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Last login: Mon Jun  5 17:29:52 on ttys000
Love-In-The-Air:~ E$ cd Desktop/hw4_starter_files
Love-In-The-Air:hw4_starter_files E$ python3 hw4pr2b.py
==>Loading data...
==>Data loaded succesfully.
```

```
==> Step 1: Finding optimal regularization parameter...
```

```
==> Running gradient descent...
```

```
-- Iteration 100 - negative log likelihood  20132.7688
-- Iteration 200 - negative log likelihood  18420.1137
-- Iteration 300 - negative log likelihood  17618.8274
-- Iteration 400 - negative log likelihood  17125.3589
-- Iteration 500 - negative log likelihood  16779.5179
-- Time elapsed for running gradient descent: 143.23 seconds
-- Accuracy is 0.9221 for lambda = 0.01
```

```
==> Running gradient descent...
```

```
-- Iteration 100 - negative log likelihood  20138.7176
-- Iteration 200 - negative log likelihood  18428.3600
-- Iteration 300 - negative log likelihood  17628.8833
-- Iteration 400 - negative log likelihood  17136.9449
-- Iteration 500 - negative log likelihood  16792.4560
-- Time elapsed for running gradient descent: 140.24 seconds
-- Accuracy is 0.9221 for lambda = 0.10
```

```
==> Running gradient descent...
```

```
-- Iteration 100 - negative log likelihood  20165.1426
-- Iteration 200 - negative log likelihood  18464.9626
-- Iteration 300 - negative log likelihood  17673.4935
-- Iteration 400 - negative log likelihood  17188.3147
-- Iteration 500 - negative log likelihood  16849.7900
-- Time elapsed for running gradient descent: 141.13 seconds
-- Accuracy is 0.9221 for lambda = 0.50
```

```
==> Running gradient descent...
```

```
-- Iteration 100 - negative log likelihood  20198.1415
-- Iteration 200 - negative log likelihood  18510.6073
-- Iteration 300 - negative log likelihood  17729.0666
-- Iteration 400 - negative log likelihood  17252.2446
-- Iteration 500 - negative log likelihood  16921.0723
-- Time elapsed for running gradient descent: 143.85 seconds
-- Accuracy is 0.9220 for lambda = 1.00
```

```
==> Running gradient descent...
```

```
-- Iteration 100 - negative log likelihood    20787.0261
-- Iteration 200 - negative log likelihood    19312.1599
-- Iteration 300 - negative log likelihood    18694.7752
-- Iteration 400 - negative log likelihood    18352.0125
-- Iteration 500 - negative log likelihood    18135.4029
-- Time elapsed for running gradient descent: 143.51 seconds
-- Accuracy is 0.9221 for lambda = 10.00
```

==> Running gradient descent...

```
-- Iteration 100 - negative log likelihood    23455.9916
-- Iteration 200 - negative log likelihood    22473.2174
-- Iteration 300 - negative log likelihood    22329.8237
-- Iteration 400 - negative log likelihood    22319.9960
-- Iteration 500 - negative log likelihood    22349.5392
-- Time elapsed for running gradient descent: 146.75 seconds
-- Accuracy is 0.9204 for lambda = 50.00
```

==> Running gradient descent...

```
-- Iteration 100 - negative log likelihood    26397.3848
-- Iteration 200 - negative log likelihood    25797.0749
-- Iteration 300 - negative log likelihood    25821.9679
-- Iteration 400 - negative log likelihood    25928.0833
-- Iteration 500 - negative log likelihood    26012.9721
-- Time elapsed for running gradient descent: 141.46 seconds
-- Accuracy is 0.9191 for lambda = 100.00
```

==> Running gradient descent...

```
-- Iteration 100 - negative log likelihood    32659.8978
-- Iteration 200 - negative log likelihood    32450.8015
-- Iteration 300 - negative log likelihood    32404.8881
-- Iteration 400 - negative log likelihood    32470.8874
-- Iteration 500 - negative log likelihood    32557.1261
-- Time elapsed for running gradient descent: 139.22 seconds
-- Accuracy is 0.9071 for lambda = 200.00
```

==> Running gradient descent...

```
-- Iteration 100 - negative log likelihood    49153.4014
-- Iteration 200 - negative log likelihood    49280.3399
-- Iteration 300 - negative log likelihood    49314.9468
-- Iteration 400 - negative log likelihood    49324.8655
-- Iteration 500 - negative log likelihood    49327.9820
-- Time elapsed for running gradient descent: 139.49 seconds
-- Accuracy is 0.8575 for lambda = 500.00
```

==> Running gradient descent...

```
-- Iteration 100 - negative log likelihood    69147.4186
```

```
-- Iteration 200 - negative log likelihood 68179.9928
-- Iteration 300 - negative log likelihood 69869.0004
-- Iteration 400 - negative log likelihood 67956.2604
-- Iteration 500 - negative log likelihood 69502.8560
-- Time elapsed for running gradient descent: 139.65 seconds
-- Accuracy is 0.8021 for lambda = 1000.00
==> Printing accuracy vs lambda...
==> Plotting completed.
```

```
-- Optimal regularization parameter is 0.01
```

```
==> Running gradient descent...
-- Iteration 100 - negative log likelihood 20132.7688
-- Iteration 200 - negative log likelihood 18420.1137
-- Iteration 300 - negative log likelihood 17618.8274
-- Iteration 400 - negative log likelihood 17125.3589
-- Iteration 500 - negative log likelihood 16779.5179
-- Iteration 600 - negative log likelihood 16518.1123
-- Iteration 700 - negative log likelihood 16310.5114
-- Iteration 800 - negative log likelihood 16139.7897
-- Iteration 900 - negative log likelihood 15995.7067
-- Iteration 1000 - negative log likelihood 15871.6418
-- Iteration 1100 - negative log likelihood 15763.0929
-- Iteration 1200 - negative log likelihood 15666.8749
-- Iteration 1300 - negative log likelihood 15580.6604
-- Iteration 1400 - negative log likelihood 15502.7035
-- Iteration 1500 - negative log likelihood 15431.6646
-- Time elapsed for running gradient descent: 424.07 seconds
```

```
==> Step 2: Plotting convergence plot...
```

```
==> Plotting completed.
```

```
Love-In-The-Air:hw4_starter_files E$
```