For decades, fiber composites have been successfully applied in yacht racing. The knowledge of application has reached an incredibly advanced level. Especially for construction parts with just a few requirements regarding the boat design, the technical development supported by simulation software is an important factor for success. Sailing and construction teams consider further technical optimization as an economic challenge, especially in the highly developed boat classes. Low production quantities even increase the cost pressure on development asking for special approaches of design.

**Optimization with subsequent validation**

In the following step, the procedure of optimization differed depending on the significance of the surrogate model. A high prognosis coefficient indicates the possibility to conduct an optimization just by using the surrogate model and a subsequent validation through the FEM model. This time saving procedure is therefore preferable. In the case of having a surrogate model with low prognosis quality, possible causing effects should firstly be investigated. The recalculations of certain design points or changing input parameters can already help to improve the coefficient of prognosis.

A minimization of weight as the main goal of the boom optimization was configured in optiSLang. The team of ar engineers considered safety limits at various points of the boom as constraints. In addition, the deflection was not allowed to exceed the limit. Due to the carefully prepared optimization, the surrogate model showed a high accuracy capable of running a direct simulation. The procedure of optimization, the validation with the FEM model as well as further parameter adjustments finally achieved a weight reduction of 18%. At the same time, the mechanical properties of the boom remained unchanged or were even improved in several cases.

Since some design input parameters, like layer angles, have typically been subjected to production-related scatter, the consideration of this influence by conducting a robustness analysis is also of great importance. Combined with the knowledge of the underlying stochastic process, optiSLang allows a classification of distribution and, thus, the determination of the reliability of the individual design values.