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Lieven, Christian; Beber, Moritz Emanuel; Sonnenschein, Nikolaus

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Memote - The genome-scale metabolic model test suite

Christian Lieven¹, [Moritz E. Beber](#)¹, Nikolaus Sonnenschein^{*1}

1: Novo Nordisk Foundation Center for Biosustainability, Technical University of Denmark

*Corresponding author email: niso@biosustain.dtu.dk

Genome-scale metabolic models (GEMs) have become fundamental and trusted tools in systems biology, facilitating *in silico* studies of metabolism across the entire spectrum of life. They are indispensable in the rational design and mechanistic understanding of cell factories at the level of metabolism. The availability of high quality GEMs is thus necessary for successful metabolic engineering projects.

As several studies have shown, neither the formal representation nor the functional requirements of GEMs are clearly defined. Without a consistent standard, reproducibility and interoperability of models between different groups and software tools cannot be guaranteed.

Here, we introduce memote (Metabolic Model Tests) a standardized testing suite for GEMs. Memote complements the *SBML Level 3 Flux Balance Constraints Package*, by providing a library of tests which enforce the standard model format. The suite also contains a host of functional checks on GEMs that go beyond the formal representation of a model. These tests cover all aspects of a metabolic model from syntactic conventions and annotations to conceptual and biological integrity. In addition, users can configure memote to use a range of experimental datasets for automated model validation.

Memote can act as a stand-alone benchmark of existing GEMs, or support *continuous* GEM reconstruction when integrated with successful software engineering practises such as web-based version control and continuous integration. A corresponding report displays the model's performance parameters for each change over time, driving informed model development and facilitating error detection.

Thus, memote not only allows researchers to more effectively iterate through the design-build-test cycle of the model reconstruction process, but also provides the scientific community with a measure of quality that is consistent across different operating systems, reconstruction platforms, and analysis software. Moreover, memote aims to simplify interaction and collaboration within the community by establishing workflows for publicly hosted and version controlled models.