Q2

June 17, 2020

```
In [2]: import tensorly
        import numpy as np
```

```
In [35]: ab = np.array([1,2,3,4]).reshape(2,2)
         ac = np.array([5,6,7,8]).reshape(2,2)
         cdd = np.array([6,4,16,10]).reshape(2,2)
         y = np.array([1,2,3,4]).reshape(4,1)
```

Given:

$$\hat{\beta} = argmin_{\beta}||y - \{[(A \otimes C)^T * (B^T \otimes A^T)][(B \odot C) * (A \odot D) + A * B \odot D]\}\beta||_2^2$$

Reduces to:

$$\hat{\beta} = argmin_{\beta}||y - \{[(A * B) \otimes (A * C)]^T[A * B \odot ((C * D) + D)]\beta||_2^2$$

```
In [20]: first_bracket = tensorly.tenalg.kronecker([ab,ac]).T
         second_bracket = tensorly.tenalg.khatri_rao([ab,cdd])
         m = np.dot(first_bracket, second_bracket)
```

```
In [66]: # beta
         np.linalg.lstsq(m, y, rcond=None)[0]
```

```
Out[66]: array([[-0.0309884 ],
                [ 0.03603101]])
```