

HW5
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Problem1

1. List the top 25 teams and their corresponding values in wt for $t = 10, 100, 1000, 2500$.

=====iteration 10=====

Rank 1: 435 Value=0.018045
Rank 2: 608 Value=0.013829
Rank 3: 440 Value=0.012406
Rank 4: 6 Value=0.012182
Rank 5: 363 Value=0.0090503
Rank 6: 343 Value=0.0088201
Rank 7: 673 Value=0.0082556
Rank 8: 133 Value=0.008
Rank 9: 696 Value=0.0074985
Rank 10: 668 Value=0.0067568
Rank 11: 465 Value=0.0067563
Rank 12: 719 Value=0.0067221
Rank 13: 432 Value=0.0065957
Rank 14: 564 Value=0.0065015
Rank 15: 598 Value=0.0064005
Rank 16: 736 Value=0.0063532
Rank 17: 715 Value=0.0061902
Rank 18: 643 Value=0.0061191
Rank 19: 489 Value=0.006018
Rank 20: 370 Value=0.0059251
Rank 21: 302 Value=0.0058792
Rank 22: 571 Value=0.0055652
Rank 23: 611 Value=0.0054736
Rank 24: 20 Value=0.0054464
Rank 25: 247 Value=0.0053441

=====iteration 100=====

Rank 1: 435 Value=0.058296
Rank 2: 6 Value=0.032117
Rank 3: 440 Value=0.030921
Rank 4: 608 Value=0.024293
Rank 5: 133 Value=0.016924
Rank 6: 409 Value=0.013411
Rank 7: 489 Value=0.012833
Rank 8: 492 Value=0.011267
Rank 9: 363 Value=0.011165
Rank 10: 611 Value=0.010525
Rank 11: 390 Value=0.010306
Rank 12: 274 Value=0.010047
Rank 13: 598 Value=0.0086909

Rank 14: 343 Value=0.0085609
Rank 15: 389 Value=0.0083131
Rank 16: 292 Value=0.0079689
Rank 17: 624 Value=0.0079641
Rank 18: 715 Value=0.0077226
Rank 19: 202 Value=0.0076445
Rank 20: 215 Value=0.0076107
Rank 21: 321 Value=0.0075459
Rank 22: 29 Value=0.0072822
Rank 23: 482 Value=0.0072056
Rank 24: 673 Value=0.0068827
Rank 25: 219 Value=0.0068485

=====iteration 1000=====

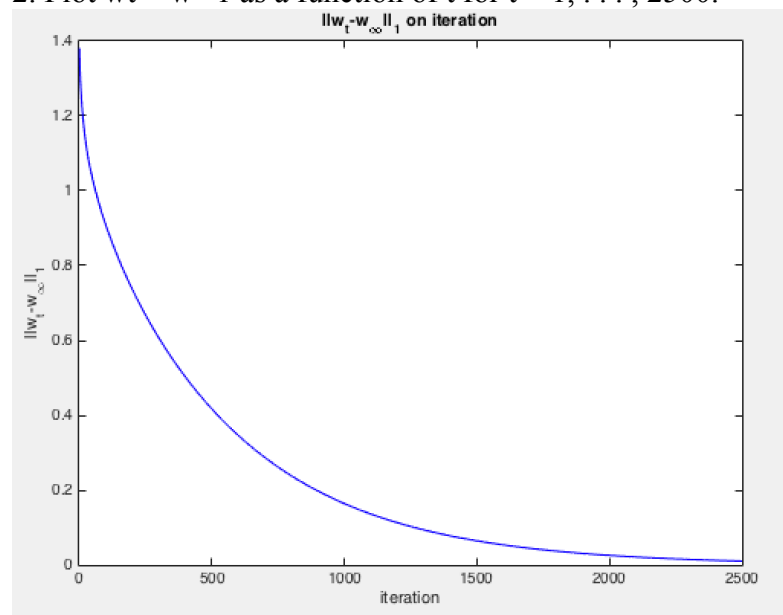
Rank 1: 6 Value=0.060949
Rank 2: 133 Value=0.031893
Rank 3: 409 Value=0.025395
Rank 4: 489 Value=0.024252
Rank 5: 492 Value=0.020878
Rank 6: 611 Value=0.019605
Rank 7: 390 Value=0.019349
Rank 8: 274 Value=0.019005
Rank 9: 389 Value=0.015638
Rank 10: 624 Value=0.014618
Rank 11: 292 Value=0.014613
Rank 12: 215 Value=0.01444
Rank 13: 321 Value=0.014259
Rank 14: 29 Value=0.013727
Rank 15: 482 Value=0.013527
Rank 16: 440 Value=0.012918
Rank 17: 219 Value=0.012813
Rank 18: 629 Value=0.012628
Rank 19: 435 Value=0.012445
Rank 20: 53 Value=0.011187
Rank 21: 679 Value=0.011006
Rank 22: 442 Value=0.010757
Rank 23: 494 Value=0.010739
Rank 24: 476 Value=0.01068
Rank 25: 458 Value=0.010112

=====iteration 2500=====

Rank 1: 6 Value=0.066742
Rank 2: 133 Value=0.034911
Rank 3: 409 Value=0.027803
Rank 4: 489 Value=0.026556
Rank 5: 492 Value=0.022822
Rank 6: 611 Value=0.021446
Rank 7: 390 Value=0.021177

Rank 8: 274 Value=0.020812
 Rank 9: 389 Value=0.017118
 Rank 10: 292 Value=0.015968
 Rank 11: 624 Value=0.015968
 Rank 12: 215 Value=0.015812
 Rank 13: 321 Value=0.015609
 Rank 14: 29 Value=0.015024
 Rank 15: 482 Value=0.014806
 Rank 16: 219 Value=0.014019
 Rank 17: 629 Value=0.01382
 Rank 18: 53 Value=0.012215
 Rank 19: 679 Value=0.012036
 Rank 20: 442 Value=0.011767
 Rank 21: 494 Value=0.011726
 Rank 22: 476 Value=0.011682
 Rank 23: 458 Value=0.011056
 Rank 24: 751 Value=0.010742
 Rank 25: 498 Value=0.01066

2. Plot $w_t - w_{\infty}$ as a function of t for $t = 1, \dots, 2500$.

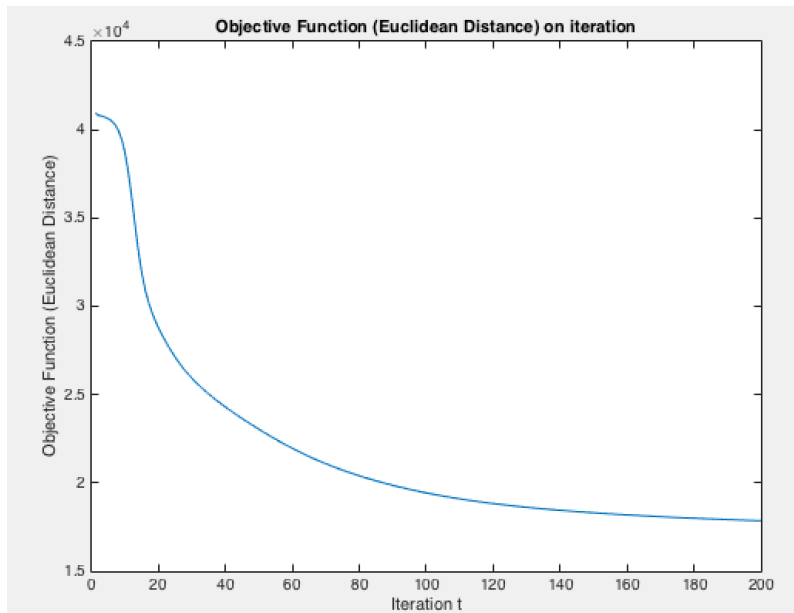


3. The value of $w_{2500} - w_{\infty}$
 $\|w_{2500} - w_{\infty}\|_1 = 0.010373$

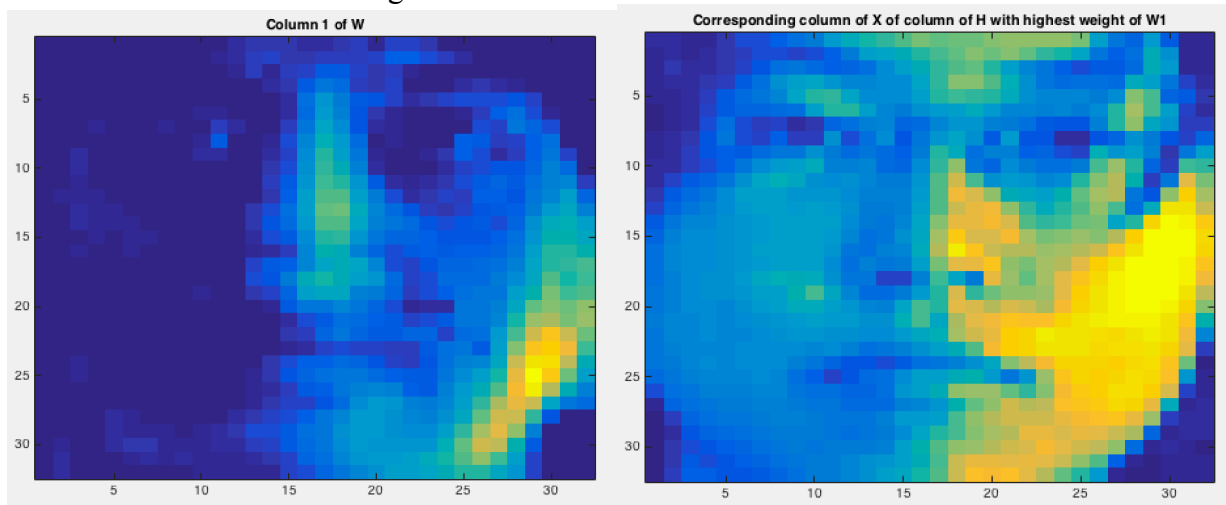
Problem2

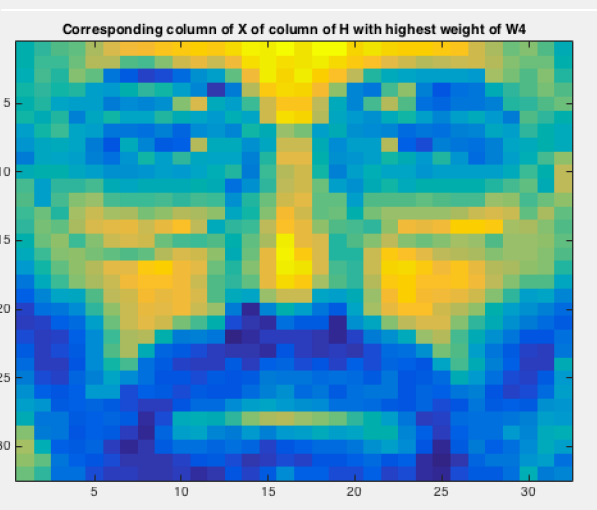
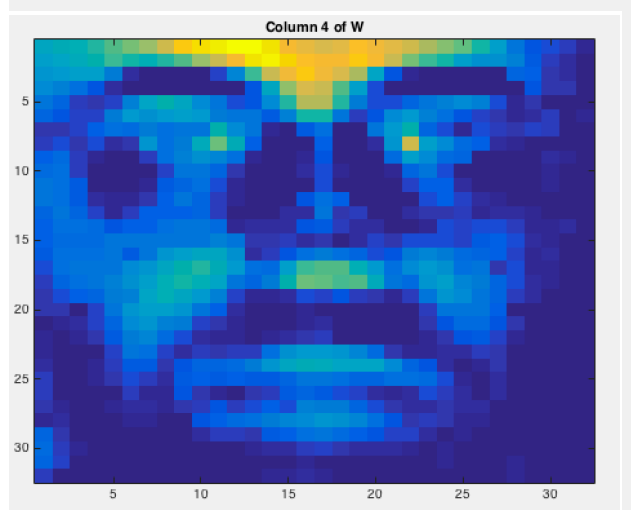
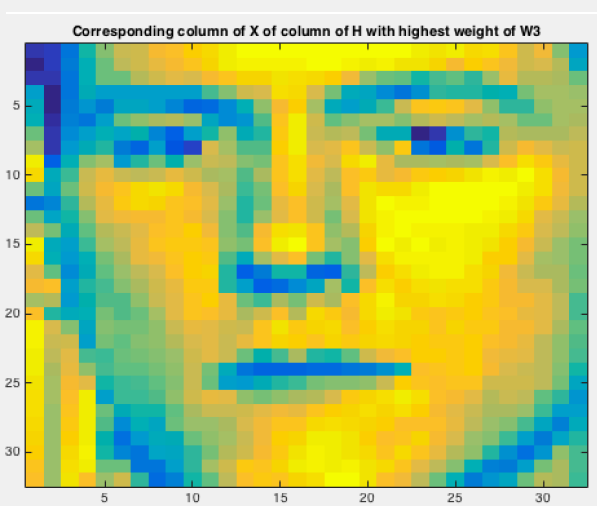
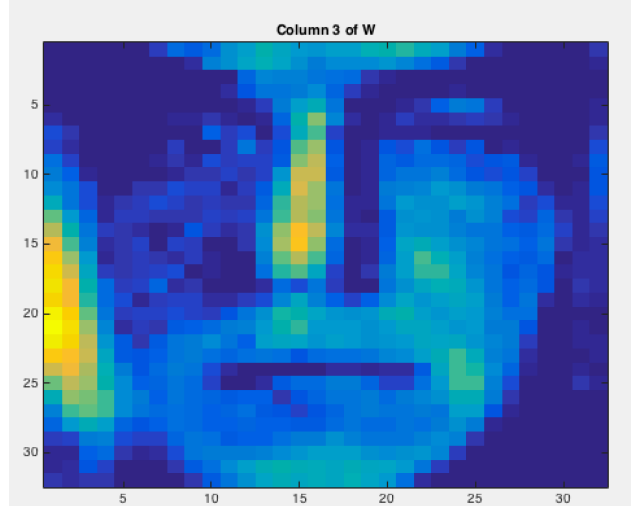
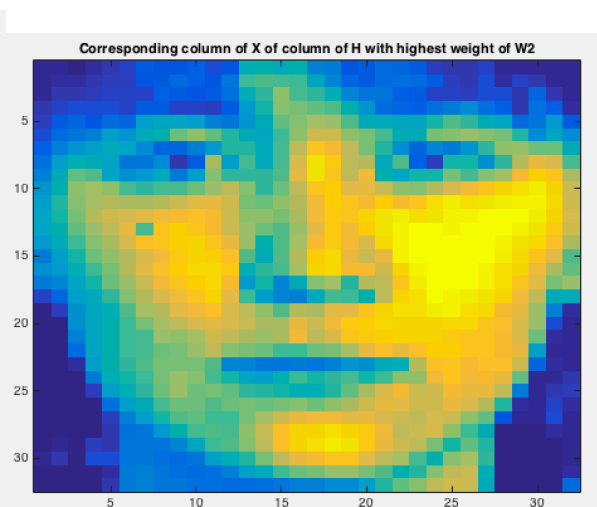
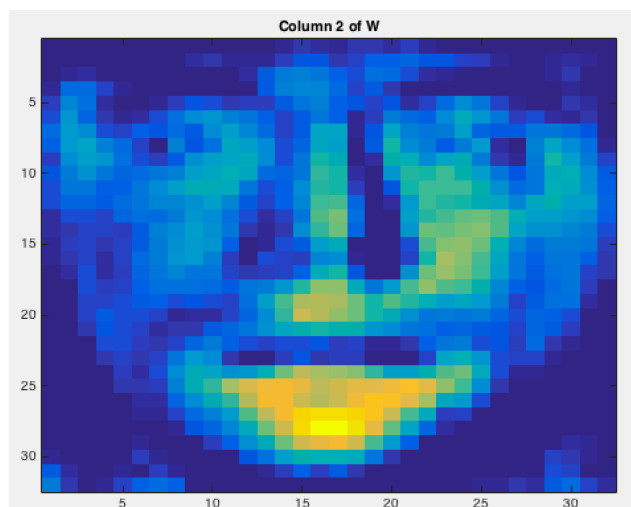
Part1

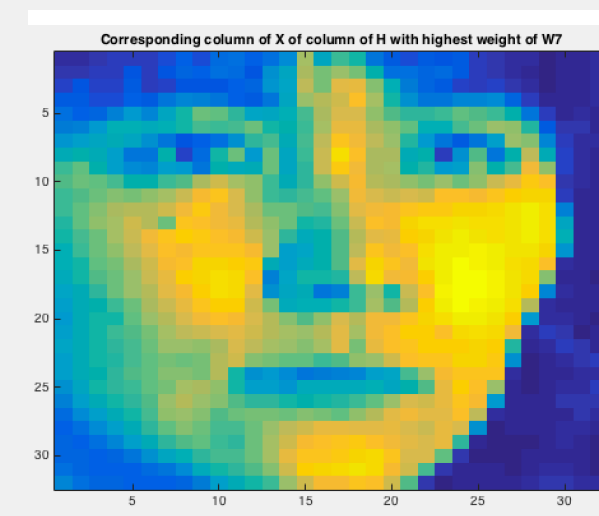
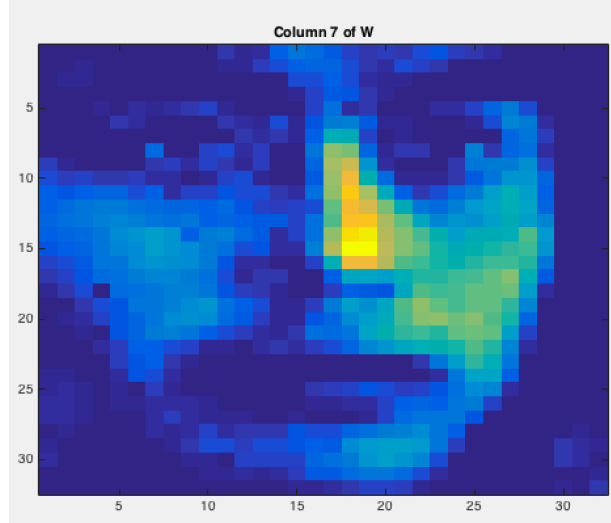
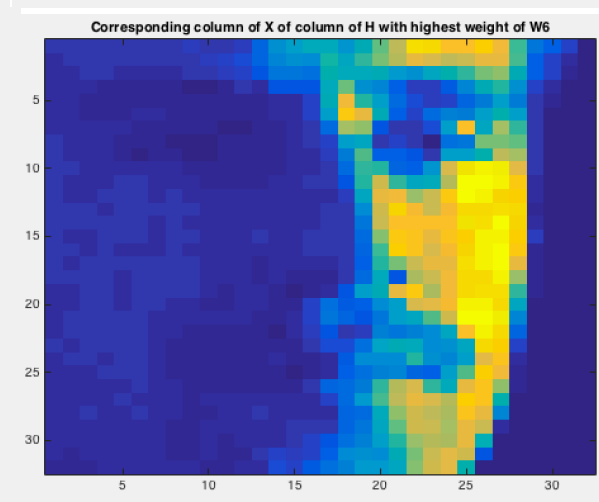
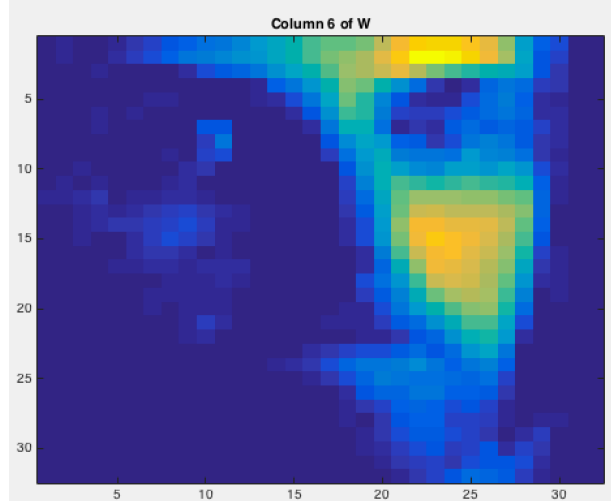
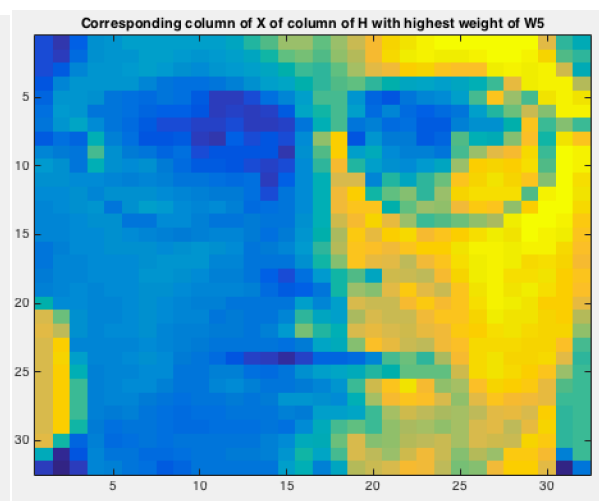
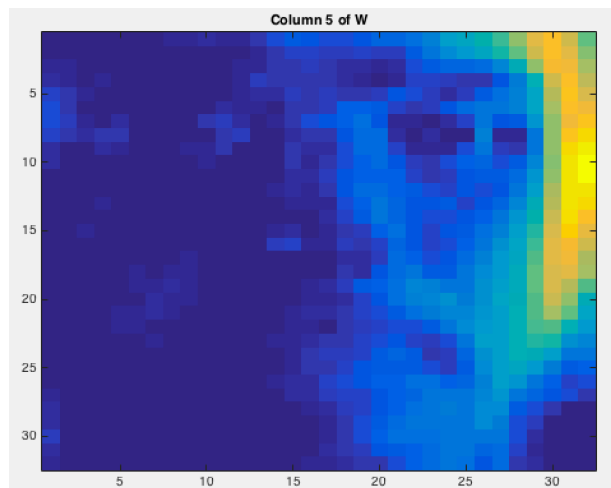
Plot the objective as a function of iteration.

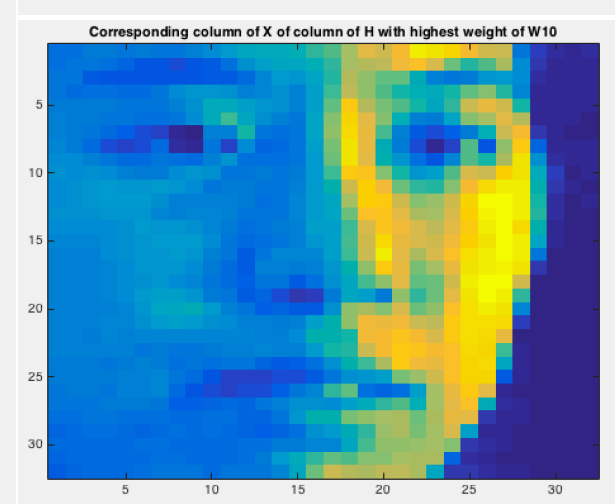
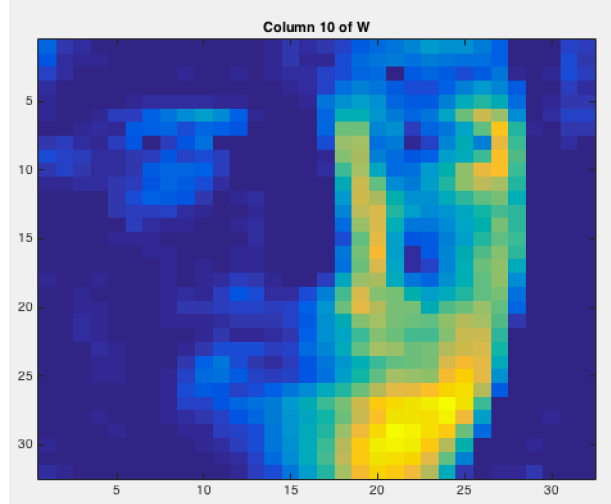
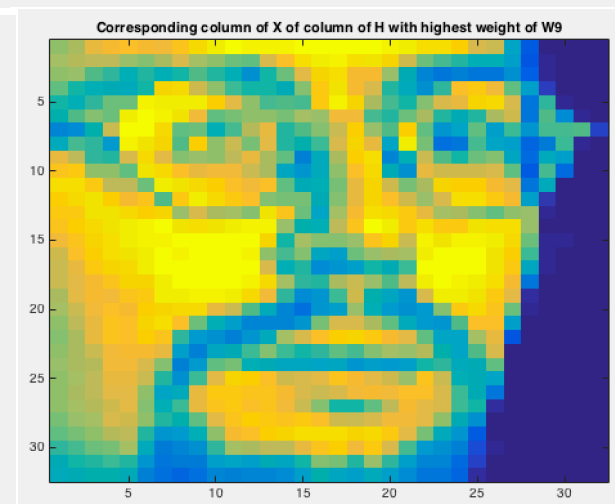
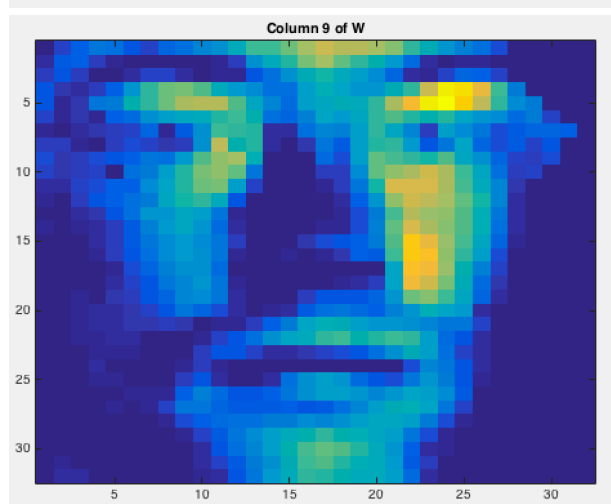
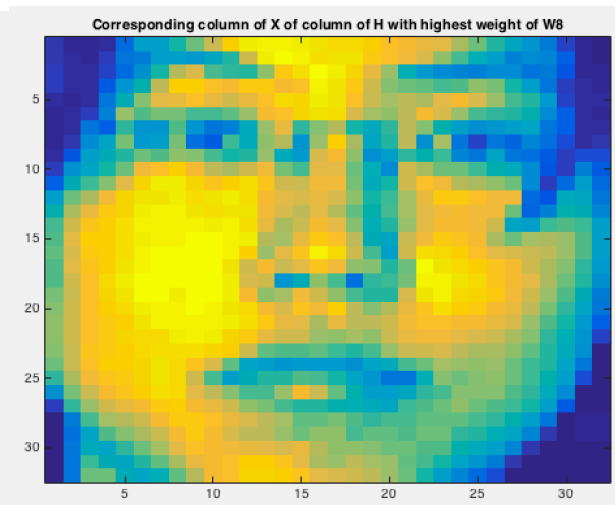
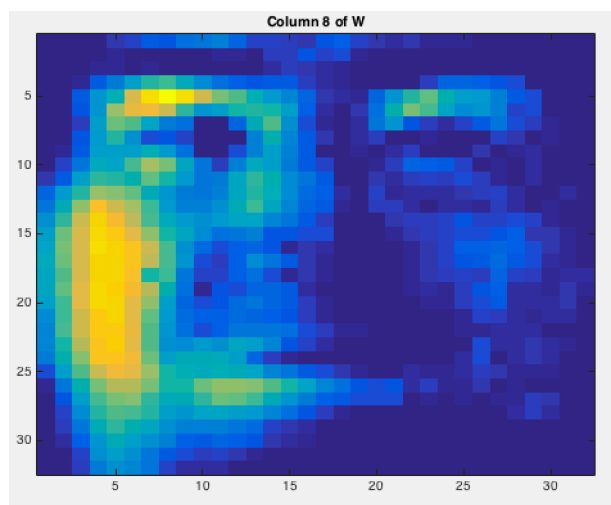


Pick 10 columns from W and show them as 32×32 images. For each vector you select from W , find the column of H that places the highest weight on this vector and show the corresponding column of X as a 32×32 image.



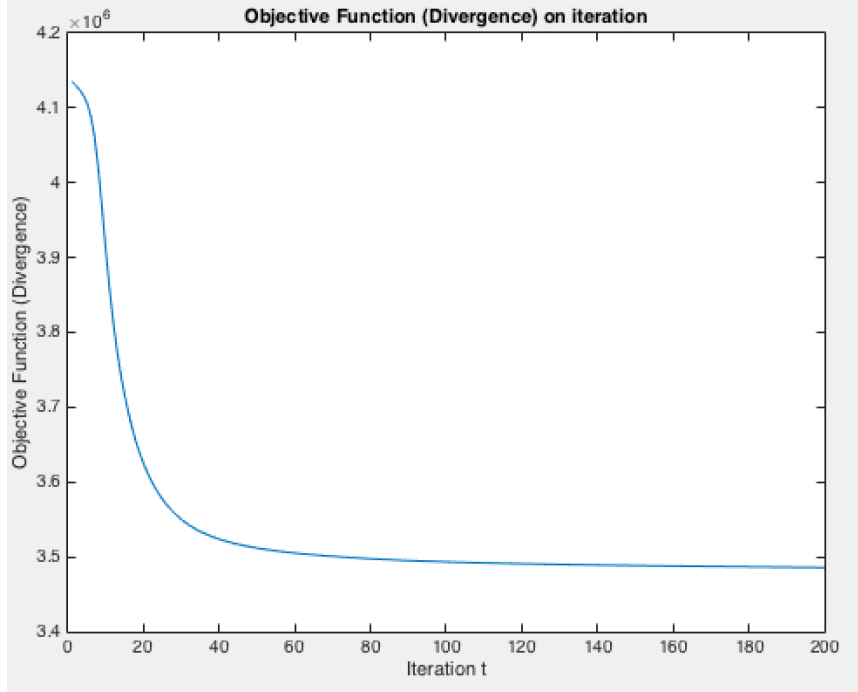






part2

Plot the objective as a function of iteration.



Pick 10 columns of W. For each column you select show the 10 words having the largest weight according to that vector and show the weight. The ith row of W corresponds to the ith word in the “dictionary” provided with the data.

=====Column 1=====

food weight=0.016681
restaurant weight=0.0096089
serve weight=0.0093977
taste weight=0.008599
fresh weight=0.0080217
wine weight=0.0076946
add weight=0.0071088
fish weight=0.0070962
eat weight=0.0070442
dinner weight=0.0069888

=====Column 2=====

vote weight=0.020169
political weight=0.017562
campaign weight=0.016931
election weight=0.014404
republican weight=0.014296
candidate weight=0.013629
party weight=0.013576
democratic weight=0.012718
leader weight=0.011408
state weight=0.010668

=====Column 3=====

game weight=0.028543
team weight=0.024366
season weight=0.018832
play weight=0.018724
player weight=0.018656
second weight=0.012547
score weight=0.010577
coach weight=0.010102
victory weight=0.0095957
point weight=0.0084809
=====Column 4=====

family weight=0.021513
child weight=0.019285
friend weight=0.017153
life weight=0.016763
live weight=0.016184
home weight=0.014895
woman weight=0.012189
tell weight=0.011984
wife weight=0.01155
man weight=0.011252
=====Column 5=====

television weight=0.027188
executive weight=0.017462
news weight=0.017347
president weight=0.015945
network weight=0.015388
advertising weight=0.011925
medium weight=0.011248
business weight=0.0099283
broadcast weight=0.0090321
name weight=0.0082927
=====Column 6=====

case weight=0.01937
lawyer weight=0.017586
court weight=0.017262
law weight=0.016608
charge weight=0.011828
judge weight=0.011339
legal weight=0.010587
state weight=0.0085039
investigation weight=0.008396
trial weight=0.0082467
=====Column 7=====

official weight=0.015693
plan weight=0.015312

meeting weight=0.013524
announce weight=0.013068
agreement weight=0.012853
agree weight=0.012616
talk weight=0.011212
deal weight=0.010589
decision weight=0.010176
meet weight=0.0098618

=====Column 8=====

drug weight=0.014281
health weight=0.013752
doctor weight=0.012708
study weight=0.011715
medical weight=0.01104
patient weight=0.010289
treatment weight=0.0095911
cause weight=0.0093727
report weight=0.0090331
problem weight=0.0081205

=====Column 9=====

president weight=0.039716
father weight=0.03824
mrs weight=0.0342
retire weight=0.033306
graduate weight=0.032414
son weight=0.030793
director weight=0.023547
daughter weight=0.023465
receive weight=0.022499
vice weight=0.021967

=====Column 10=====

company weight=0.03809
business weight=0.01737
executive weight=0.014627
share weight=0.01428
financial weight=0.012858
bank weight=0.012564
stock weight=0.011732
firm weight=0.010708
sell weight=0.010625
buy weight=0.0099293