

Here is a detailed summary of how you should prepare a Powerpoint presentation to present your solutions and discuss the important aspects of this collaborative data visualization project:

## 1 Title Slide

- Include project title, team members' names & student IDs, course name & number, professor's name, and date

## 2 Problem Statement

- State the problem: Visualizing steady heat flow in a metal plate using Laplace's equation
- Explain objectives: Implement Jacobi and Gauss-Seidel iterative methods, construct diffusion matrix, solve system of equations, visualize solution as a heatmap

## 3 Methods

- Briefly explain key methods used:
  - Constructing large sparse matrix  $A$  using scipy sparse matrices
  - Implementing Jacobi and Gauss-Seidel iterative solver functions
  - Solving  $AU=b$  to find temperature distribution  $U$
  - Rearranging  $U$  into matrix and padding for visualization
  - Creating heatmap with `plt.imshow()`

## 4 Code Walkthrough

- Show snippets of key code sections
  - sparse matrix construction
  - iterative solvers
  - heatmap visualization
- Explain what each section achieves

## 5 Results

- Present heatmap visualization
  - Discuss insights from visualization
    - \* How heat flows from the boundaries
    - \* Steady state distribution
    - \* Hot and cold regions
  - Provide quantitative metrics:
    - \* Iterations required to converge
    - \* Solver runtimes
    - \* Accuracy comparisons between solvers

## 6 Discussion

- Compare Jacobi and Gauss-Seidel convergence rates
- Relate findings to physical heat diffusion processes
- Discuss limitations and potential improvements

## 7 Conclusions

- Summarize key achievements
  - Meeting objectives
  - Implementations and analysis
  - Collaborative process

## 8 Q&A Slide

- Open-ended for any final questions

Make sure to practice presentation to check timing and flow. Include clear graphics and visualizations to effectively communicate the analysis. Discuss roles for presenting different sections.