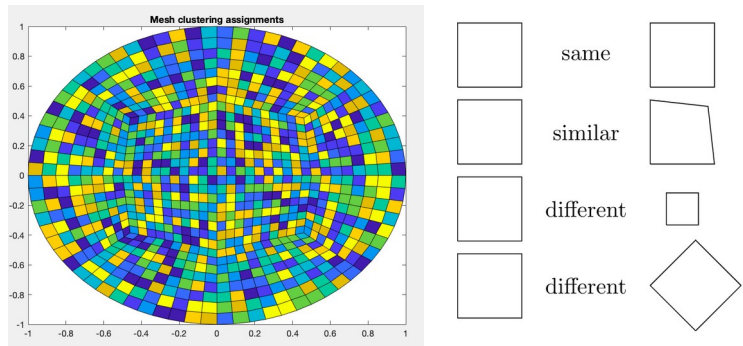


MESH CLUSTERING to detect and enhance mesh structure for extreme- scale finite element simulations.

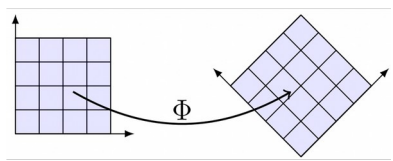
Eugene Agyei-Kodie, 1442
Graham Harper, 1442

Goal: To make shapes similar to reuse FEM basic functions

Step 1



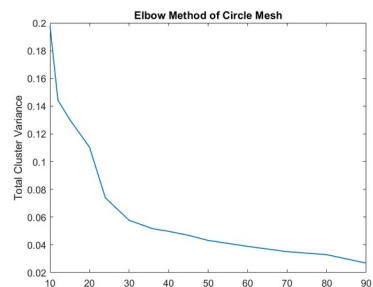
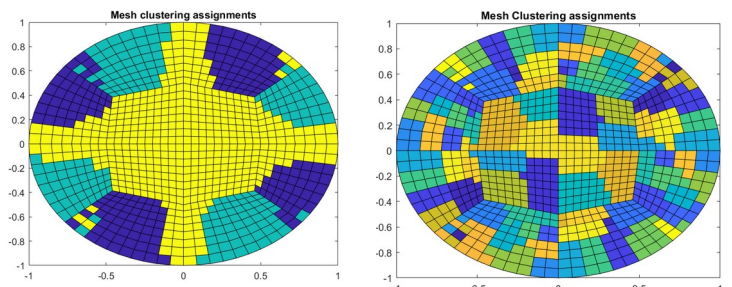
Step 2: Analyze reference-to-physical mapping Jacobian



$$\Phi(\hat{x}, \hat{y}) = \begin{bmatrix} a_1 + a_2\hat{x} + a_3\hat{y} + a_4\hat{x}\hat{y} \\ b_1 + b_2\hat{x} + b_3\hat{y} + b_4\hat{x}\hat{y} \end{bmatrix}$$

$$J_{\Phi}(\hat{x}, \hat{y}) = \begin{bmatrix} a_2 + a_4\hat{y} & a_3 + a_4\hat{x} \\ b_2 + b_4\hat{y} & b_3 + b_4\hat{x} \end{bmatrix} = \begin{bmatrix} a_2 & a_3 \\ b_2 & b_3 \end{bmatrix} + \begin{bmatrix} a_4 \\ b_4 \end{bmatrix} \begin{bmatrix} \hat{x} & \hat{y} \end{bmatrix}$$

Step 3: Clustering and Optimal Number



Step 4: Cluster-respecting optimization

