

A User Guide

Riemannian Curve Evolution Analysis: Image Segmentation Application

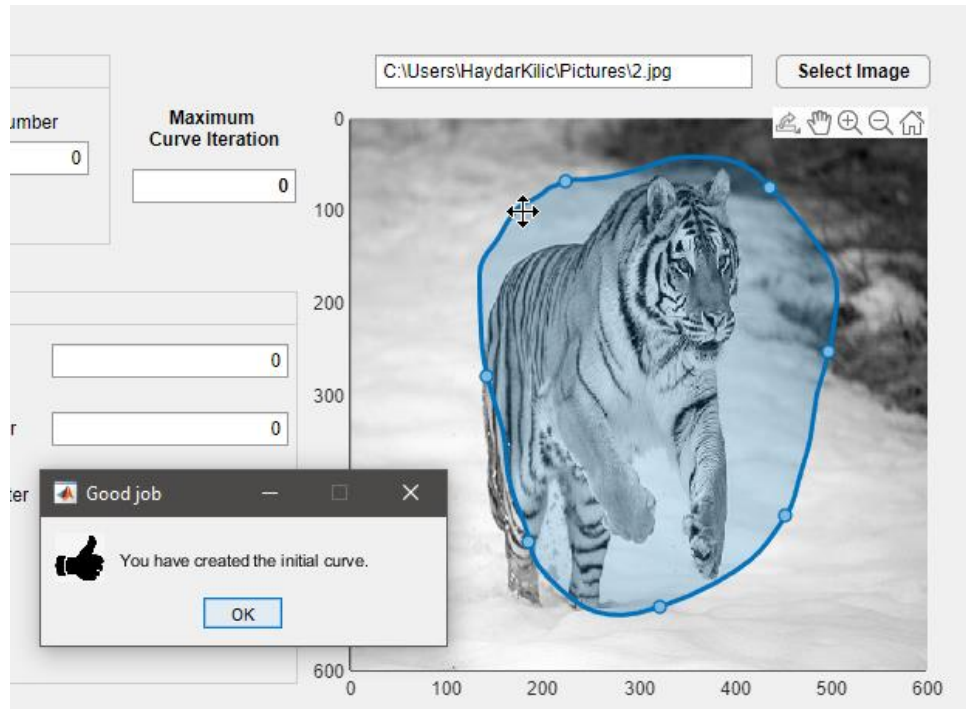
As can be seen in the following figure of the application, sub-panels where calculations will be made with different user inputs are placed in a main panel.

The application interface is divided into several sections:

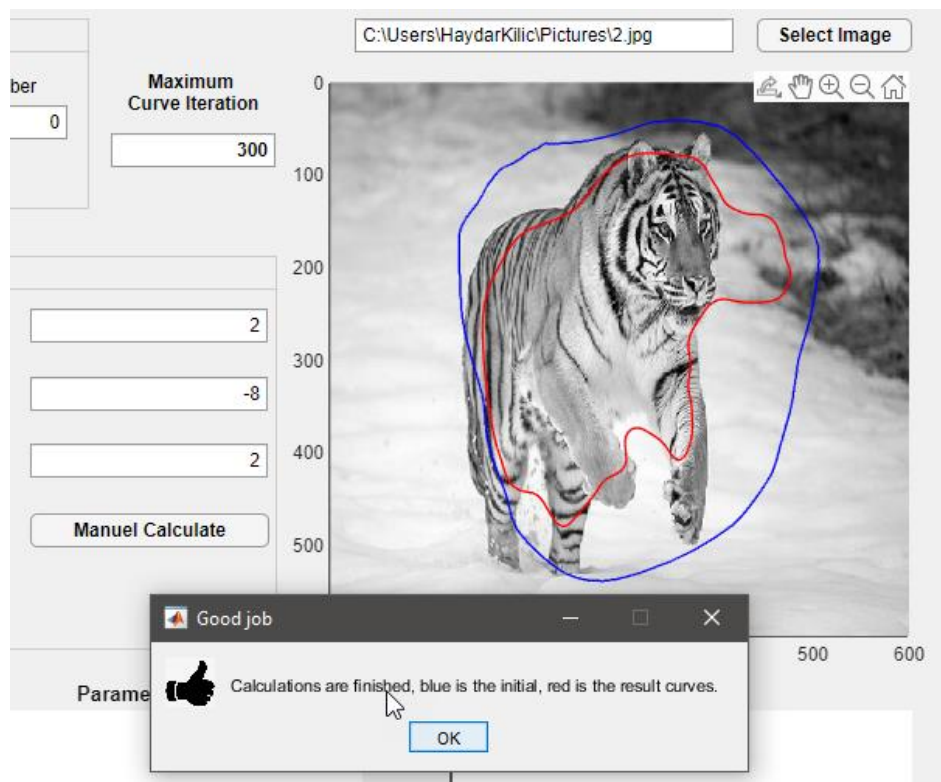
- Calculate by Algorithm:** Contains a dropdown menu for 'Select Algorithm' (currently set to 'ABC'), input fields for 'Maks. Algorithm Iteration' (0) and 'Training Number' (0), and a 'Calculate' button.
- Maximum Curve Iteration:** An input field set to 0.
- Image Path and Selection:** An 'Image Path' text field and a 'Select Image' button.
- Results:** A section with input fields for 'Average Cost' (0), 'Best Cost' (0), 'Worst Cost' (0), 'Standard Deviation' (0), 'Spent Time' (0), 'Edge Parameter' (0), 'Evolution Parameter' (0), and 'Smoothing Parameter' (0). It also includes a 'Manuel Calculate' button.
- Plots:** Four coordinate systems (X vs Y, both ranging from 0 to 1) are provided for visualization:
 - Cost:** A plot for visualizing cost-related data.
 - Parameters:** A plot for visualizing parameter-related data.
 - Spent Time:** A plot for visualizing time-related data.
 - Initial Curve:** A plot titled 'Please draw initial curve!' for drawing the starting curve.

When the user starts the application, he/she will be able to select the image to be processed from anywhere on his computer with the 'Select Picture' button in the upper right corner of the blank main panel. Next to the Select Picture button, the 'Picture Path' field, which is presented to the user, contains the subfolders of the picture in the computer.

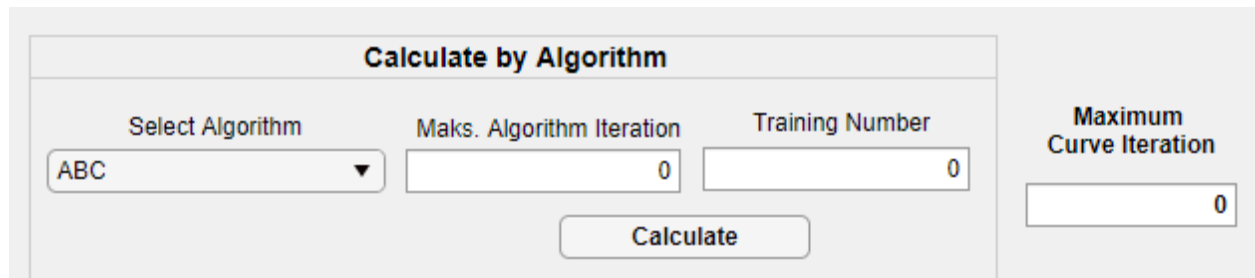
After the user selects the image, he/she will create the initial curve to be evolved. The starting curve will be a closed curve that the user can draw freely with the mouse cursor where the image is placed. An illustration of all of them is shown in the figure below. Another thing that draws attention in this way is the 'Manual Curve Iteration' field, in which the user will enter the information in how many iterations the differential evolution of the initial curve should be generated. This field will be filled in both manual and artificial intelligence algorithms.



After creating the initial curve, two types of calculations can be made. The first of these is manual calculation. Here, when the parameters are entered by the user and the manual calculate button is clicked, the result of the calculations will be shown as blue initial curve and red result curve in the region where the picture is located, as shown in the figure below.



If the application user wants to find parameters with artificial intelligence algorithms, not by manual calculation, he/she will fill in the 'Calculation by Algorithm' panel and the 'Maximum Curve Iteration' field as shown in the figure below.



Calculate by Algorithm

Select Algorithm: ABC

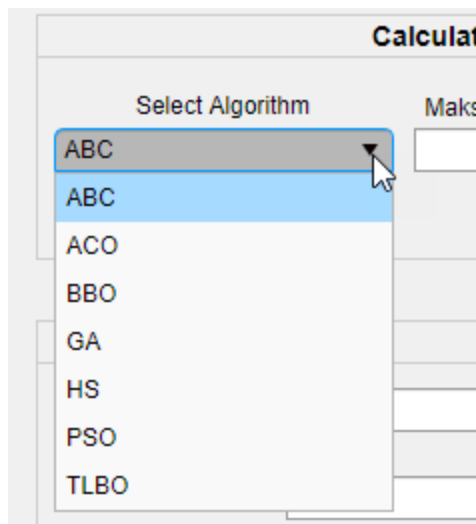
Maks. Algorithm Iteration: 0

Training Number: 0

Calculate

Maximum Curve Iteration: 0

From the 'Select Algorithm' menu on the Calculate by Algorithm panel, it will be sufficient to specify which algorithm you want to calculate with and press the 'Calculate' button.



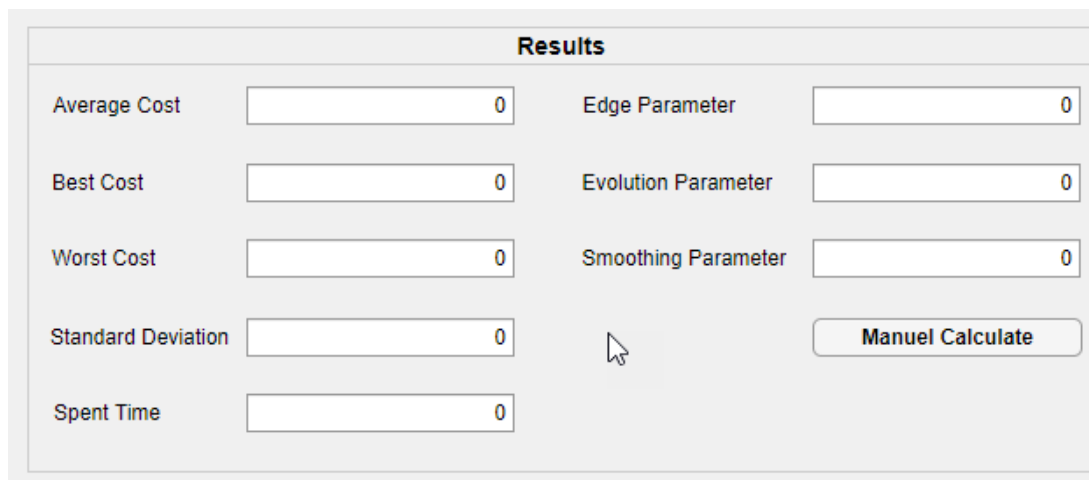
Calculat

Select Algorithm

- ABC
- ABC
- ACO
- BBO
- GA
- HS
- PSO
- TLBO

Maks

After starting the calculation, the 'Results' panel below will be filled automatically with the results found by the artificial intelligence algorithm.



Results

Average Cost: 0

Best Cost: 0

Worst Cost: 0

Standard Deviation: 0

Spent Time: 0

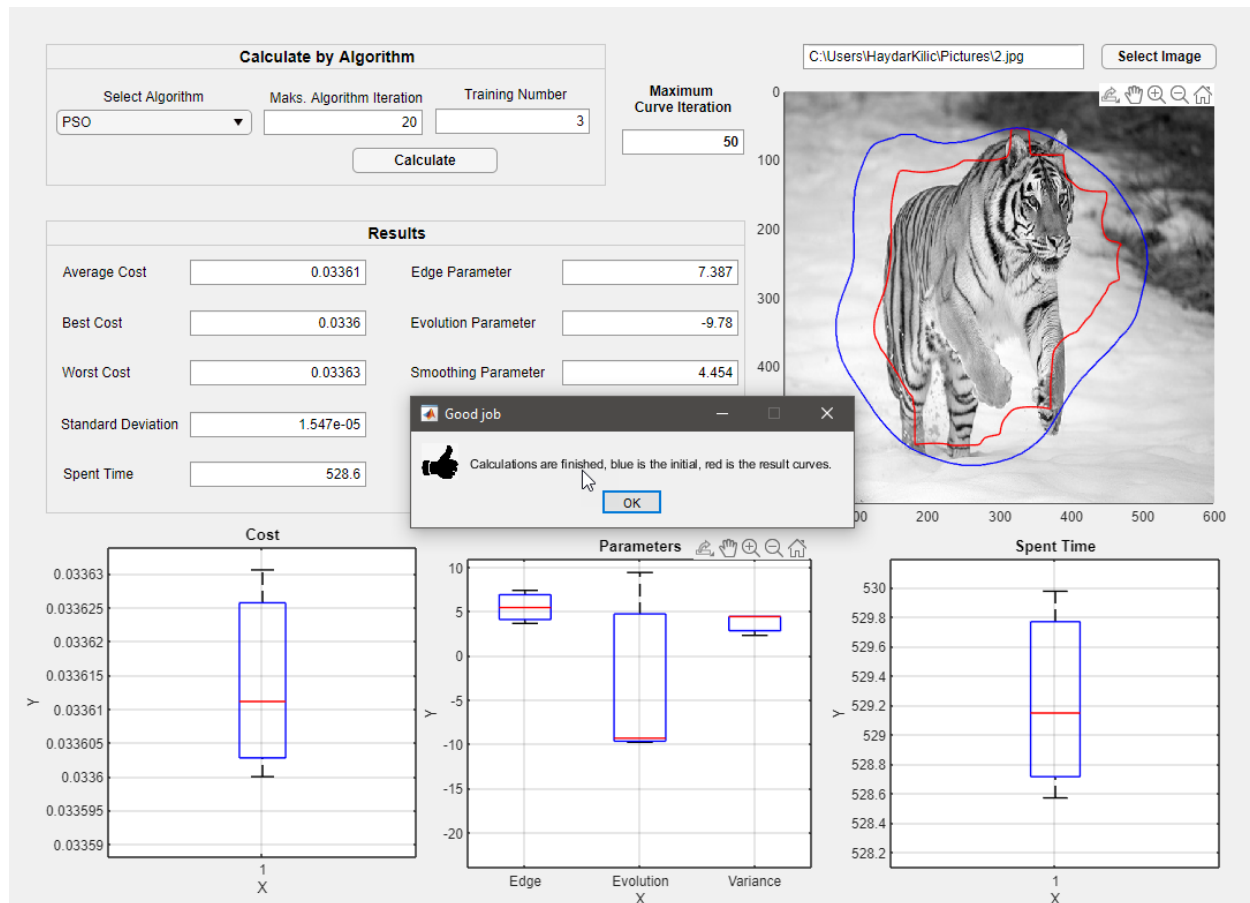
Edge Parameter: 0

Evolution Parameter: 0

Smoothing Parameter: 0

Manuel Calculate

As a result of the calculations made with the artificial intelligence algorithm, the application will notify the user with a warning that the computations are over. This notification is also made when manual computations are finished. As a result of the calculations, in the graphics section at the bottom of the main panel, the statistical results of Cost, Parameters and Spent time will be presented when all cycles or iterations are completed. In addition, the final results of the image will be included in the picture section as seen in the figure below.



Thank you for your interest.

Haydar Kilic