

Computational-Elliptic-Fourier-Analysis Workflow on StreamlitApp

The objective is transition from manual single-particle analysis to an automated, high-throughput workflow. Users will utilize batch processing in an interactive Python-based Streamlit GUI to perform statistical shape analysis and parameter sensitivity studies on large datasets.

Step-by-Step Procedure

1. Launch Streamlit App:

- Open the app: <https://computational-elliptic-fourier-analysis-1.streamlit.app/> (if needed, wake up the app)
 - Drop your prepared particle data into Dropbox or use test dataset file (test_data.csv) from <https://github.com/aidanaboribayeva/Computational-Elliptic-Fourier-Analysis>, and also put here your data scaling px/mm.
 - OR for Dropping use test dataset file (test_data.csv) from <https://github.com/aidanaboribayeva/Computational-Elliptic-Fourier-Analysis>, and also put here data scaling 77 px/mm
2. **Module 1 (Reconstruction):** Select one particle and toggle the harmonic order slider from 1 to 40. Observe the "Reconstruction Error" and how the digital outline converges with the original shape.
3. **Module 2 (Sensitivity):** Apply different harmonic orders to the *entire* dataset. Observe how indices like Asymmetry stabilize as the number of harmonics increases.
4. **Module 3 (Statistics):** Generate distribution plots for Elongation, Angularity, and Roughness. Export the correlation matrix to identify which shape descriptors are redundant.

Important Notes:

- **Note on the "Yes, get this app back!" button:**
After a period of inactivity, the Streamlit app may go into a "hibernation" or "sleep" mode. When you first revisit the link, you might expect a button that says "**Yes, get this app back!**" to wake the app.
- **Unique IDs:** Ensure that each particle in your dataset has a unique identification number, as the Streamlit App uses these IDs to further calculate for each individual particle data.
- **Processing Power:** When computing shape indices for the full dataset (~100 particles) in Module 2, increasing the harmonic order significantly may result in a short calculation delay, depends on user's computer power; wait for the "Running" icon in the top right of the App to disappear.