

Popular science summary of the PhD thesis

PhD student	Christoffer Fyllgraf Christensen
Title of the PhD thesis	Topology Optimization of Multiscale Structures with Local and Global Failure Criteria
PhD school/Department	Construct PhD School

Science summary

This PhD thesis focuses on making complex multiscale structures safer and more robust. The research enhances buckling stability (preventing collapse under pressure) and yield strength (resisting permanent deformation). Additionally, it introduces a smart early-warning system to detect potential failures.

A new method was developed to improve buckling stability using porous materials. By controlling material density and predicting local buckling, the designs became lighter and stronger. Computer simulation tests showed significant improvements and efficiency gains.

The thesis also integrates yield strength limits into these structures, ensuring they can withstand real-world forces. An innovative pre-failure indicator system was created, providing early warnings of critical conditions, which was validated through experimental tests of 3D-printed models.

Overall, this research advances the design of safer, more reliable multiscale structures with promising applications in engineering fields like construction and aerospace.



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Please email the summary to the PhD secretary at the department