Opt4Deck: A Python Library for Engineering Optimization

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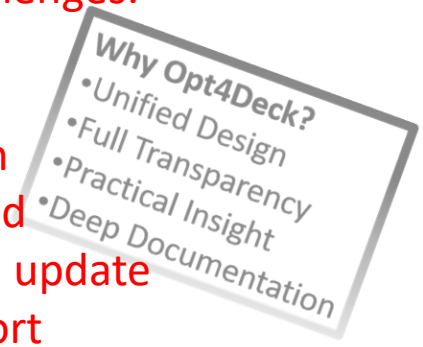
Opt4Deck is a unified, open-source optimization platform designed to deliver reliability, clarity, and practical utility across every stage of analysis. It integrates efficient computational methods with a coherent methodology for formulating and managing optimization problems, enabling engineers and researchers to apply modern techniques to a wide range of scenarios – from simple linear models to complex nonlinear and dynamic systems. With targeted documentation, transparent computational steps, and a consistent design philosophy, Opt4Deck offers a robust and accessible environment for those seeking a dependable and practically applicable solution to optimization challenges.



📐 SIMPLEX

- Linear programming (maximization)
- Moves across feasible vertices
- Tableau-based, stepwise procedure
- Full transparency of calculations
- Ideal for resources and logistics

📊 BFGS

- Nonlinear optimization
- Gradient-based method
- Quasi-Newton Hessian update
- Variable-bounds support
- Fast and stable convergence

🧬 GENETIC

- Evolutionary stochastic search
- Suitable for complex landscapes
- Binary variable encoding
- Operators: crossover & mutation
- Gradient-free method

⚡ ADJOINT

- Dynamic system optimization
- Gradient via adjoint equation
- Independent of design variables
- High computational efficiency
- Ideal for engineering & control