# Image Segmentation with PSO


**Submitted By**

**Ch. Venkatarami Reddy**

**P.Geet Nitin**

**Y.S.S.Siddharth**

**Under Guidance of**

**Dr. Boopesh Singh**

# Topics to be Covered

- Overview of the Project
- PSO Algorithm for Image Segmentation
- Demo of the web application
- Conclusion and Future Work

# Overview

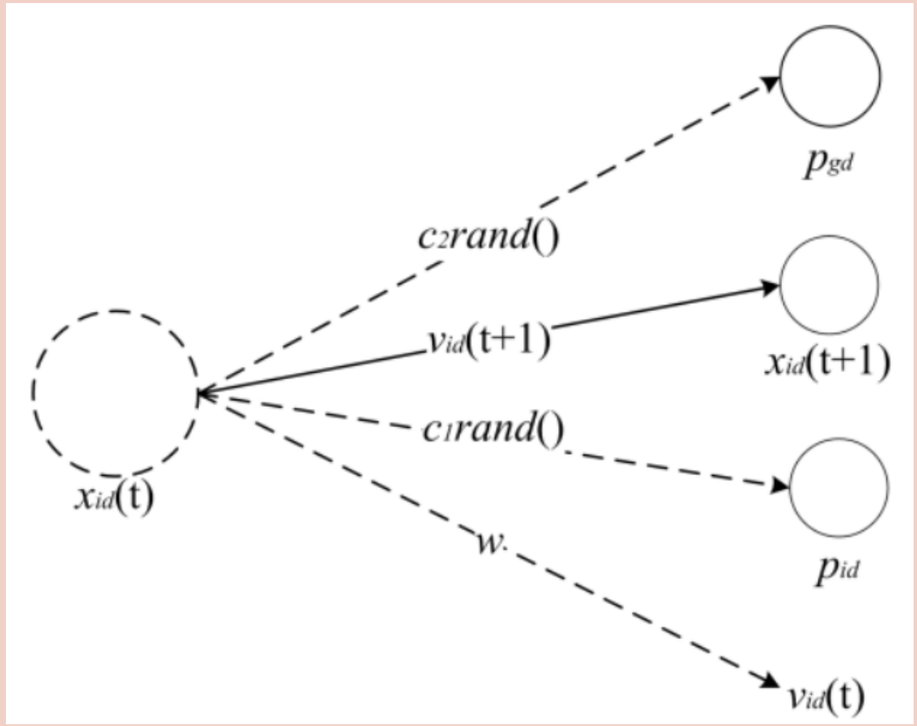
The main aim of the project is to develop a PSO-based image segmentation algorithm and evaluate its performance on different types of images

Particle Swarm Optimization (PSO) is a meta-heuristic optimization algorithm.PSO is a population-based optimization algorithm that searches for the optimal solution in a multidimensional search space by iteratively updating the positions and velocities of a group of particles.

In the web application we will be able to upload the image,then choose the segmentation mode,and choose number of centroids.Then we will be able to segment the image using PSO

# PSO for Image Segmentation

In digital image processing and computer vision, image segmentation is the process of partitioning a digital image into multiple image segments, also known as image regions or image objects.
For more effective results we apply the particle swarm optimization algorithm.
PSO is a stochastic optimization technique.




**Position Vector**

$$\mathbf{x_{id}}(t+1) = x_{id}(t) + v_{id}(t+1)$$

**Inertia (Optimization)**

$$\omega = w_{max} - iter\frac{w_{max} - w_{min}}{iter_{max}} + \sigma \times N(0,1)$$

**Velocity Vector**

$$\mathbf{v_{id}}_{t+1} = w\mathbf{v_{id}}(t) + c_1 rand()(\mathbf{p_{id}}_i - \mathbf{x_{id}}(t)) + c_2 rand()(\mathbf{v_{gd}}_g - \mathbf{x_{gd}}(t))$$

# Testing

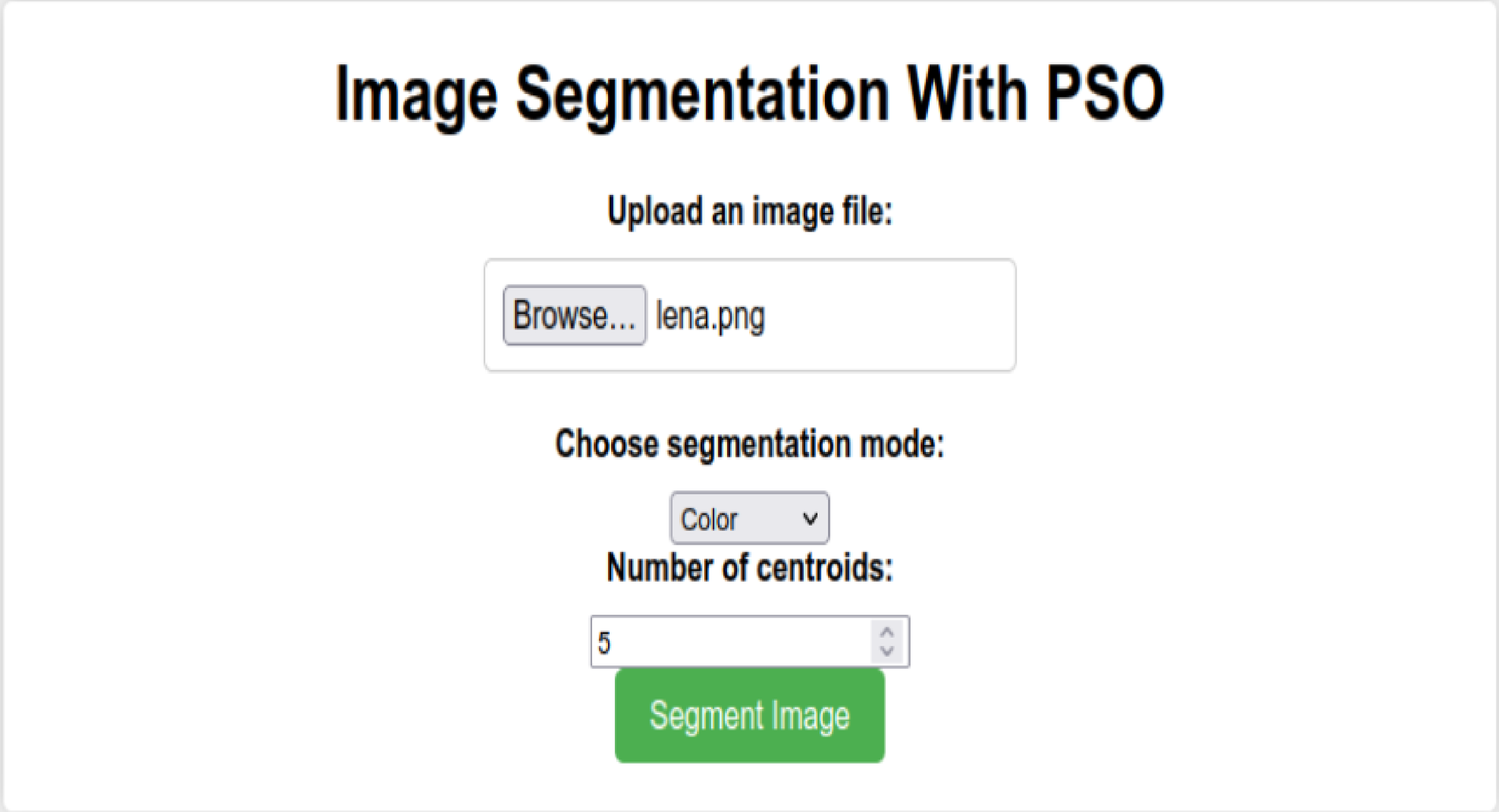


Image Segmentation With PSO
Upload an image file:
Browse...
lena.png
Choose segmentation mode:
Color
Number of centroids:
5
Segment Image

# Results for Colored Image

## Image Segmentation Result

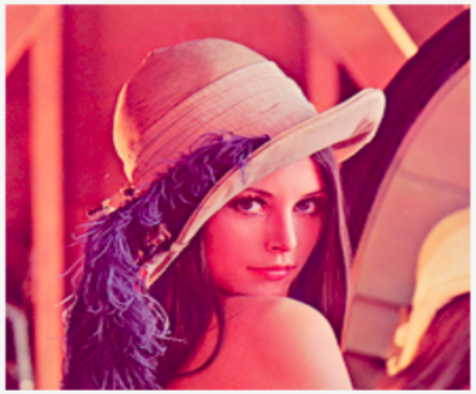
Original Image

Segmented Image

# Results for Grayscale Image

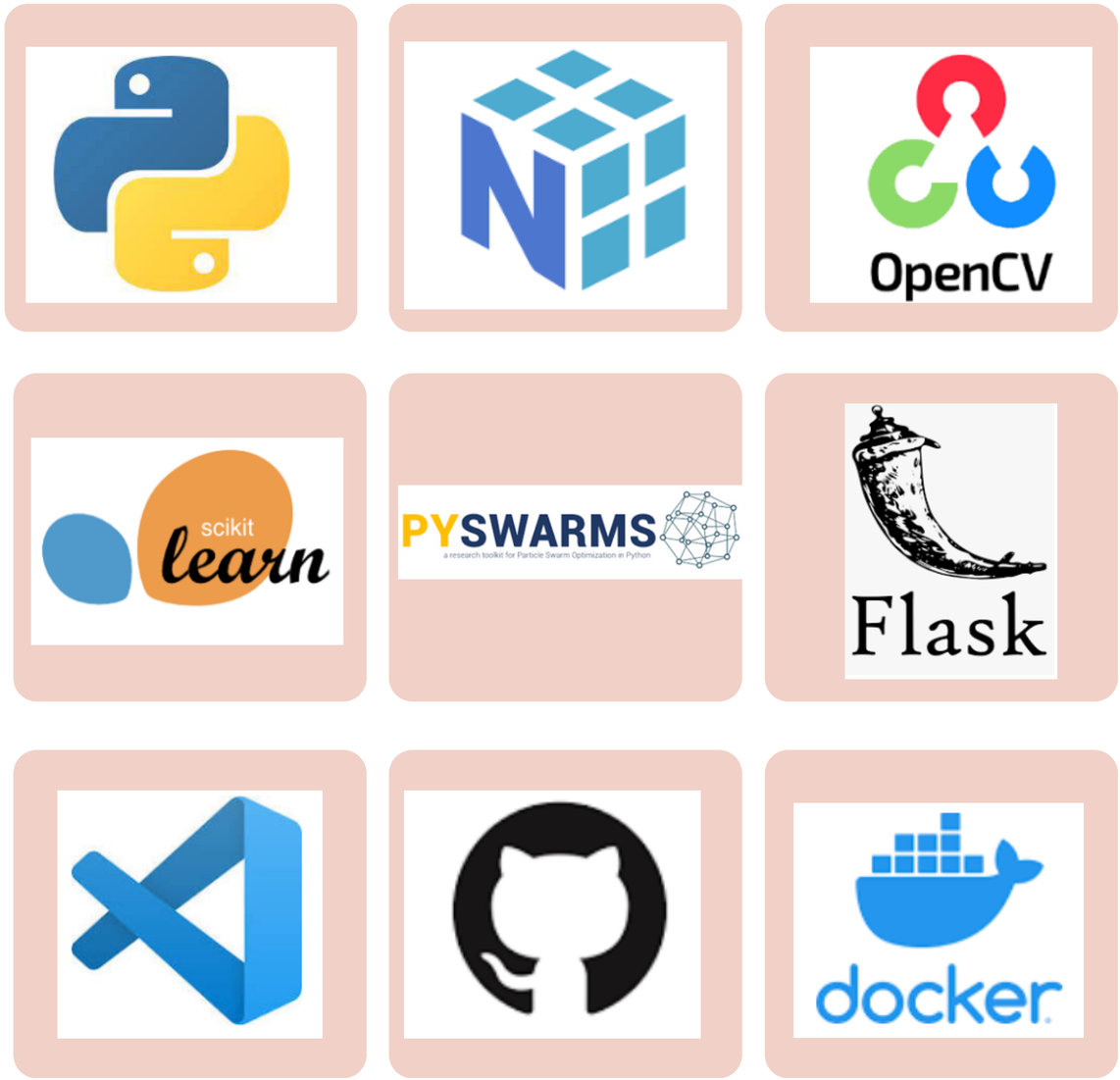
## Image Segmentation Result

Original Image



Segmented Image

# Packages & Development Tools



# Future Goals

- In the future, there are several directions in which this project can be expanded and improved.
- First, we could explore different optimization algorithms besides PSO, such as genetic algorithms or simulated annealing, to further improve the performance of the clustering algorithm.
- Second, we could implement additional segmentation techniques, such as graph-based segmentation or region growing, to provide users with a wider range of segmentation options.
- Third, we could integrate the application with cloud services such as AWS or Azure to improve scalability and reliability. Fourth, we could investigate the use of
- deep learning models, such as convolutional neural networks (CNN's), for image segmentation, which have shown promising results in recent years.

# Limitations

- The segmentation depends on the placements of the initial centroids, if there are not placed well-enough then it creates chaos while doing the segmentation
- This algorithm can't be used for large datasets because of the complexity of this algorithm as it takes more time to computate.
- The algorithm requires the information of clusters prior to the process, so if we don't have the information of the clusters, we need to apply advanced clustering techniques and find out the information related to clusters.

# Thank You!

Do you have any questions for me before we go?

Docker: **docker pull chagantireddy/ispso:latest**