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Project Overview

The 2015-2016 Boston Scientific SCOPE team's goal was to create and verify a mathematical model that could be used to accurately predict behavior and performance of a braided gastrointestinal stent of any material and design based on empirically obtained input values.

Accurate mathematical models are an integral part of making decisions relating to product development. Use of models ultimately helps engineers design relevant and high performing products more quickly.

Gastrointestinal Stents



A gastrointestinal stent is a medical device used to hold open constrictions that may form in the GI tract. These stents are constructed from helical wires, which push out against the wall of the GI tract and hold the tract open, and can also include a silicone covering.

Modeling Process

Research

Searched for relevant work on which to build our models and use as a starting point.

Model

Formulated closed-form solutions for various deformation modes with and without stent coverings.

Implement

Robustly implemented these solutions in a MATLAB-based back end with integrated GUI for ease of use.

Verify

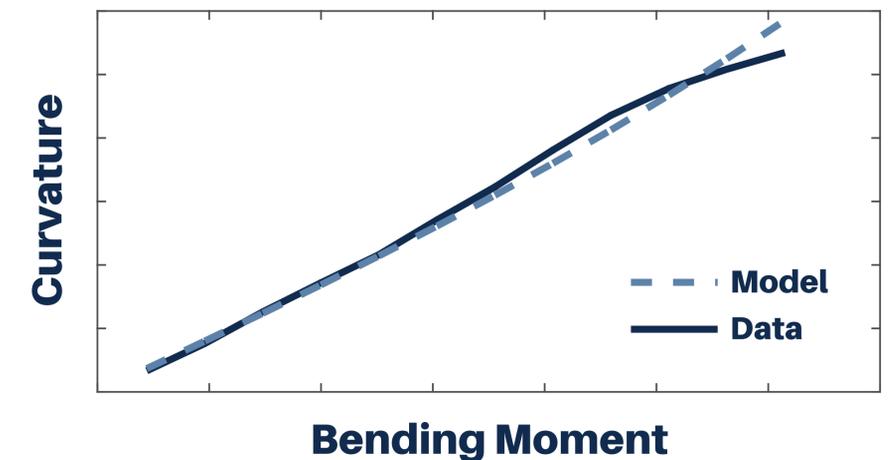
Verified that our model was accurate using test data from Boston Scientific and our own test methods.

Model Goals

- **Inform** stent designs to cut down on prototyping and testing costs
- **Apply** to a wide range of stent geometries, materials, and deformations
- **Reduce** activation energy for model use

Results & Future Work

Figure 1. Example of model prediction compared to data.



Model predictions closely matched experimental data for covered and uncovered stents. We provided thorough model documentation, which will allow Boston Scientific engineers to adjust the models and add to them as necessary.