In [1]:

```
import tensorflow as tf
```

Linear Algebra with Tensorflow

In [2]:

```
X = tf.range(2*3*5)
with tf.Session() as session:
    print("X:")
    print(session.run(X))

    print("\n\nReshaped into a 3rd order tensor")
    print(session.run(tf.reshape(X, [2, 3, 5])))

    print("\n\nReshaped into a 2nd order tensor or a matrix")
    print(session.run(tf.reshape(X, [6, 5])))

    print("\n\nTransposed")
    print(session.run(tf.transpose(tf.reshape(X, [6, 5]))))
```

```
X:
[ 0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 2
2 23
 24 25 26 27 28 29]


Reshaped into a 3rd order tensor
[[[ 0  1  2  3  4]
  [ 5  6  7  8  9]
  [10 11 12 13 14]]

 [[15 16 17 18 19]
  [20 21 22 23 24]
  [25 26 27 28 29]]]


Reshaped into a 2nd order tensor or a matrix
[[ 0  1  2  3  4]
 [ 5  6  7  8  9]
 [10 11 12 13 14]
 [15 16 17 18 19]
 [20 21 22 23 24]
 [25 26 27 28 29]]


Transposed
[[ 0  5 10 15 20 25]
 [ 1  6 11 16 21 26]
 [ 2  7 12 17 22 27]
 [ 3  8 13 18 23 28]
 [ 4  9 14 19 24 29]]
```

Casting a matrix - Its a good idea to cast matrices to float if you want to use it for numerical calculations

In [3]:

```
with tf.Session() as session:
    X1 = tf.reshape(X, [5, 6])
    X2 = tf.cast(X1, tf.float32)

    print("X1:")
    print(session.run(X1))

    print("X2")
    print(session.run(X2))
```

```
X1:
[[ 0  1  2  3  4  5]
 [ 6  7  8  9 10 11]
 [12 13 14 15 16 17]
 [18 19 20 21 22 23]
 [24 25 26 27 28 29]]
X2
[[ 0.  1.  2.  3.  4.  5.]
 [ 6.  7.  8.  9. 10. 11.]
 [12. 13. 14. 15. 16. 17.]
 [18. 19. 20. 21. 22. 23.]
 [24. 25. 26. 27. 28. 29.]]
```

Elementwise Multiplication

In [7]:

```
A = tf.cast(tf.tile(tf.reshape(tf.range(5),[5,1]), [1,10]),tf.float32)
b = 2 * tf.ones([1,10])

with tf.Session() as session:
    print(session.run(tf.multiply(A, b)))
```

```
[[0. 0. 0. 0. 0. 0. 0. 0. 0. 0.]
 [2. 2. 2. 2. 2. 2. 2. 2. 2. 2.]
 [4. 4. 4. 4. 4. 4. 4. 4. 4. 4.]
 [6. 6. 6. 6. 6. 6. 6. 6. 6. 6.]
 [8. 8. 8. 8. 8. 8. 8. 8. 8. 8.]]
```

Slicing matrices

In [8]:

```
# Extract specific rows
x = tf.range(10*5)

X = tf.cast(tf.reshape(x, [10, 5]), tf.float32)
indices = [0, 2, 4, 6, 8]

Y = tf.gather(X, indices)

with tf.Session() as session:
    print("X:")
    print(session.run(X))
    print("Y:")
    print(session.run(Y))
```

```
X:
[[ 0.  1.  2.  3.  4.]
 [ 5.  6.  7.  8.  9.]
 [10. 11. 12. 13. 14.]
 [15. 16. 17. 18. 19.]
 [20. 21. 22. 23. 24.]
 [25. 26. 27. 28. 29.]
 [30. 31. 32. 33. 34.]
 [35. 36. 37. 38. 39.]
 [40. 41. 42. 43. 44.]
 [45. 46. 47. 48. 49.]]
Y:
[[ 0.  1.  2.  3.  4.]
 [10. 11. 12. 13. 14.]
 [20. 21. 22. 23. 24.]
 [30. 31. 32. 33. 34.]
 [40. 41. 42. 43. 44.]]
```

In [ ]:

```
# Extract columns

x = tf.range(10*5)

X = tf.cast(tf.reshape(x, [10, 5]), tf.float32)
indices = [0, 2, 3]

Y = tf.transpose(X)

Z = tf.gather(Y, indices)

ZZ = tf.transpose(Z)

with tf.Session() as session:
    print("X:")
    print(session.run(X))
    print("ZZ:")
    print(session.run(ZZ))
```