePy's functionality, demonstrate key use cases through practical examples, and discuss the roadmap for future developments, including parametric optimization and integration with Jupyter Notebooks or Marimo Notebooks for educational purposes. By leveraging the flexibility of Python and the rigor of the Eurocodes, EurocodePy aims to enhance structural reliability, reduce design time, and promote open science in civil and structural engineering. EurocodePy includes modules for common structural elements and loading scenarios, including load combinations (EN 1990), actions on structures (EN 1991), and design of steel (EN 1993), concrete (EN 1992), and timber structures (EN 1995). The package supports both ultimate and serviceability limit state verification and includes built-in functions for partial safety factors, combination rules, section classification, and design checks. Integration with popular numerical libraries such as NumPy and Pandas ensures high computational efficiency and the ability to handle real-world design problems.

Keywords:

Structural engineering, eurocodes, notebooks, python.