Task 1. Iris dataset

For this task I used initial temperature T = 2000 and maximum number iteration is equal to 300. The following annealing rates were compared 0.999, 0.99, 0.9, 0.8, 0.5 on train and test datasets. The results of performance are shown below :

Annealing rate	0.999	0.99	0.9	0.8	0.5
Train accuracy	0.658	0.6666	0.675	0.566	0.333
Test accuracy	0.700	0.6333	0.633	0.6	0.333

For backpropagation I used 300 epochs. The results obtained by backpropagation:

	Backpropagation
Train accuracy	0.958
Test accuracy	0.966

Time comparison.

This comparison can be unfair since Keras library use multithreading, but anyway I have done it. Results are shown below:

	Average time
Backpropagation	4.12 s
Simulated annealing	45.6 s

Findings.

Backpropagation vs Simulated Annealing
As we can see Backpropagation is better in terms of speed and performance. It shows much better accuracy than simulated annealing optimisation 0.95 compare to 0.7. Also it more than 10 times faster.

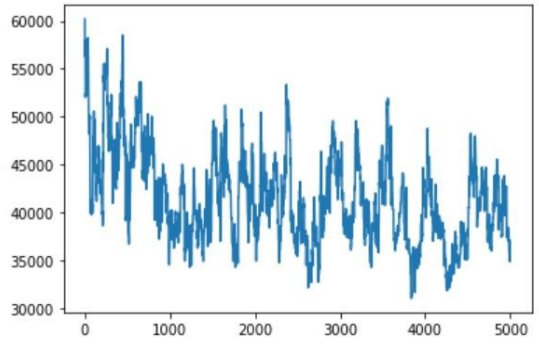
Annealing rate

As we can see with annealing rate decreasing
As we can see with the annealing rate decreasing the accuracy of the model decreases. I guess it because of the model with low annealing rate early converges to local optima.

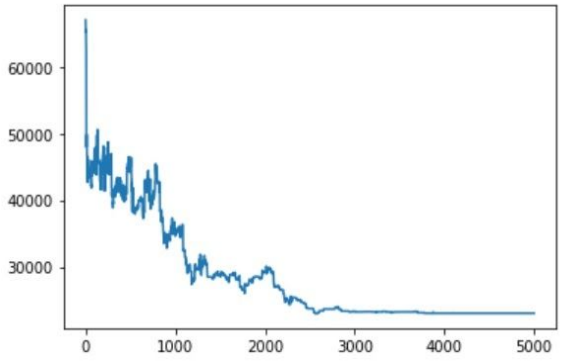
Task 2. Iris dataset

For this task I used initial temperature T = 2000 and maximum number iteration is equal to 5000. The following annealing rates were compared 0.999,0,.9999 0.995, 0.9. The converges speed of different rates are shown below:

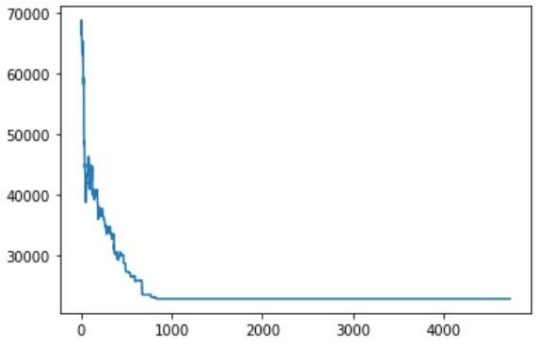
Annealing rate =0.9999



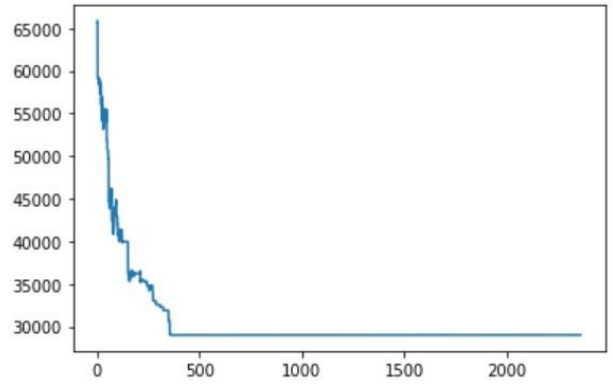
Annealing rate =0.999



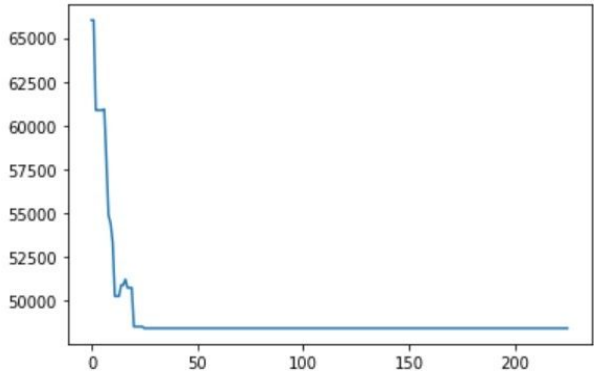
Annealing rate = 0.995



Annealing rate = 0.990



Annealing rate = 0.900



Findings:
With annealing rate decreasing it find a less optimal solution but converges faster.

Visualisation

Visualization of the optimization process (with the country outline) can be found here:
https://github.com/arsee2/simulated_annealing/tree/master/visualisation

Github

The following repository contains code and visualization for the both tasks:
https://github.com/arsee2/simulated_annealing