

## Sensitivity Analysis of Stokes flow

### Considerations

The  $q$  value was fixed at  $q=0.01$  in order to simplify the problem and that is the reason the result **control.pvd** does not get in the global optimum.

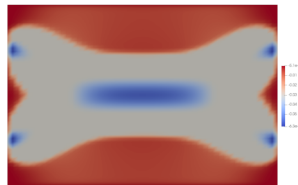
This code uses Dofin-Adjoint for the sake of simplicity, however it can also be done purely with Fenics.

### Simulation

All the code used in this simulation can be found in this Github repository [Sensitivity\\_Analysis\\_Stokes.py](#) .

### Results

The sensitivity can be found for each iteration in **output/derivative.pvd**. Here's our logo (hover to see the title text):



Final Derivative Plot:



Final Design Variable:

The results of the control variable can be found in **output/control.pvd** and the sensitivity in **output/derivatives\_999.vtu** where 999 is the iteration wanted. The output file look like:

```
<UnstructuredGrid>
<Piece  NumberOfPoints="2601"  NumberOfCells="5000">
<Points>
<DataArray  type="Float64"  NumberOfComponents="3"  format="ascii">
0 0 0  0.03 0 0  0.06 0 0  0.09 0 0  0.12 0 0  0.15 0 0  0.18 0 0
0.21 0 0  0.24 0 0  0.27 0 0  0.3 0 0  0.33 0 0  0.36 0 0  0.39 0 0
0.42 0 0  0.45 0 0  0.48 0 0  0.51 0 0  0.54 0 0  0.57 0 0  0.6 0 0
0.63 0 0  0.66 0 0  0.6899999999999999 0 0  0.72 0 0  0.75 0 0  0.78
0 0  0.8100000000000000 0 0  0.84 0 0  0.87 0 0  0.9 0 0  0.93 0 0
```

```
0.96 0 0 0.99 0 0 1.02 0 0 1.05 0 0 1.08 0 0 1.11 0 0 1.14 0 0
1.17 0 0 1.2 0 0 1.23 0 0 1.26 0 0 1.29 0 0 1.32 0 0 1.35 0 0
....
</PointData>
</Piece>
</UnstructuredGrid>
</VTKFile>
```