

Homework 3: Stochastic Gradient Descent

TODO: Add author(s)

1 Introduction

TODO: Describe the overall goals of this report

TODO: Outline your algorithm for stochastic gradient descent

2 Experiments

TODO: Describe the experiments that you ran, including the combinations of parameters that you tried; please also describe how you generated your training and test datasets

3 Analysis of ρ -Lipschitz properties

TODO: Answer the question about ρ -Lipschitz properties for each scenario

TODO: If you use non-constant learning rates, describe how you selected them (for each scenario)

4 Results

TODO: Fill in the following table of results. (Note: here, n is the training set size, and N is the test set size. Excess risk should be calculated as “mean – min”.)

Scenario	σ	n	N	# trials	Logistic loss			Excess Risk	Classification error	
					Mean	Std Dev	Min		Mean	Std Dev
1	0.05	50	400	30	TODO	TODO	TODO	TODO	TODO	
1	0.05	100	400	30	TODO	TODO	TODO	TODO	TODO	
1	0.05	500	400	30	TODO	TODO	TODO	TODO	TODO	
1	0.05	1000	400	30	TODO	TODO	TODO	TODO	TODO	
1	0.3	50	400	30	TODO	TODO	TODO	TODO	TODO	
1	0.3	100	400	30	TODO	TODO	TODO	TODO	TODO	
1	0.3	500	400	30	TODO	TODO	TODO	TODO	TODO	
1	0.3	1000	400	30	TODO	TODO	TODO	TODO	TODO	
2	0.05	50	400	30	TODO	TODO	TODO	TODO	TODO	
2	0.05	100	400	30	TODO	TODO	TODO	TODO	TODO	
2	0.05	500	400	30	TODO	TODO	TODO	TODO	TODO	
2	0.05	1000	400	30	TODO	TODO	TODO	TODO	TODO	
2	0.3	50	400	30	TODO	TODO	TODO	TODO	TODO	
2	0.3	100	400	30	TODO	TODO	TODO	TODO	TODO	
2	0.3	500	400	30	TODO	TODO	TODO	TODO	TODO	
2	0.3	1000	400	30	TODO	TODO	TODO	TODO	TODO	

TODO: Include figures of results

5 Conclusion

TODO: Comment on your results. Explain whether or not they agree with the theoretical results we derived in class. Compare your results in Scenarios 1 and 2. Is there any difference? If so, can you justify it? For each scenario, compare between your results for each setting of σ (the standard deviation of the Gaussian distribution). Do you spot any difference? If so, can you justify it?

A Appendix: Symbol Listing

TODO: Provide a listing of the symbols used in your analysis, along with a brief description of their meaning. If your code uses a different variable name corresponding to a particular symbol, mention it here (for example, your analysis might use N to refer to the test-set size, while your code uses `testSetSize`.)

B Appendix: Library Routines

TODO: If you used any packages or built-in libraries in your code (for example, to perform linear algebra operations), please briefly describe the functions/subroutines you used here. This is merely to help us understand your code, so you only need to describe library routines which are not trivial and whose functionality is not obvious from the name.

C Appendix: Code

TODO: Include your code below. Please make sure your code is sufficiently well-documented for us to understand what it is doing.

```
#### Insert your code here ####
```