Input

Output

— Domain Division —

vertices coordinates → vertices indices in each domain → Mesh generation (p.3)

— (Plastic) Right Cauchy-Green Tensor Field —

domain_id	$[C_{ij}^p]$
⋮	⋮
6	$\begin{bmatrix} 1 & 0.8 \\ 0.8 & 1.8 \end{bmatrix}$
⋮	⋮

— A vtk file containing various fields —

Output.vtk

$$\min_{\mathbf{y}(\mathbf{x})} \mathcal{F}[\mathbf{y}(\mathbf{x}), \mathbf{C}^p(\mathbf{x})]$$

$\mathcal{F}$: elastic energy
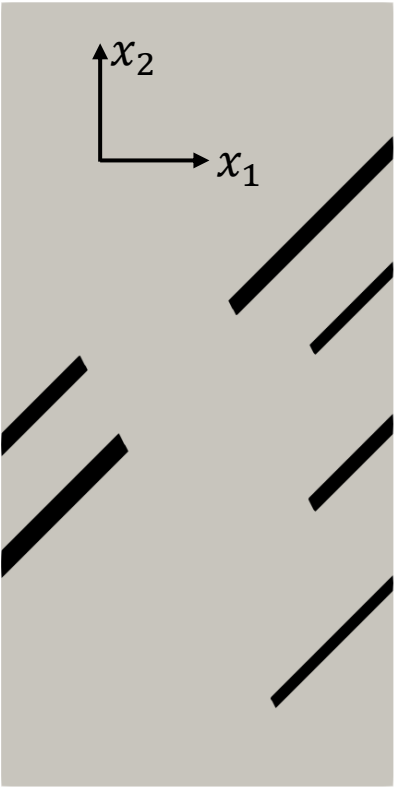
Ref. config. colored with $C_{12}^p(\mathbf{x})$
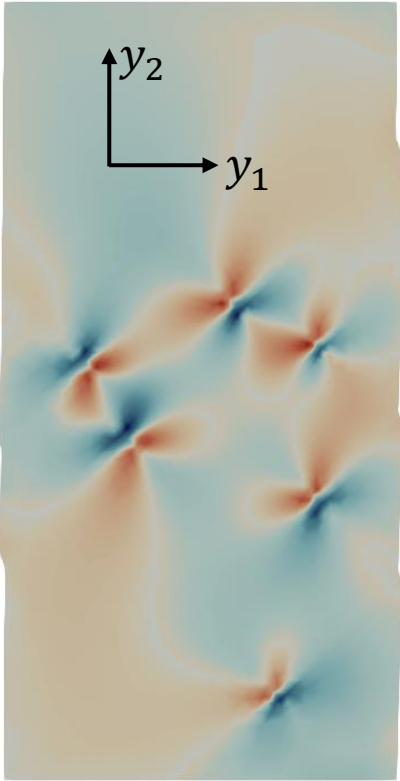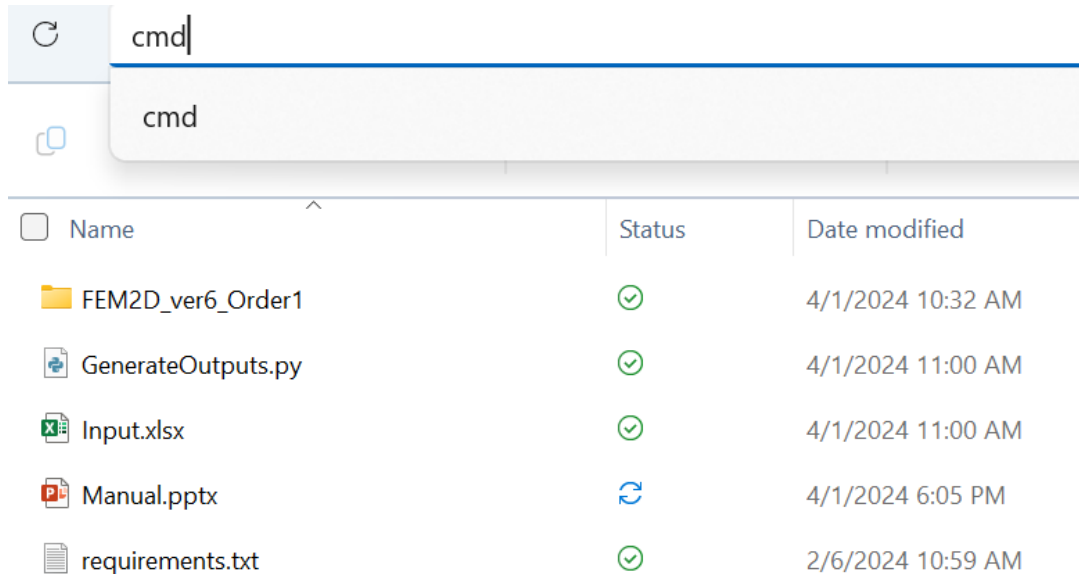
Deformed config. colored with shear stress σ_{12}
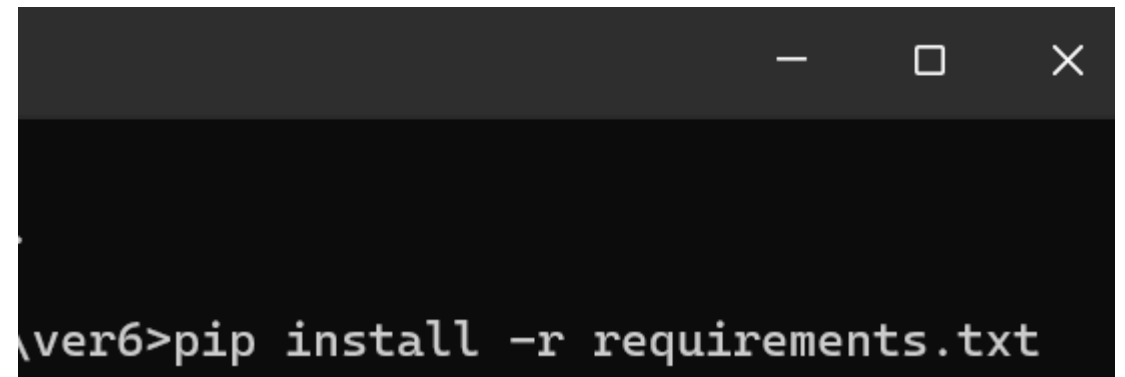
☐ **Enter the 'ver6' folder, type 'cmd' in the navigation bar and press 'Enter.'**

☐ **After pressing 'Enter,' type 'pip install –r requirements.txt' on the command line that pops up to complete the installation of the required libraries.**
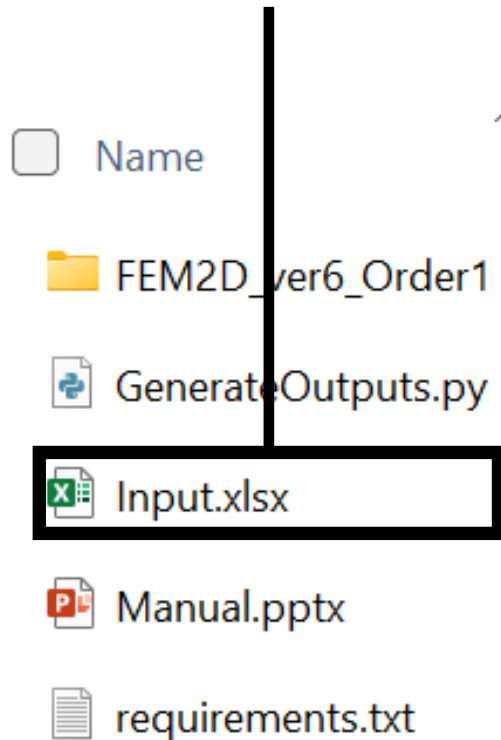
☐ **Open 'Input.xlsx' and enter various parameters required to solve stress equilibrium equations.**

Name

📁 FEM2D_ver6_Order1

🐍 GenerateOutputs.py

📊 Input.xlsx

📊 Manual.pptx

📄 requirements.txt

Elasticity

Shear modulus [GPa]	Poisson's ratio
21	0.26

| > | Elasticity | Bound_Condition | ⋯ | + | ⋮ |

Vertical displacement at the upper boundary

Vertical Loading Displacement [um]	Output File Name
−0.2	Output_2
0	Output_3

| > | Elasticity | Bound_Condition | Vert | ⋯ | + | ⋮ | ◄ | ▬▬ | ► |

Vertices coordinates

x_1 [um]	x_2 [um]	MeshSize [um]
0	5	1
3	2	0.2
3.14	2.26	0.2

| > | ⋯ | Vertices_Coords | Domain_\ | ⋯ | + | ⋮ |

Domain division

	vertex index of P0 at domain bound.	vertex index of P1 at domain bound.	vertex in
domain0	0	1	
domain1	4	5	
domain2	8	9	
domain3	12	13	

| > | ⋯ | Vertices_Coords | Domain_VertID | Domain_Cp | + | ⋮ | ◄ | ▬ | ► |

Plastic right Cachy-Green tensor C^p in each domain

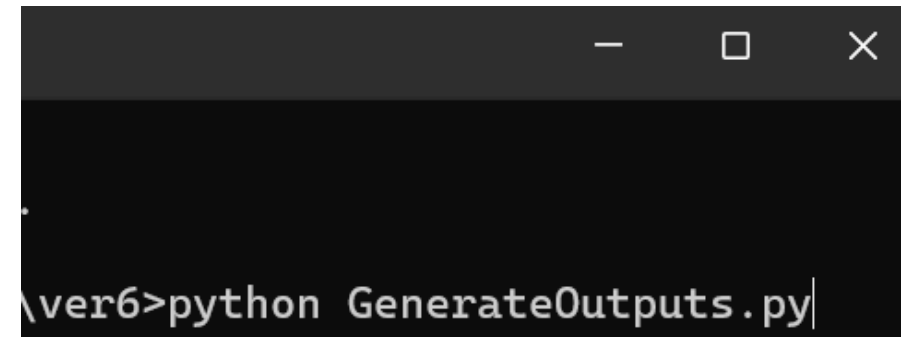|	Cp_11	Cp_12	Cp_22
domain0	1.78	0.18	0.58
domain1	1.78	0.18	0.58
domain2	1.78	0.18	0.58

| > | ⋯ | Vertices_Coords | Domain_Cp | Domain_VertID |

☐ **Again, enter the 'ver6' folder, type 'cmd' in the navigation bar and press 'Enter.'**
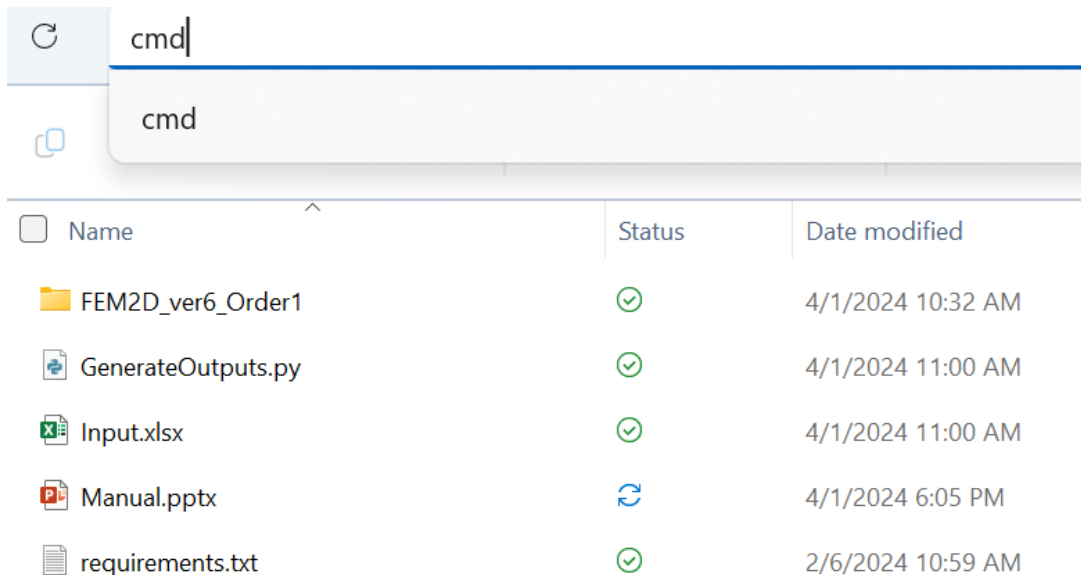
☐ **After pressing 'Enter,' type 'python GenerateOutputs.py' on the command line that pops up to start to solve the stress equilibrium equations.**

☐ **Outputs (With names defined in 'Bound_condition' in 'input.xlsx.' Each file corresponds to one bound. condition.):**

Output_2.vtk

Output_3.vtk