5. Algorithm Discussion

Once you have completed the implementation of the 3 learning algorithms, you should qualitatively verify your implementations. In **main.py** we have included a block of code that you should uncomment. This code loads a 2D dataset from **toy_data.txt**, and trains your models using $T = 10, \lambda = 0.2$. **main.py** will compute θ and θ_0 for each of the learning algorithms that you have written. Then, it will call **plot_toy_data** to plot the resulting model and boundary.

Plots

6.0/6 points (graded)
In order to verify your plots, please enter the values of θ and θ_0 for all three algorithms.

(For example, if $\theta = (1, 0.5)$, then type **1, 0.5** without the brackets. Make sure your answers are correct up to 4 decimal places.)

For the **perceptron** algorithm:

θ = 3.9174, 4.164 ✔

Answer: 3.9173999999999918, 4.164000000000001 θ_0 =

-8.0 ✔ **Answer:** -8.0

For the **average perceptron** algorithm:

θ = 3.4783, 3.6111 ✔

Answer: 3.47826049999999, 3.611060999999974 θ_0 =

-6.373 ✔ **Answer:** -6.373

For the **Pegasos** algorithm:

θ = 0.7346, 0.63 ✔

Answer: 0.7346463119064065, 0.6300224592973831 θ_0 =

-1.2195 ✔ **Answer:** -1.2195071848898564

Submit You have used 4 of 20 attempts

Answers are displayed within the problem

Convergence

0/1 point (graded)

Since you have implemented three different learning algorithm for linear classifier, it is interesting to investigate which algorithm would actually converge. Please run it with a larger number of iterations T to see whether the algorithm would visually converge. You may also check whether the parameter in your theta converge in the first decimal place. Achieving convergence in longer decimal requires longer iterations, but the conclusion should be the same.

Which of the following algorithm will converge on this dataset? (Choose all that apply.)

- [ ] perceptron algorithm
- [x] average perceptron algorithm ✔
- [ ] pegasos algorithm ✔

✖

Solution:

- Perceptron algorithm will not converge if the data is not linear separable.
- Average perceptron algorithm is stable due to averaging repeated solutions of perceptron outputs.
- Pegasos algorithm can find the optimal decision boundary for hinge loss.

Submit You have used 3 of 3 attempts

ℹ Answers are displayed within the problem

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?	Convergence - check whether the parameter in your theta converge in the first	

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