Approximating the Volume Enclosed in R3 Between the plane, $x + y + z = 1$

1 Introduction

We will use a similar concept like finding the volume of a sphere. But, now this is a form of Simplex. We will use the MC method to calculate the volume of both inside outside regions while shooting randomly. Then we will divide the ratio by 8; following 2^n where n is 3.

2 Python Script

```python
import random
import matplotlib.pyplot as plt
from mpl_toolkits import mplot3d

inside_sphere = 0
outer_sphere = 0

x_list = []
y_list = []
z_list = []


for i in range (10000):
  x = random.uniform(0,1)
  y = random.uniform(0,1)
  z = random.uniform(0,1)

  s = x+y+z

  if s<=1:
    inside_sphere = inside_sphere + 1

    x_list.append(x)
    y_list.append(y)
    z_list.append(z)

  outer_sphere = outer_sphere + 1

  volume = (inside_sphere / outer_sphere)

print("Volume of the Shaded Region is", volume)

fig = plt.figure()
ax = plt.axes(projection='3d')

ax.scatter(x_list, y_list, z_list)
ax.set_xlabel('X')
ax.set_ylabel('Y')
ax.set_zlabel('Z')
ax.view_init(50,60)

plt.show()
```

```
Volume of the Shaded Region is 0.1631
```