VISTAR Manual

Welcome to the user manual for our image-based data analysis application. This tool is designed to help researchers, engineers, and students working with scientific data that is represented using color-mapped visualizations. Whether you're working with simulation outputs from TCAD tools or exploring visual data from fields like medical imaging, electromagnetics, or environmental sciences, this application simplifies the process of extracting meaningful numerical insights from images.

In many scientific domains, simulation tools generate colorful images to represent complex data—for example, the variation of electric field, potential, or charge density in semiconductor devices. However, once these images are exported for presentations or publications, the connection between the color in the image and the actual numerical values it represents is often lost. That's where this application comes in.

The tool was originally developed with a focus on TCAD (Technology Computer-Aided Design) color profiles, which are commonly used in semiconductor research. These profiles are a unique form of data visualization, and our application makes it easy to analyze them—even when the original simulation files or software are not available. By simply loading an exported simulation image and providing the corresponding color map legend, users can accurately recover the data that each color represents.

What sets this application apart is its combination of powerful image processing and a user-friendly design. Without writing a single line of code or learning complicated tools, users can:

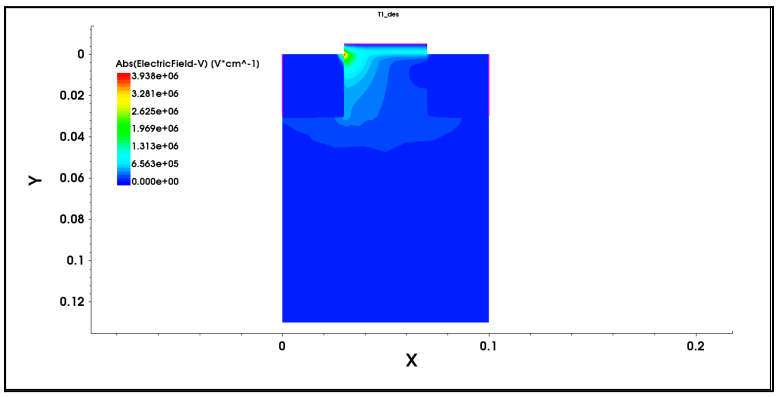
- Select regions of interest on the image—including freeform shapes
- Segment and analyze different areas of the plot
- Map colors to actual values using the provided legend
- View and export statistical summaries and parameter trends

The application runs smoothly across platforms (Windows, macOS, Linux), and its interface is intuitive and modern—modeled after familiar design patterns used in today's most accessible software.

Whether you're conducting research, verifying simulation results, or preparing visual data for analysis, this tool helps you bridge the gap between color and computation, saving time and improving accuracy. In the sections that follow, you'll find step-by-step guidance on using every feature of the application.

🧱 Step 1: Open Simulation Output in Sentaurus Visual

From your Sentaurus Workbench project, open the .tdr file of the simulated device structure using **Sentaurus Visual (svisual)**.

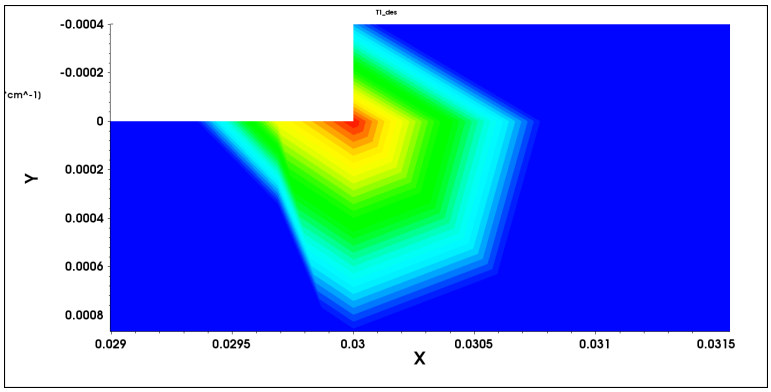


🎯 Step 2: Identify Region of Interest

Visually locate and highlight the region you wish to analyze (refer to the image in the manual, if included).
Roughly estimate the value range of the selected region using the color bar, and adjust the **display range** in Svisual accordingly to enhance contrast and visibility.

🔍 Step 3: Optimize the Display Range

Zoom in on the area of interest.
Try to select a value range within the **same exponential order** (e.g. 1e15 to 5e15) for better accuracy in segmentation.



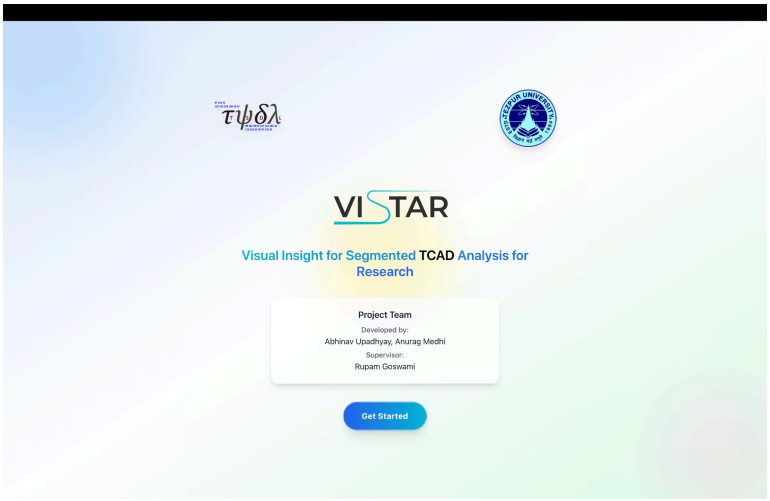
🔔 *Note*: This is a suggestion—not a restriction. The tool can handle any value range.
Record the **minimum and maximum color map values**, as these will be required later.

💾 Step 4: Export the Image

Export the visualization from Svisual in a **high resolution** format (recommended: **1920×1080** or higher).
Ensure that the **entire region of interest and the coordinate axes** are visible in the exported image.

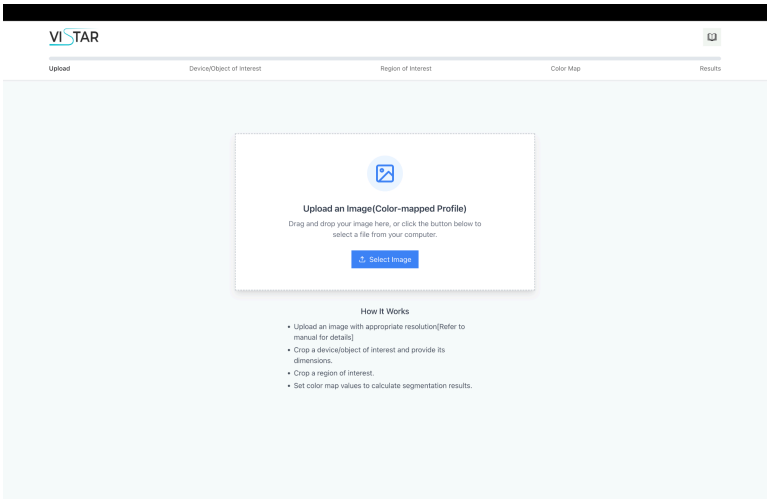
🚀 Step 5: Launch Vistar

Open the **Vistar application** and click **"Get Started"** on the landing page.



🖼️ Step 6: Upload the Exported Image

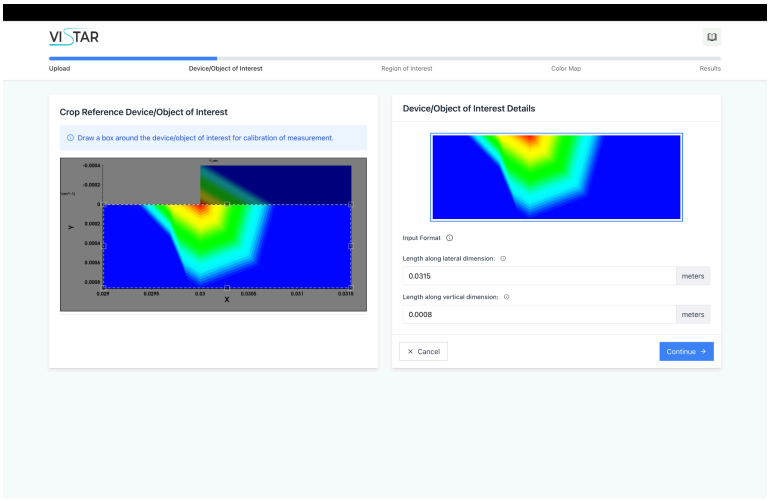
Click **“Select Image”** and navigate to the directory where the image was saved. Choose the exported TCAD device image and open it.



✂️ Step 7: Crop and Define Device Dimensions

On the preview screen:

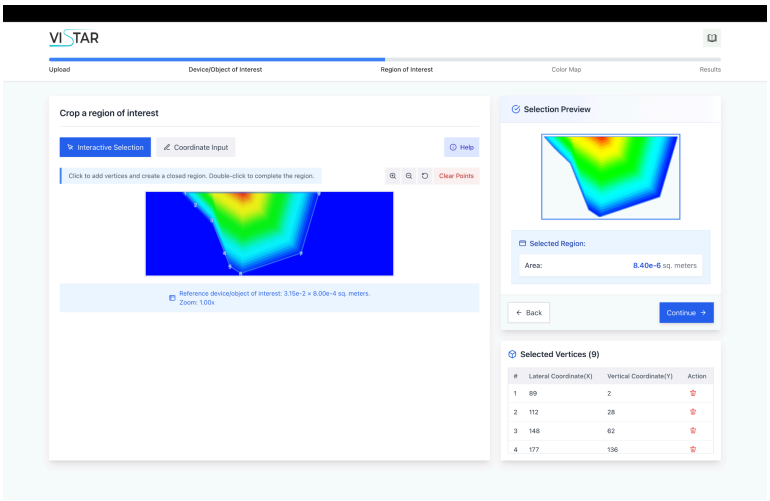
- Use the click-and-drag functionality to **crop** the image around the device, removing extra borders and color legends.
- Enter the **lateral and vertical physical dimensions** of the device area you cropped.
  These can be estimated from the coordinate axes markings visible in the image.



🔲 Step 8: Select Region of Interest (ROI)

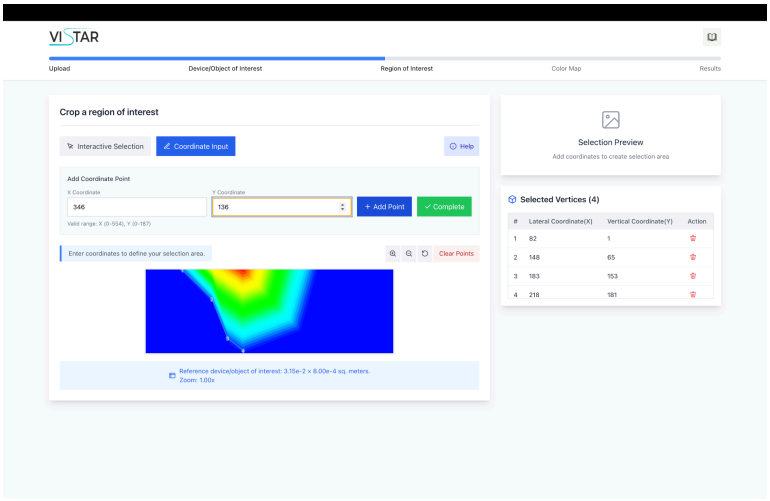
Option A – *Interactive Selection*:

- Click on the cropped image to place vertices around the region you want to analyze.
- To close the selection, double-click on the final vertex.



Option B – *Coordinate Input*:

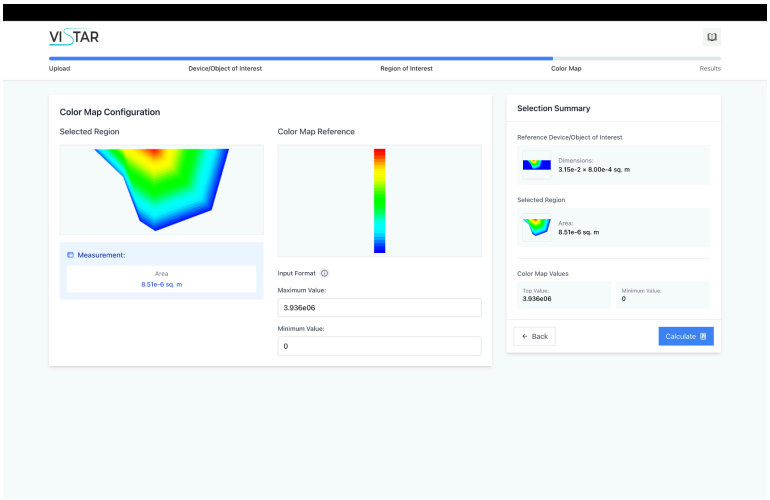
- If you have pre-recorded coordinate values (e.g., from a previous session), you can input them directly for a consistent ROI across multiple plots.



🎨 Step 9: Configure Color Map Values

In the **Color Map Configuration** screen:

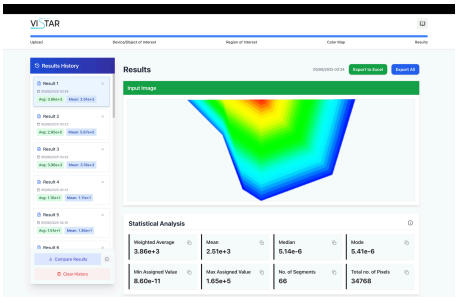
- Enter the **maximum and minimum scalar values** corresponding to the color map, as noted earlier from Svisual.
- Click **"Calculate"** to generate region-specific statistics.

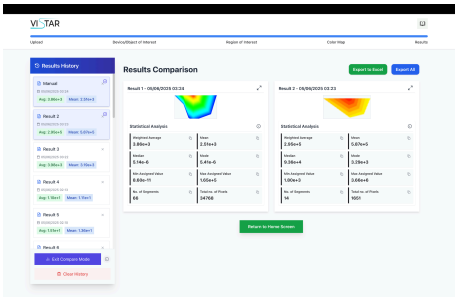


📊 Step 10: View Results

The **Results Section** will now display:

- Region statistics (e.g., mean, min, max values)
- A Color Legend
- Option to **export results** (e.g., as CSV)





✅ Additional Recommendations

- Always export device profiles in **high resolution** for more accurate segmentation.
- Carefully crop the device and avoid including extra regions like legends or labels.
- Ensure clean ROI selection for the most meaningful scalar extraction and visualization.