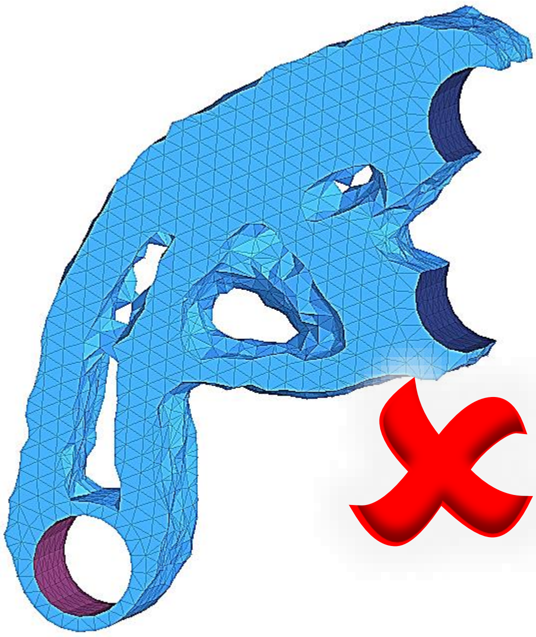
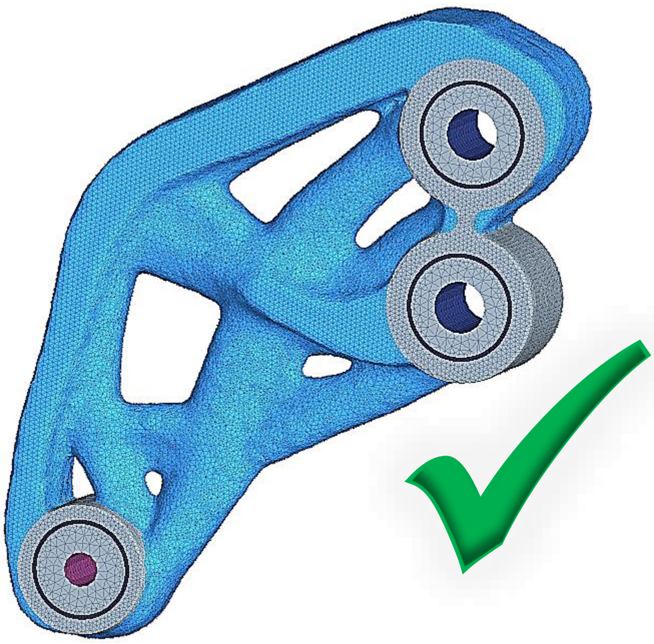
Center for Advanced Engineering Software and Simulations

How to get good results in topology optimization

Quick guide for ProTOp users

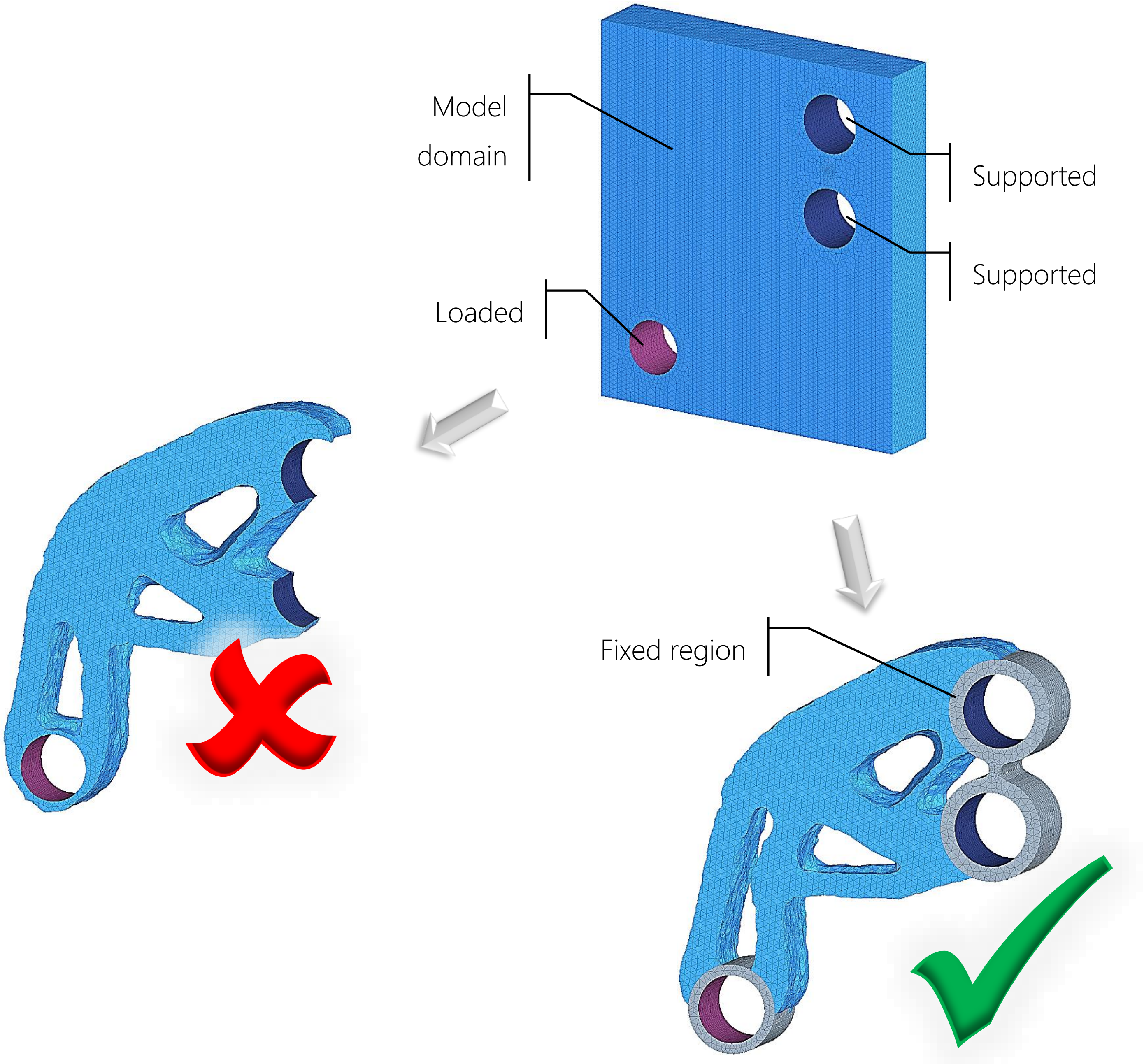




1. Define and partition your model domain ...

Note

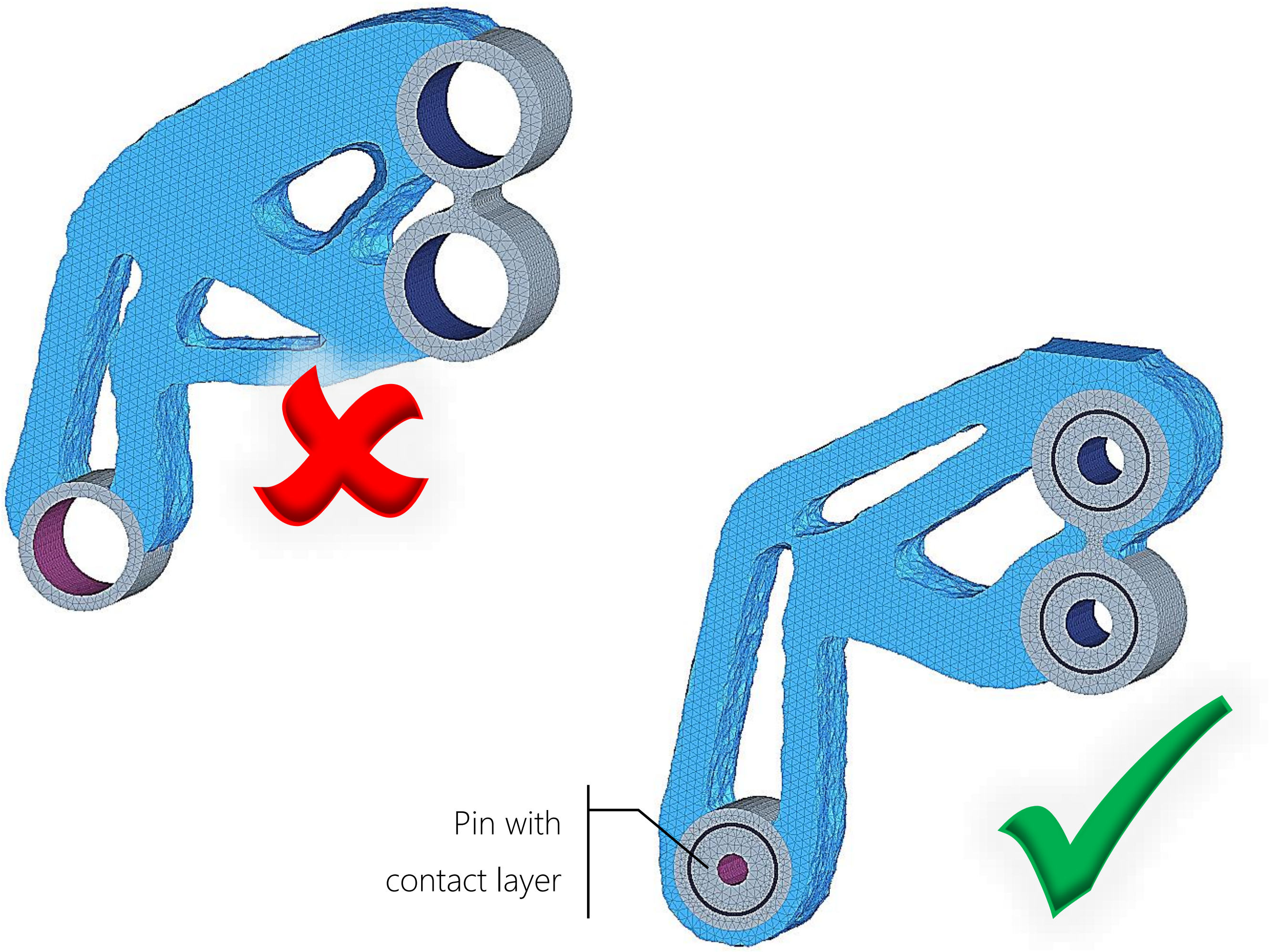
- Identify the types of all regions of your model: free, fixed, fixed-contact, ...
- Partition your model domain accordingly and assign to each region its type, e.g., the regions around supports and loads should typically be of the fixed type, ...



2. Carefully define support conditions ...

Very important

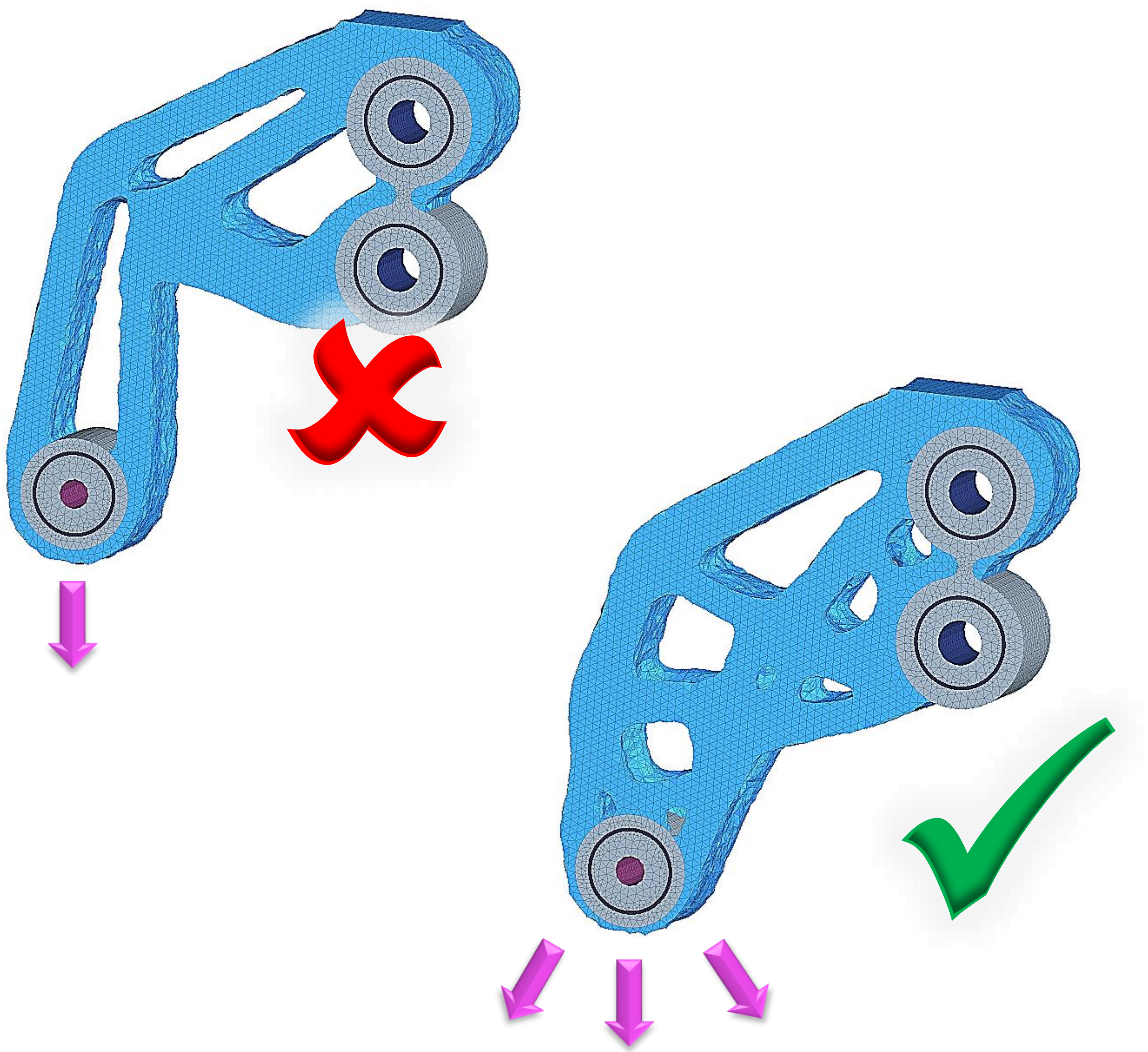
- Carefully examine your support conditions: typically, these have to be modeled much more precise than for usual FEA
- Create additional regions if necessary; use the special semi-contact FEs in cases of situations involving pins, bolts, ...; e.g., a pin contact typically requires a thin fixed-contact region to model the contact and a fixed region to model the pin



3. Identify and apply all possible loadings ...

Very important

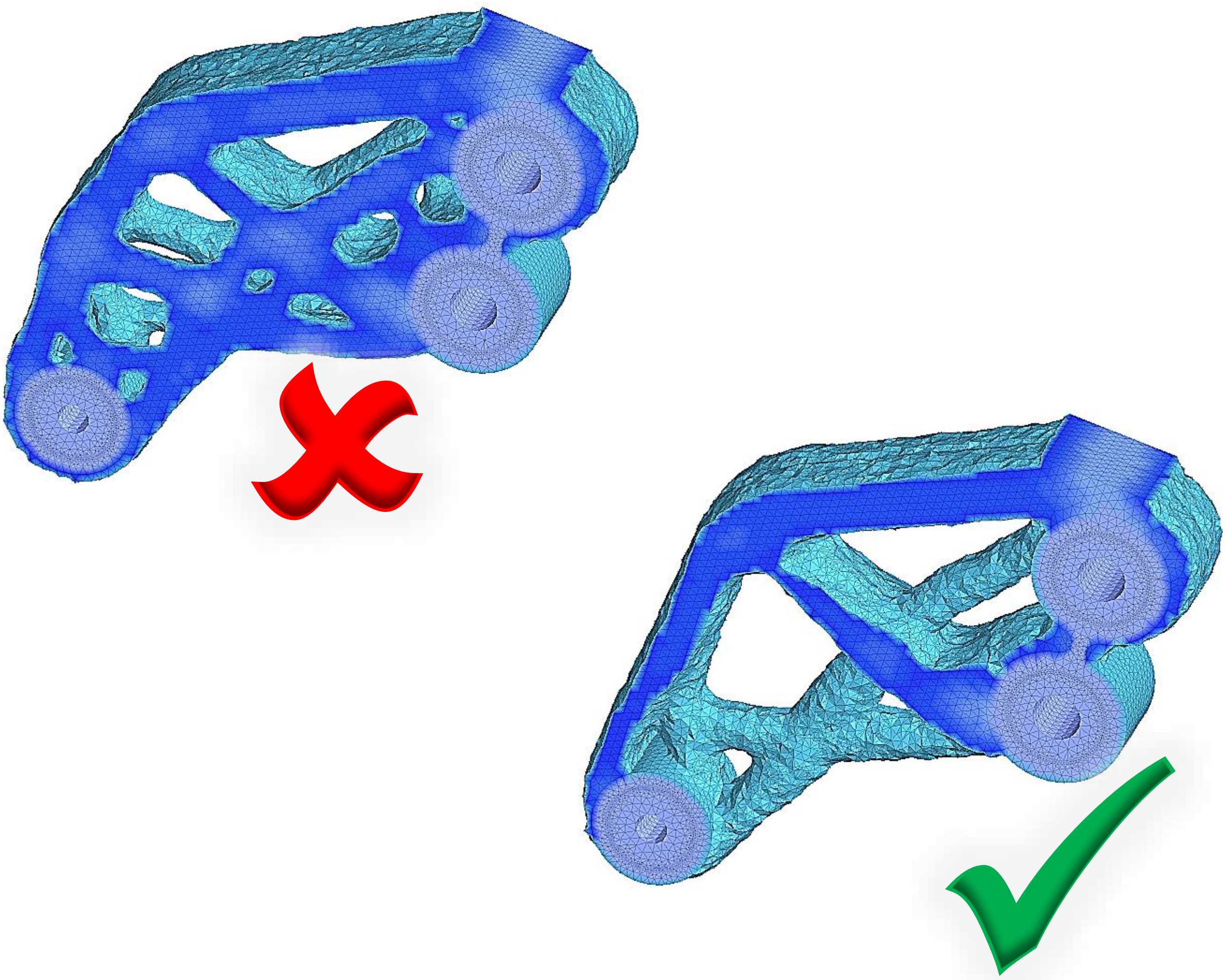
- Carefully identify all possible loading conditions that may eventually appear in addition to your obvious loads; add all these eventual loading situations as extra load cases
- Keep in mind: it is far better and safer having too many load cases than too few



4. Enforce eventual technological constraints …

Note

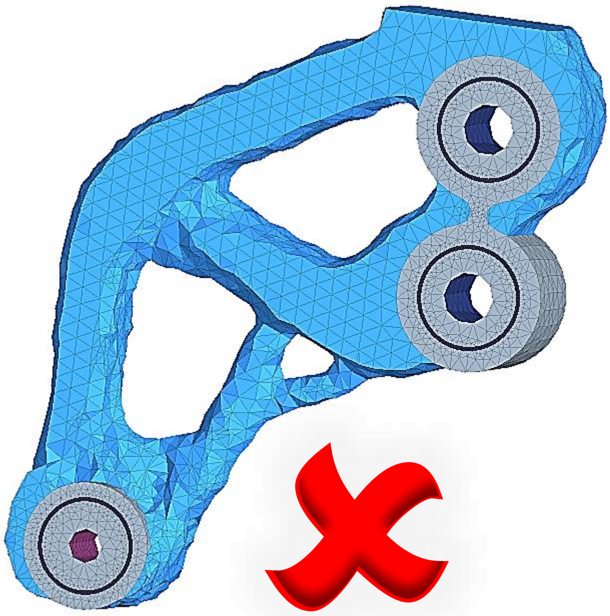
- Production, aesthetic, or some other requirements may make it necessary to impose various technological constraints related to opening directions, symmetry, …
- Impose proper technological constraints to ensure your design will be acceptable, e.g., for casting, forging, …

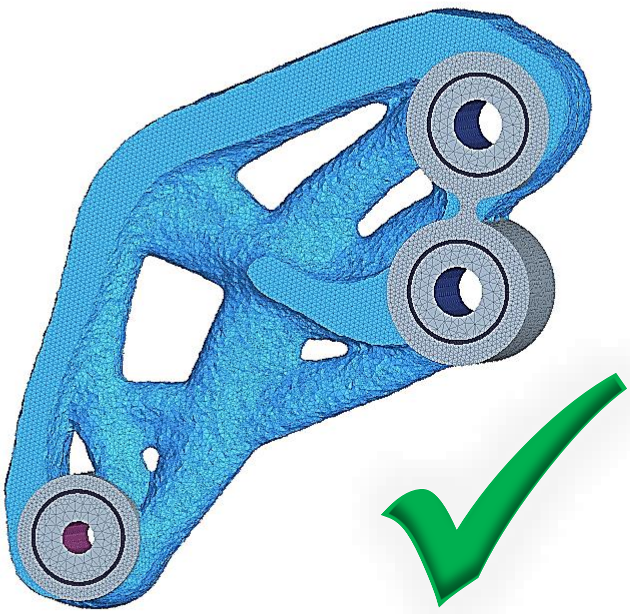


5. Use dense FE meshes ...

Note

- A coarse FE mesh may be usable to start the optimization; but, the final result has to be obtained by a FE mesh being much finer than utilized for usual FEA, especially, if technological constraints are imposed
- Choosing a higher-order FE for a coarse mesh will not improve the situation

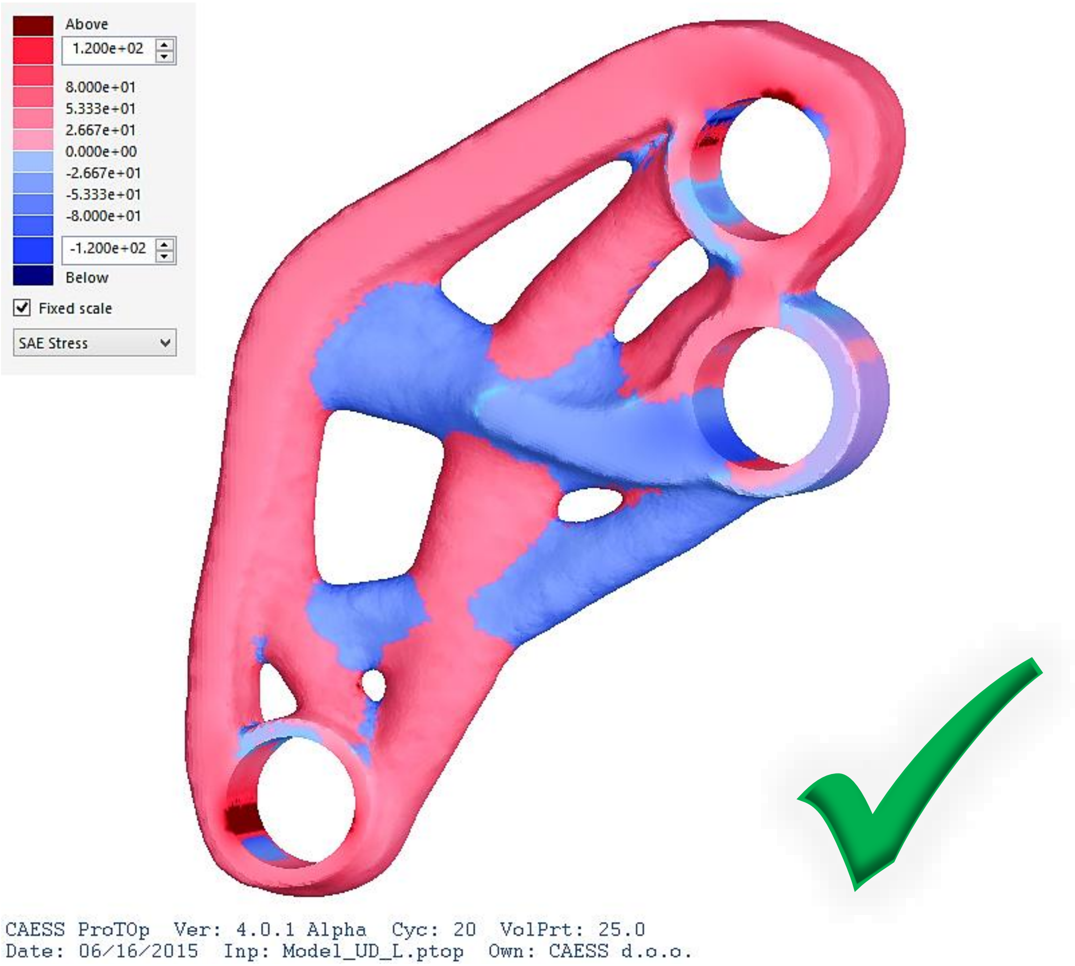




6. Run your optimization task efficiently …

Note

- Start the optimization with a low density mesh and then switch to high density mesh by using the start-from functionality
- Customized high density mesh can be obtained by mesh refinement within ProTOp
- Occasionally check intermediate results and adjust the optimization parameters as required
- Finally, use the surface export tools to get a smooth surface mesh of your part



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We will be glad to discuss your needs and we will do our best to fulfill your expectations.

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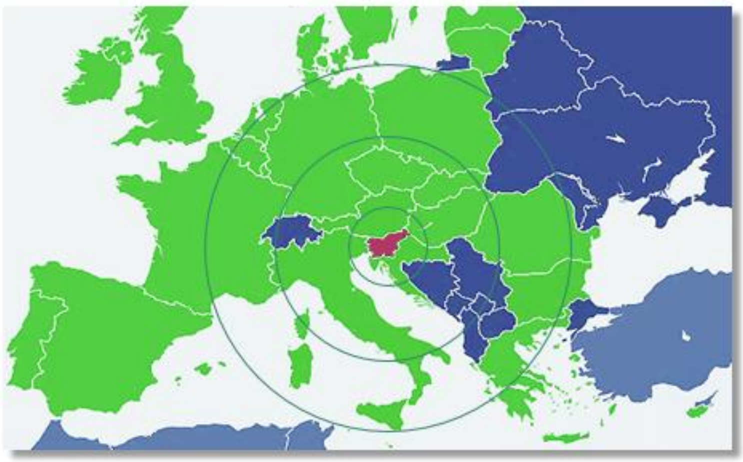

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