

15-494/694: Cognitive Robotics

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Lecture 10: matplotlib

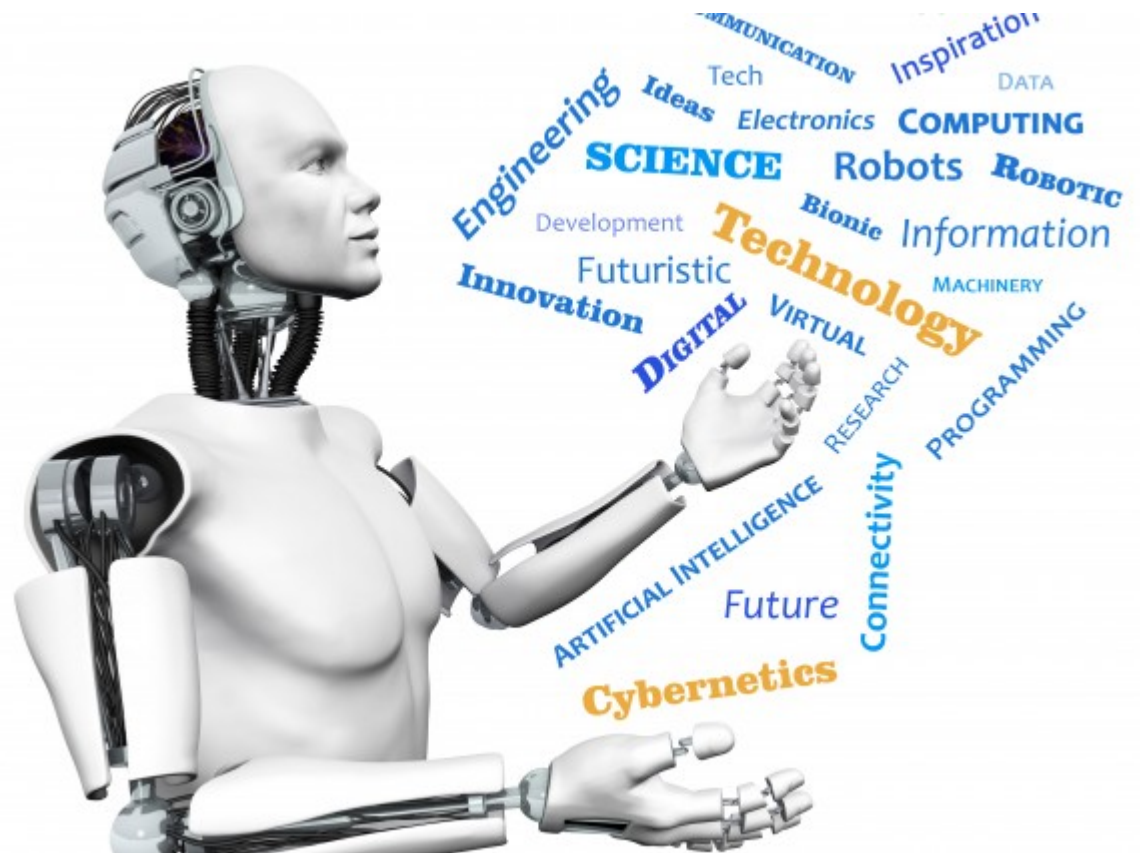


Image from <http://www.futuristgerd.com/2015/09/10>

Intro to matplotlib

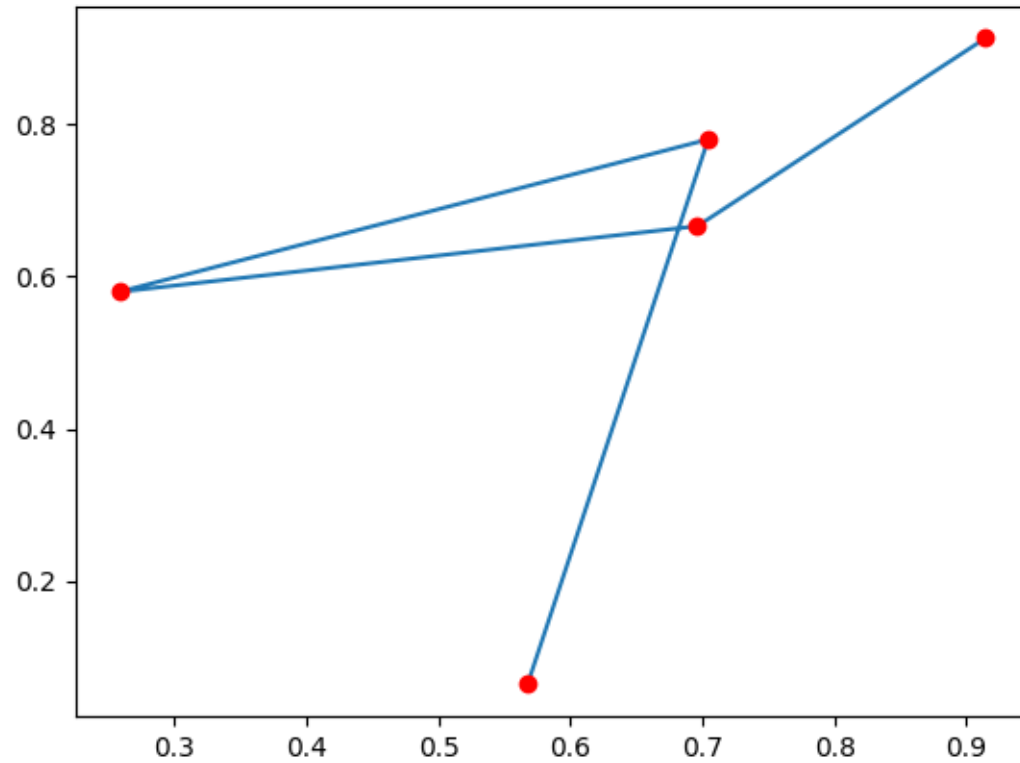
- matplotlib is “MATLAB (subset) in Python”
- Relies on **numpy** for vectors, math
- Relies on **tkinter** for display graphics
- Usage:

```
import matplotlib.pyplot as plt
```

Sample Program

```
import numpy as np
import matplotlib.pyplot as plt
fig = plt.figure()
ax = fig.gca() # get current axis
rand = np.random.random
xvals = rand(5); yvals = rand(5)
ax.plot(xvals, yvals)
ax.plot(xvals, yvals, 'ro',
        linestyle='None')
plt.pause(0.01)
```

Plotting Points



PlotDrive (1)

```
from aim_fsm import *
```

```
class PlotDrive(StateMachineProgram):
```

```
    class SetupPlot(StateNode):
```

```
        def start(self, event=None):
```

```
            super().start()
```

```
            self.parent.fig = plt.figure()
```

```
            self.parent.ax = ax = self.parent.gca()
```

```
            ax.set_xlim(-5,5)
```

```
            ax.set_ylim(23,29)
```

```
            ax.plot([-5,5],[25,25],'g--')
```

```
            ax.plot([0,0],[23,29],'r--')
```

```
            ax.set_xlabel('Drift')
```

```
            ax.set_ylabel('Travel Distance')
```

```
            self.parent.old_pose = self.robot.pose
```

PlotDrive (2)

```
class AddPoint(StateNode):  
    def start(self,event=None):  
        super().start()  
        fwd = self.robot.pose.x - self.parent.old_pose.x  
        drift = wrap_angle(self.robot.pose.theta -  
                           self.parent.old_pose.theta) * 180/pi  
        print('fwd=',fwd,'drift=',drift)  
        self.parent.ax.plot(drift,fwd,'bo',linestyle='None')  
        self.parent.old_pose = self.robot.pose
```

```
class ShowPlot(StateNode):  
    def start(self,event=None):  
        super().start()  
        plt.pause(0.01)
```

PlotDrive (3)

```
$setup{  
  self.SetupPlot() =N=> loop  
  
  loop: Iterate(range(5))  
  loop =D=> Forward(25) =T(5)=> self.AddPoint() =Next=> loop  
  loop =C=> show  
  
  show: self.ShowPlot()  
  
}
```

PlotDrive

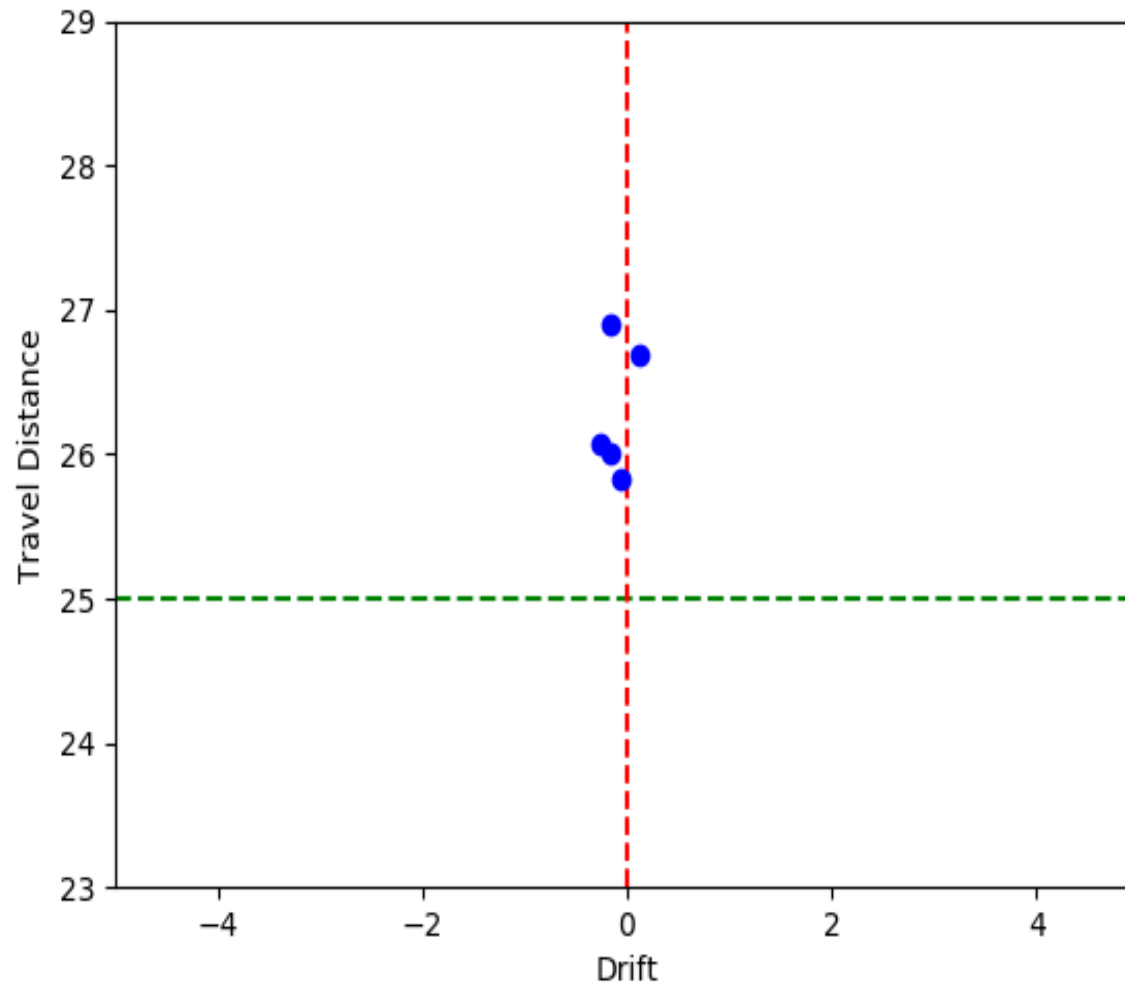


Image Display

```
current_image = robot.camera_image
```

```
img = np.array(current_image)
```

```
plt.imshow(img)
```

```
plt.pause(0.01)
```

Intensity Histogram

```
green_chan = tuple(img[:, :, 1].flat)
```

```
plt.hist(green_chan, bins=25)
```

```
plt.pause(0.01)
```

