Problem 2

a. See Python code attached.

b.

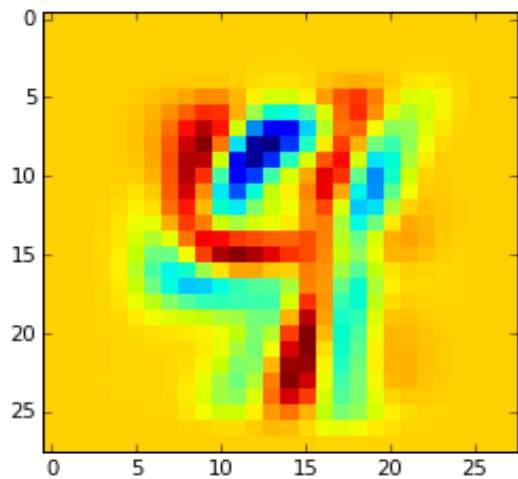Likelihood distribution of y and w
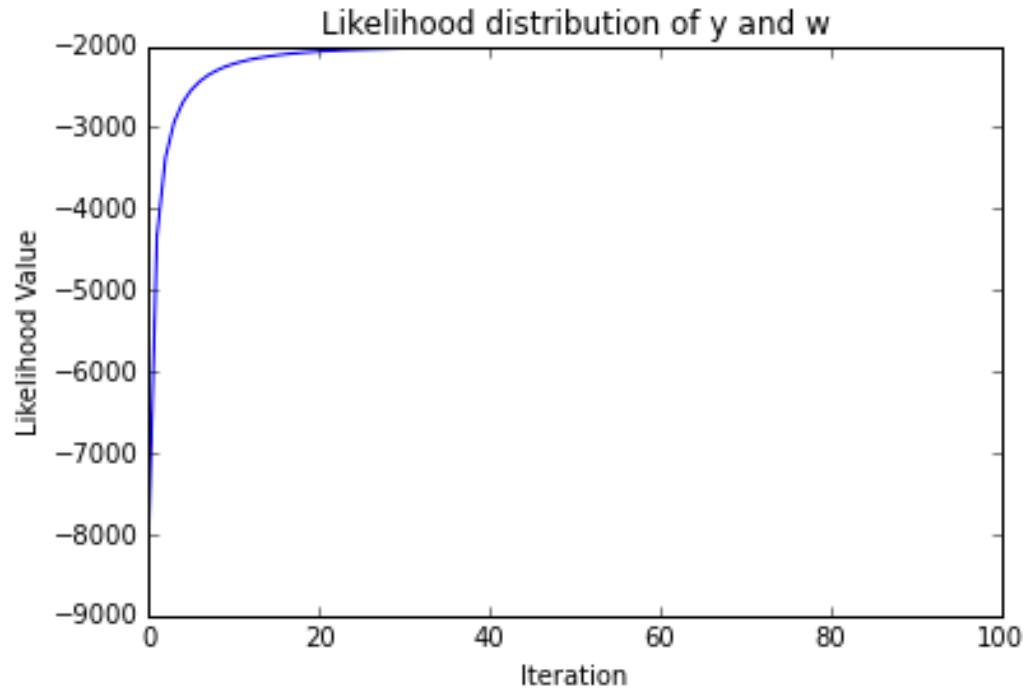
c.

	Actual = 4	Predicted = 9
Predicted = 4	930	52
Predicted = 9	77	932

d. Misclassified digits

Observation 40	Observation 46	Observation 340
Predicted Class = 9	Predicted Class = 9	Predicted Class = 9
Actual Class = 4	Actual Class = 4	Actual Class = 4
$E[Y=9|X] = 0.754821$	$E[Y=9|X] = 0.78199$	$E[Y=9|X] = 0.50465$
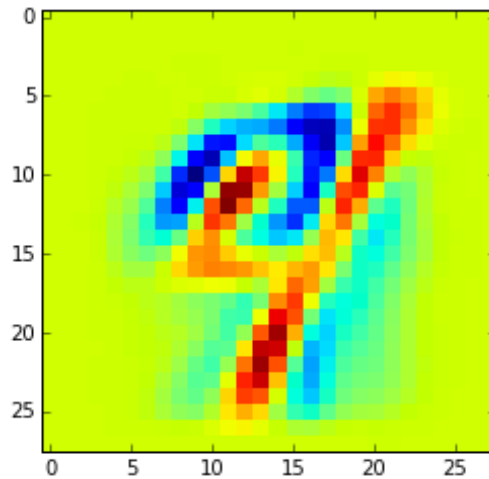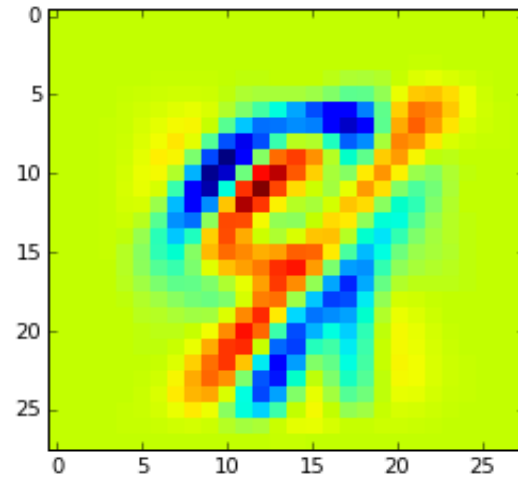
e. Most ambiguous predictions

Observation 586

Predicted Class = 9
Actual Class = 4
E[Y=9|X] = 0.50026

Observation 340

Predicted Class = 9
Actual Class = 4
E[Y=9|X] = 0.50465

Observation 210
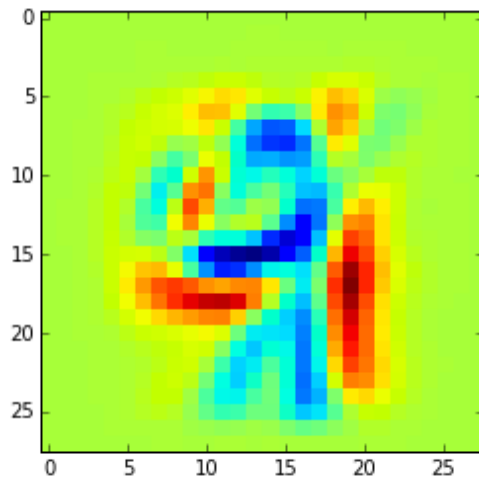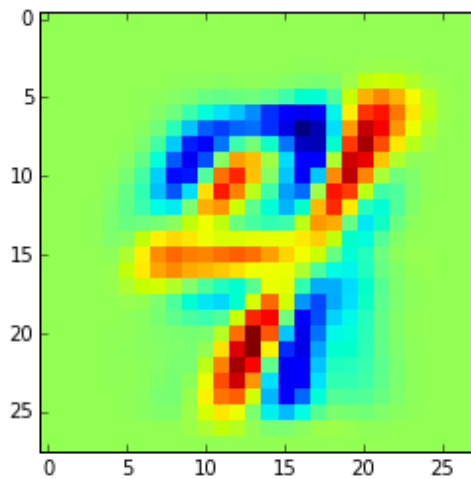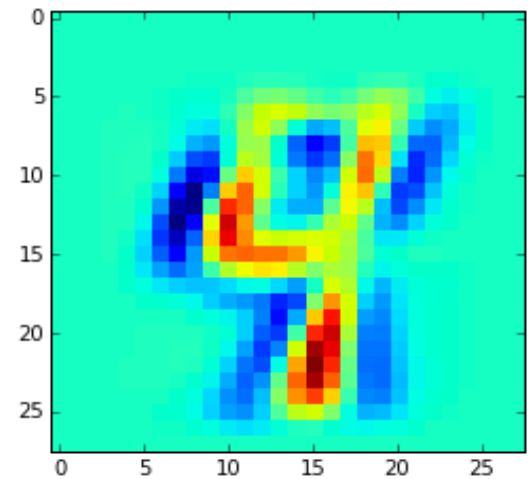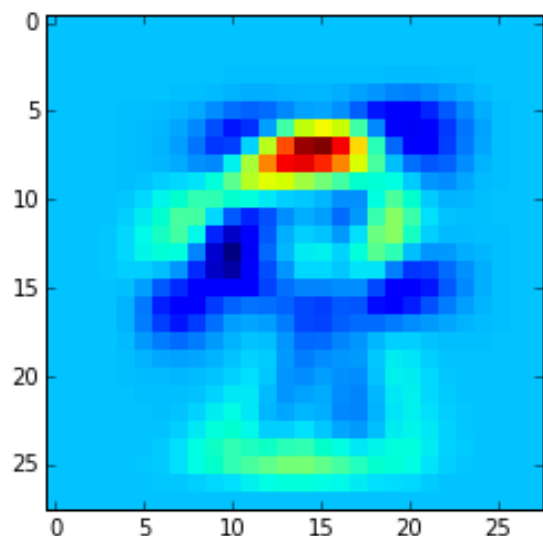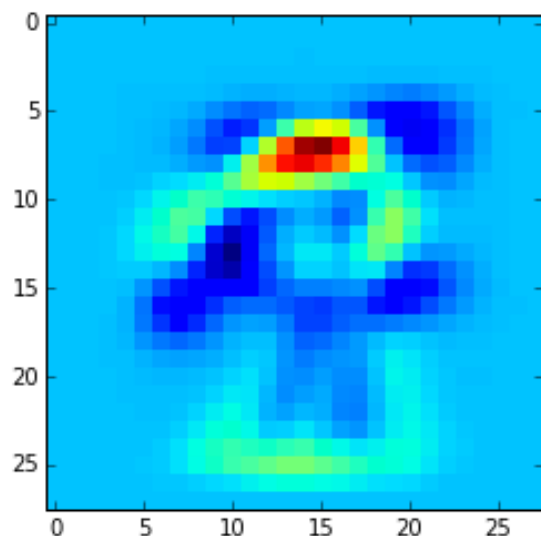

Predicted Class = 9
Actual Class = 4
E[Y=9|X] = 0.506176

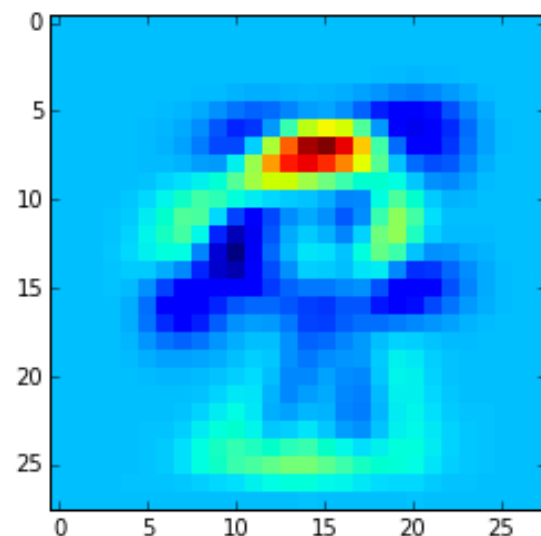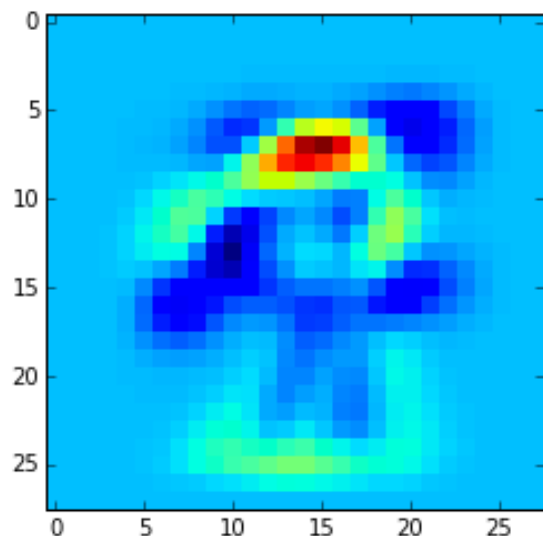f. Reconstructed w_t

t = 1

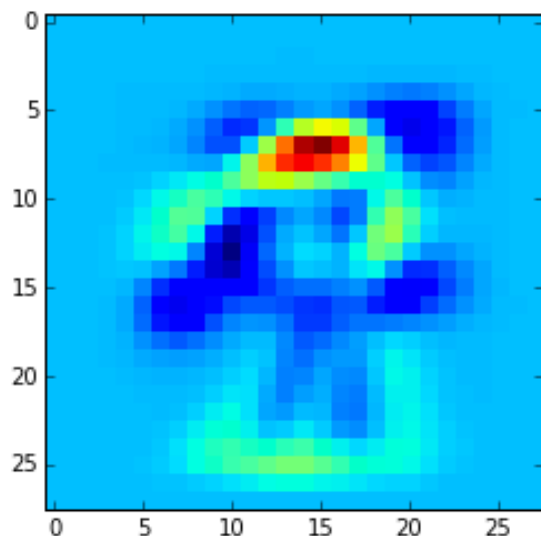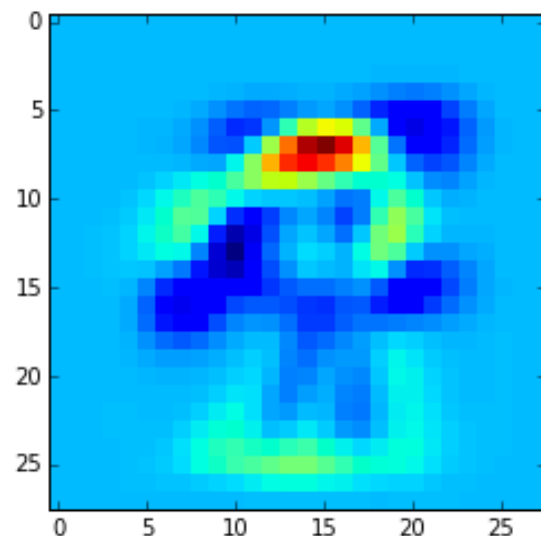t = 5

t = 10

t = 25

t = 50

t = 100