Visualization of sun-sail using PyVista

```python
import numpy as np
import pyvista as pv


data = np.load('Finite_Element_Mesh.npz')


coordinates = data['coordinates']
membrane = data['membrane']
edge = data['edge']
support = data['support']
truss = data['truss']


points = coordinates[:, 1:4]
triangles = membrane[:, 1:4]
faces = np.hstack([np.full((triangles.shape[0], 1), 3), triangles]).flatten()


membrane_mesh = pv.PolyData(points, faces=faces)


edge_coo = edge[:, 1:3]
line_cells_edge = np.hstack([np.full((edge_coo.shape[0], 1), 2), edge_coo]).flatten()


support_coo = support[:, 1:3]
line_cells_support = np.hstack([np.full((support_coo.shape[0], 1), 2),
support_coo]).flatten()


truss_coo = truss[:, 1:3]
line_cells_truss = np.hstack([np.full((truss_coo.shape[0], 1), 2),
truss_coo]).flatten()


edge_mesh = pv.PolyData(points, lines=line_cells_edge)
support_mesh = pv.PolyData(points, lines=line_cells_support)
truss_mesh = pv.PolyData(points, lines=line_cells_truss)


pl = pv.Plotter()
pl.add_mesh(membrane_mesh)
pl.add_mesh(edge_mesh, line_width=2, color='darkred', label='Edges')
pl.add_mesh(support_mesh, line_width=2, color='green', label='Supports')
pl.add_mesh(truss_mesh, line_width=2, color='orange', label='Trusses')
pl.add_legend()
pl.show()
```
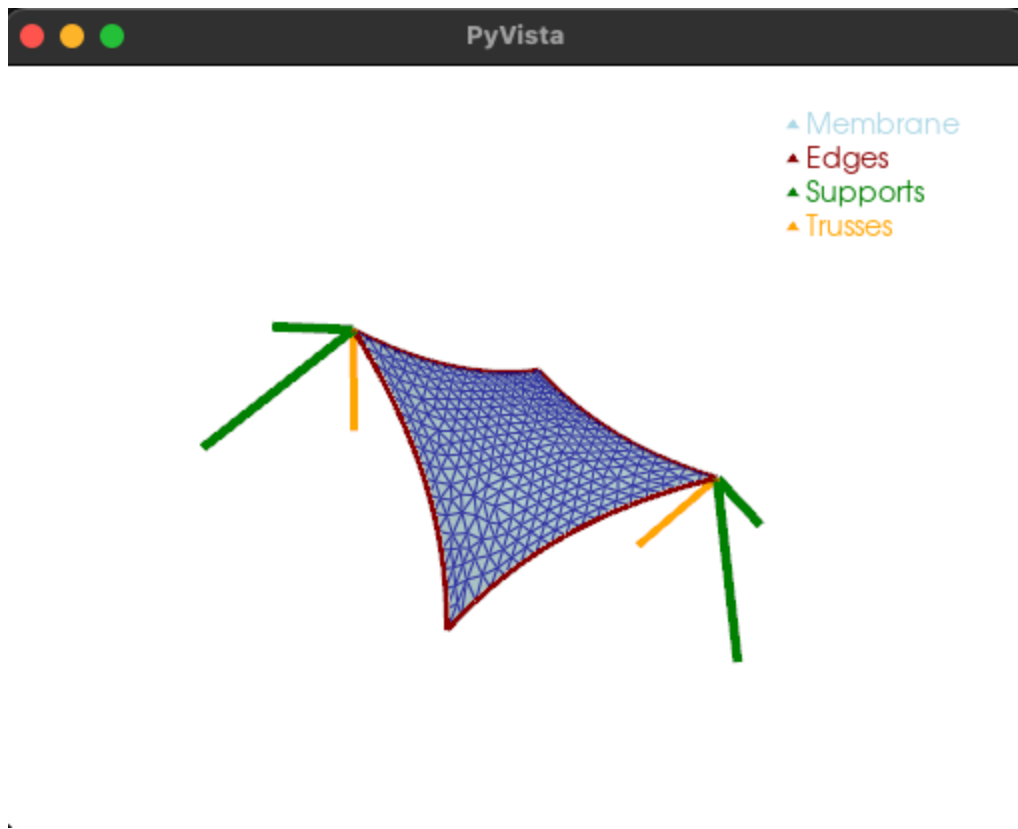
Research Questions

1. What is the probability of failure under snow-load?
   P(Fail) = P(membrane stress > rupture stress)

2. Which input parameters have the most impact on the membrane stress?

Literature Review - Kriging Method

"Kriging is [a] that use[s] a limited set of sampled data points to estimate the value of a variable over a continuous spatial field."
https://www.publichealth.columbia.edu/research/population-health-methods/kriging-interpolation

- Provides a computationally inexpensive surrogate model to interpolate probability of failure, given n_{max} number of observations.

- *Bonus question: How to select n_{max} points to build optimal interpolation?*

- Fits a **variogram** to the data, which incorporates spatial correlation between data points. This is captured in a weight matrix that holds information about the covariance structure of the output.