

# An open-source adaptive mesh refinement framework for topology optimization

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## ABSTRACT

Topology optimization is a powerful computational tool for engineering design, allowing engineers to discover efficient and lightweight structures. However, its success heavily depends on the quality of the mesh used for analysis. Traditional meshing techniques often struggle to capture intricate details, leading to suboptimal designs. This paper introduces an open-source framework for adaptive mesh refinement in topology optimization, aiming to overcome these limitations. By incorporating open-source libraries and algorithms, this framework offers a cost-effective and scalable solution for engineers and researchers. Furthermore, it promotes collaboration and knowledge sharing within the engineering community. The research presents the underlying principles of the adaptive mesh refinement strategy and demonstrates its effectiveness through a series of benchmark problems. The framework's performance is evaluated in terms of computational efficiency, accuracy, and versatility, showcasing its potential for optimizing complex structures in various engineering domains. Overall, this paper provides a valuable contribution to the field of topology optimization by introducing an accessible and versatile open-source framework for adaptive mesh refinement. By improving the accuracy and efficiency of topology optimization, this framework opens doors for innovative engineering designs that are not only structurally sound but also highly efficient.