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1 Question 1

1.3

Time (in seconds) to complete standard training: 1381.1138.
Time (in seconds) to complete free adversarial training: 386.9370.

1.4

Model/Task	Accuracy	PGD Success rate
Standard	0.9168	0.9025
Adv.-trained	0.8225	0.3695

Adversarial training significantly decreases the PGD succees rate, i.e increases robustness with the price of a some (around 10%) decrease in accuracy.

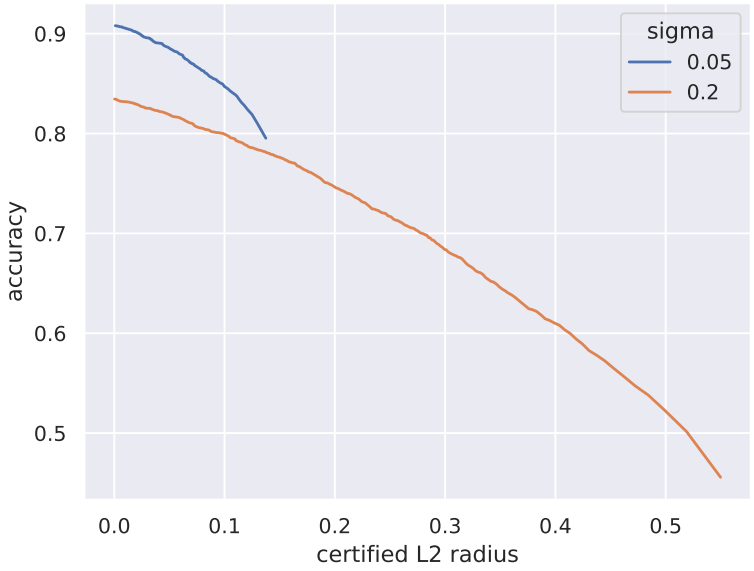
1.5

m/metric	Time	Accuracy	PGD Success rate
4	383.8422	0.8077	0.3808
5	323.3860	0.7900	0.3828
6	276.1508	0.7713	0.3963
7	258.2459	0.7460	0.4073

It seems that both the benign accuracy, robustness and training time decrease as m increases.

2 Question 2

2.2



Let us recall the equation that we've seen in class:

$$R = \sigma \Phi^{-1}(p_c)$$

where R is the radius, σ is the standard deviation of the Gaussian noise, Φ^{-1} is the inverse of the CDF of the Gaussian distribution and p_c is the confidence level of class c.
Note that there are two competing factors here: sigma multiplies the value of R, hence as σ grows larger R grows larger. On the other hand, as σ grows larger, the Gaussian distribution becomes more spread out, this means that the probability of two predictions having the same maximum class decreases, hence p_c decreases, which in turn decreases $\Phi^{-1}(p_c)$.
It seems that in the range of σ that we've tested, the the lower value of σ, i.e $\sigma = 0.05$ has higher accuracy for a given radius, i.e a larger number of samples with radii bigger then the radius. This means that the second factor we described dominates.

3 Question 3

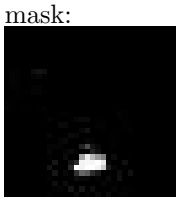
3.2

Model 1 is backdoored, the backdoor forces it to output class 0.

3.3

3.3.1

mask:



trigger:

3.3.2

Yes. The accuracy of Model 1 is only very slightly lower than that of Model 2 (0.9107 vs 0.9168).

3.3.3

Very successful, its success rate is 0.9980.