

# MTRE 2610 – Intermediate Programming for Mechatronics

## Homework – Python Plot and Classes

1. The contents of `pointsHW08.txt` are 3D data points collected from a LiDAR sensor for objects such as vehicles, bicyclists, and pedestrians. Each row of the file contains the  $x$ ,  $y$ , and  $z$  positions of a point with units of meters. Load the data file and use [`sklearn.cluster.Kmeans`](#) to perform clustering on the six objects in the data. Display the points as a [`3D scatter plot`](#) using `matplotlib.axes.Axes.scatter` where each of the six object clusters has a different color. Tip: display a dummy point at (0,0,15) so that the axes will be reasonably equal in all directions and the objects will be less distorted.

2. Write a program to implement the `myMat` class so that the following script creates/multiplies matrices `x` and `y`, resulting in the output below. Note that `numpy.dot(m1,m2)` returns the multiplication of 2D numpy arrays `m1` and `m2`. Overload the `*` operator using `__mul__`, and allow displaying with `print` by overloading the `__str__` method.

```
x = myMat()    # Creates 0x0 array filled with zeros

print(x, '\n')

x.addValue(1,1,6) # Expands size of x as needed

print(x, '\n')

x.addValue(2,2,5)

x.addValue(1,0,4)

x.addValue(0,1,3)

x.addValue(2,0,20)

x.addValue(2,0,2) # Overwrite previous value of 20 in this place

print(x, '\n')


y = myMat(3,3) # Creates 3x3 array filled with zeros

print(y, '\n')

y.addValue(0,0,2)

y.addValue(0,1,3)

y.addValue(0,2,4)
```

```
y.addValue(1,0,5)
```

```
y.addValue(1,2,6)
```

```
y.addValue(2,1,7)
```

```
y.addValue(2,2,8)
```

```
print(y, '\n')
```

```
print(x*y)
```

Output:

```
[]
```

```
[[0. 0.]  
 [0. 6.]]
```

```
[[0. 3. 0.]  
 [4. 6. 0.]  
 [2. 0. 5.]]
```

```
[[0. 0. 0.]  
 [0. 0. 0.]  
 [0. 0. 0.]]
```

```
[[2. 3. 4.]  
 [5. 0. 6.]  
 [0. 7. 8.]]
```

```
[[15.  0. 18.]  
 [38. 12. 52.]  
 [ 4. 41. 48.]]
```