Divya Sharma (ds655)
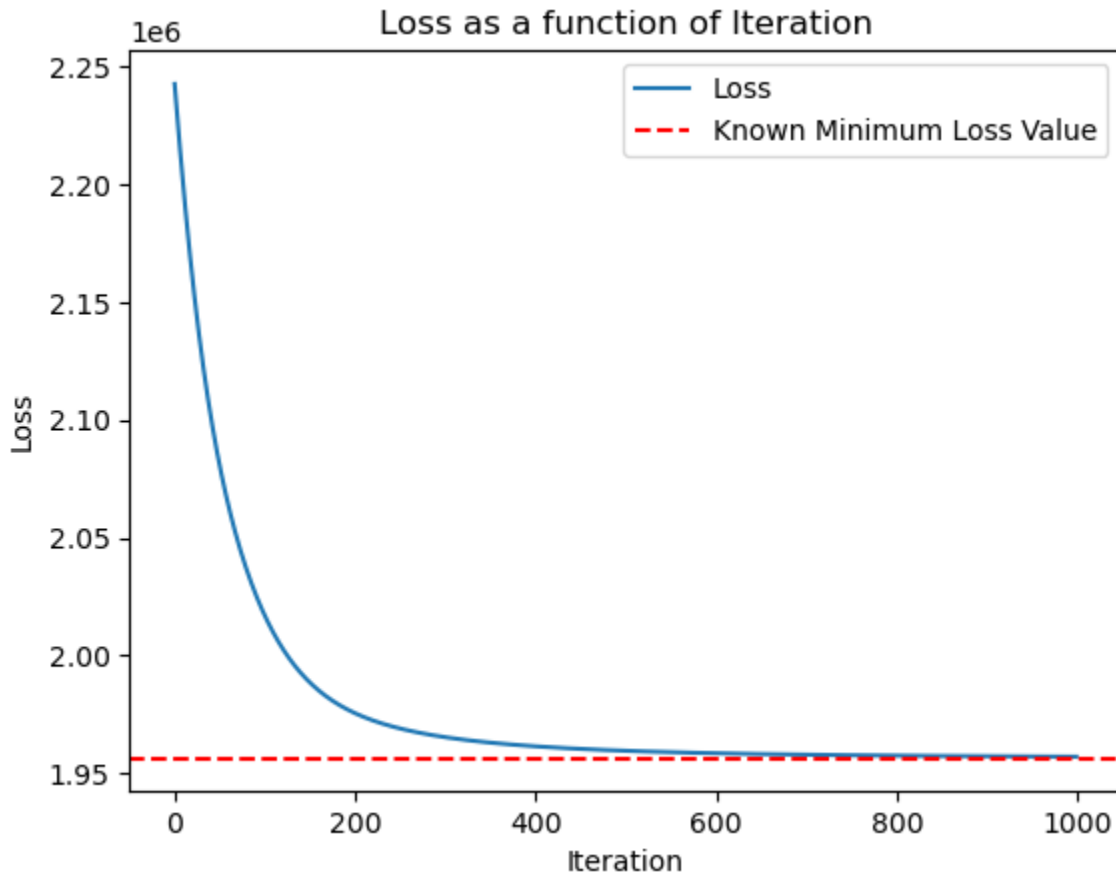
Gradient Descent

#Iterations for Gradient Descent - num_iterations = 1000
Step size - learning_rate = 0.01

Chart 1: The loss as a function of time/iteration
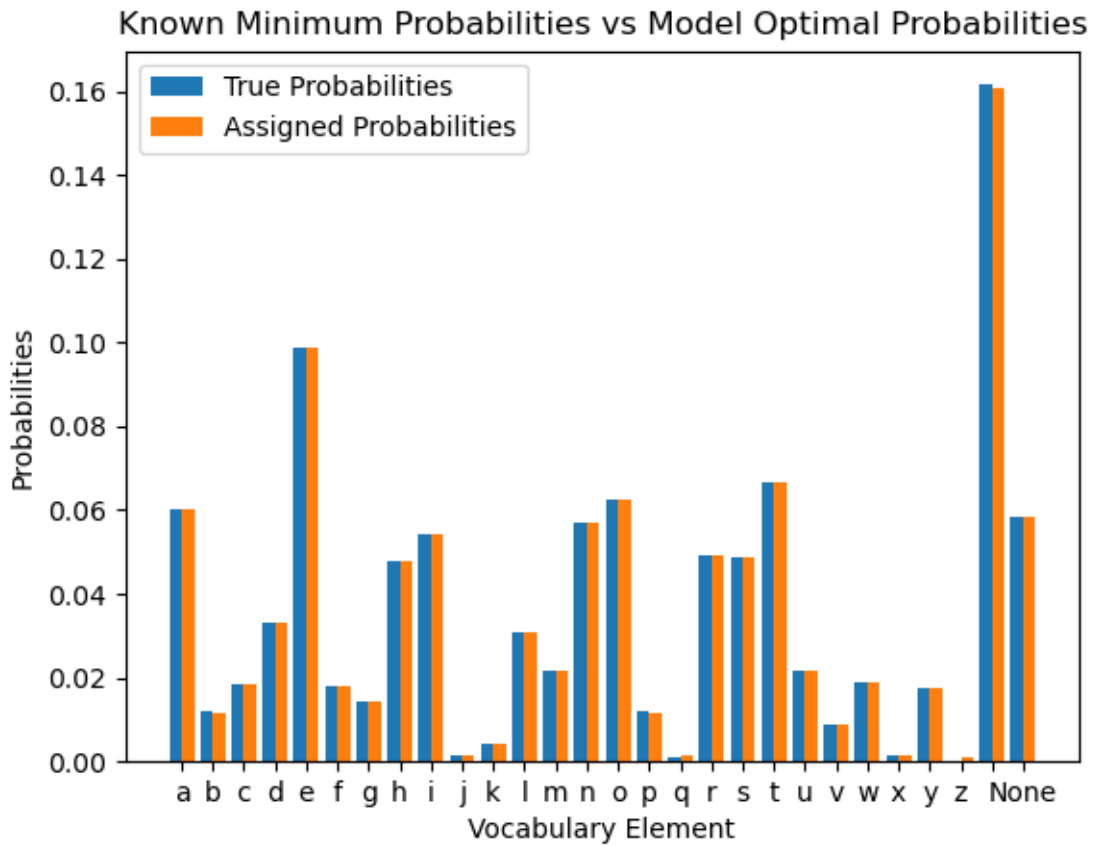

Known Minimum Loss Value: 1956525.8508438326

Known Probabilities:
[0.0600961 0.01179456 0.01848825 0.03316831 0.09897002 0.01816731
 0.0141927 0.047939   0.05426866 0.00140857 0.00413062 0.03064982
 0.02171846 0.05712146 0.06242738 0.01180645 0.00089744 0.04939809
 0.0486938 0.06685517 0.02186704 0.00869065 0.01880325 0.0012481
 0.01735159 0.00010252 0.16153558 0.05820909]

Gradient Descent Output Probabilities:
[0.060044   0.011733   0.01845325 0.03316603 0.09872618 0.01813125
 0.01414192 0.04792133 0.05423482 0.00169563 0.00401792 0.03064405
 0.02169324 0.05707906 0.06236716 0.01174495 0.0013843 0.04937708
 0.04867443 0.06677827 0.02184223 0.00861092 0.01876927 0.00159273
 0.01731275 0.00099377 0.16070712 0.05816324]

Chart 2: Comparison of True vs Gradient Descent Assigned Probabilities

Known Minimum Probabilities vs Model Optimal Probabilities

Chart 3: Scatterplot Comparison of True vs Gradient Descent Assigned Probabilities
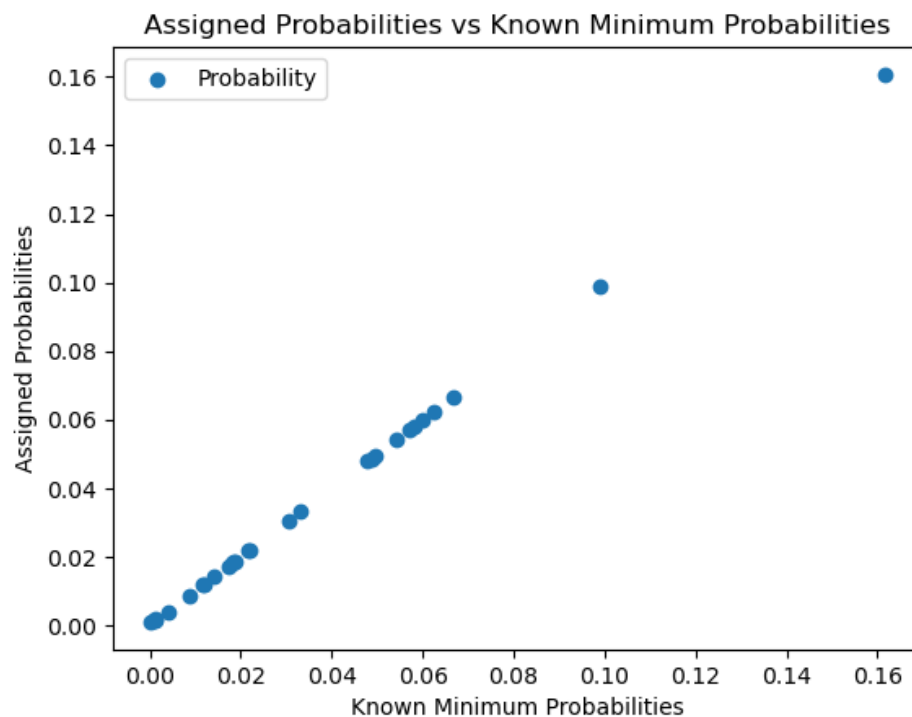

Assigned Probabilities vs Known Minimum Probabilities

Table 1: Comparison of Actual and Assigned Probabilities

Character	Actual Probabilities	Assigned Probabilities	Difference
a	0.060096104	0.060044002	0.0000521
b	0.011794562	0.011732998	0.0000616
c	0.018488251	0.018453252	0.0000350
d	0.033168307	0.033166032	0.0000023
e	0.098970019	0.098726183	0.0002438
f	0.018167311	0.018131249	0.0000361
g	0.014192701	0.014141921	0.0000508
h	0.047938998	0.047921326	0.0000177
i	0.054268657	0.054234821	0.0000338
j	0.001408572	0.001695634	-0.0002871
k	0.004130623	0.004017924	0.0001127
l	0.030649815	0.03064405	0.0000058
m	0.021718458	0.021693239	0.0000252
n	0.057121461	0.057079062	0.0000424
o	0.06242738	0.062367156	0.0000602
p	0.011806449	0.011744945	0.0000615
q	0.000897445	0.0013843	-0.0004869
r	0.049398088	0.04937708	0.0000210
s	0.048693802	0.048674431	0.0000194
t	0.06685517	0.066778272	0.0000769
u	0.021867041	0.021842234	0.0000248
v	0.008690652	0.008610919	0.0000797
w	0.018803249	0.01876927	0.0000340
x	0.001248102	0.001592731	-0.0003446
y	0.017351587	0.017312754	0.0000388
z	0.000102523	0.000993769	-0.0008912
<space>	0.161535581	0.160707116	0.0008285
None	0.058209093	0.058163244	0.0000458