

HW3: Problem 1

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1 Part 1

1.1 Subsection A

Here is the calculation for the first outer product: $[[0.43226352 \ 0.25222353 \ 0.48671532]$
 $[0.10984608 \ 0.06409462 \ 0.12368328]$
 $[0.42953904 \ 0.25063381 \ 0.48364764]]$.

1.2 Subsection B

The first term for the Kruskal tensor is: $[[7.53169304 \ 8.36104576]$
 $[6.95335795 \ 7.71902727]$
 $[6.47565559 \ 7.1887227 \]$
 $[4.39470396 \ 4.87862699]$
 $[4.05724843 \ 4.50401252]$
 $[3.77851157 \ 4.19458254]$
 $[8.48045282 \ 9.41427827]$
 $[7.82926544 \ 8.69138536]$
 $[7.29138739 \ 8.09427885]$
 $[1.91394119 \ 2.12469491]$
 $[1.76697565 \ 1.96154625]$
 $[1.64558273 \ 1.82678614]$
 $[1.11677479 \ 1.2397485 \]$
 $[1.03102116 \ 1.1445521 \]$
 $[0.96018902 \ 1.06592027]$
 $[2.15503843 \ 2.39234059]$
 $[1.98955979 \ 2.20864026]$
 $[1.85287512 \ 2.05690455]$
 $[7.48422212 \ 8.30834757]$
 $[6.90953217 \ 7.67037562]$
 $[6.43484068 \ 7.14341346]$
 $[4.36700493 \ 4.84787787]$
 $[4.03167631 \ 4.47562453]$
 $[3.75469628 \ 4.16814484]$
 $[8.42700203 \ 9.35494175]$
 $[7.77991897 \ 8.6366051 \]$
 $[7.24543108 \ 8.04326205]]$.

The second term for the Kruskal tensor is: $[[-2.55595915 \ -3.45550892]$
 $[-2.5740198 \ -3.47992588]$
 $[-0.99973259 \ -1.35158063]$
 $[-0.82170374 \ -1.11089593]$
 $[-0.82750998 \ -1.11874563]$
 $[-0.32139951 \ -0.43451354]$
 $[-1.61396023 \ -2.18198087]$
 $[-1.62536463 \ -2.19739896]$
 $[-0.63128107 \ -0.8534555 \]$
 $[4.33091368 \ 5.85514478]$
 $[4.36151634 \ 5.8965178 \]$
 $[1.69398464 \ 2.29016924]$
 $[1.39232585 \ 1.88234401]$
 $[1.40216416 \ 1.89564483]$
 $[0.54459146 \ 0.73625615]$

[2.73475515 3.69723077]
[2.7540792 3.72335577]
[1.06966649 1.44612721]
[-3.54806272 -4.79677556]
[-3.57313368 -4.83067005]
[-1.38778193 -1.87620089]
[-1.14065063 -1.54209368]
[-1.14871058 -1.55299026]
[-0.44615173 -0.60317134]
[-2.24042397 -3.02892361]
[-2.25625502 -3.05032627]
[-0.87631481 -1.18472693]].

Here is the calculation for the Kruskal tensor: [[4.97573389 4.90553684]

[4.37933814 4.23910139]
[5.475923 5.83714207]
[3.57300022 3.76773106]
[3.22973844 3.38526689]
[3.45711206 3.760069]
[6.86649259 7.23229739]
[6.20390081 6.4939864]
[6.66010632 7.24082335]
[6.24485487 7.97983969]
[6.12849198 7.85806405]
[3.33956736 4.11695539]
[2.50910064 3.12209251]
[2.43318532 3.04019693]
[1.50478047 1.80217642]
[4.88979358 6.08957136]
[4.74363899 5.93199602]
[2.92254161 3.50303177]
[3.9361594 3.51157201]
[3.33639849 2.83970557]
[5.04705875 5.26721256]
[3.22635429 3.3057842]
[2.88296573 2.92263427]
[3.30854455 3.5649735]
[6.18657807 6.32601814]
[5.52366395 5.58627883]
[6.36911627 6.85853512]].

2 Part 2

Here is the calculation for the Tucker tensor: [[[[5.10100643 5.80186261]

[4.99129859 5.53890968]
[4.80561947 5.4454022]]

[[3.48145003 3.44117511]
[2.84300047 3.59675864]
[3.19627907 3.27594982]]

[[8.4494077 5.746398]
[4.06876905 7.8071309]
[7.33749349 5.73753646]]]

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[[[ 3.33961221 6.57606924]
 [ 6.5368703 0.73014512]
 [ 3.63097401 5.34938374]]
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[[ 2.38667868 3.61945962]
 [ 3.38294471 1.82517912]
 [ 2.40381302 3.1553465 ]]
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[[ 6.33187165 4.42028174]
 [ 2.79251954 11.09517187]
 [ 5.4605745 5.16818593]]]
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[[[ 3.30654779 6.59527835]
 [ 6.57138663 0.6350008 ]
 [ 3.60973992 5.35058505]]
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[[ 2.3663087 3.62510679]
 [ 3.39564197 1.79103195]
 [ 2.38946098 3.15478383]]
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[[ 6.2934687 4.39649616]
 [ 2.7687788 11.16696751]
 [ 5.42644706 5.15987497]]].
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3 Part 3

The mean-square error for Tucker decomposition is: 2.6217621054926816.

The mean-square error for CP decomposition is: 3.19421561560853