Step 1 – Data Input	Step 2 – Preprocessing	Step 3 – Clustering	Step 4 – Visualization	Step 5 – Exploration and Analysis	Step 6 – Export & Reporting

Step 1 – Data Input

- User uploads a CSV or JSON file containing research titles, abstracts, and optional metadata.

- The system validates and displays sample records.

Step 2 – Preprocessing

- User clicks "Process Data."

- The app cleans and vectorizes the text automatically.

- Summary statistics (e.g., missing values, token counts) appear on screen.

Step 3 – Clustering

- User selects preferred clustering method:

  - **K-Means** (default)

  - **Hierarchical (Agglomerative)**

  - **DBSCAN**

- The app performs clustering and displays progress and evaluation metrics.

Step 4 – Visualization

- The clustered data is plotted in an interactive **2D/3D scatter plot** (via PCA/t-SNE).

- The user can hover over points to view paper titles.

- Supporting visuals:

  - Word cloud per cluster

  - Bar chart of keyword frequencies

  - Pie chart showing cluster size distribution

Step 5 – Exploration and Analysis

- Clicking on a cluster filters and lists the papers in that cluster.

- A text summary is generated describing the main theme and representative works.

Step 6 – Export & Reporting

- User downloads full cluster summaries as **CSV**, **JSON**, or **PDF**.

- The exported report contains:

  - Number of clusters

  - Cluster-level summaries

  - Evaluation metrics

  - Visualization snapshots