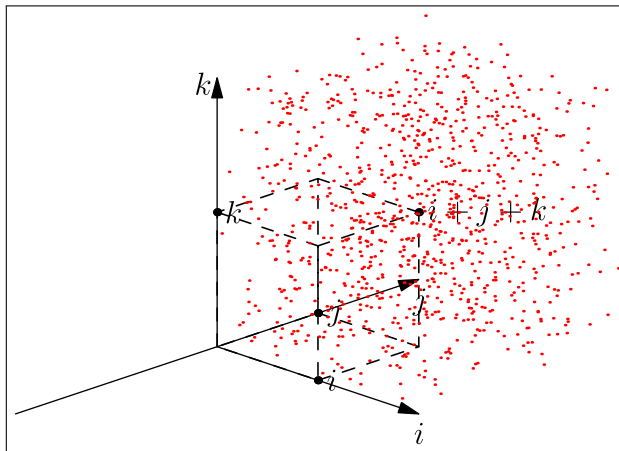Exercise 10:

Which point of the cube is $i+j$. Which point is the vector sum of $i = (1, 0, 0)$ and $j = (0, 1, 0)$ and $k = (0, 0, 1)$? Describe all points (x, y, z) in the cube. We will generate random points using three random values a, b and c as:

$$a * A + b * B + c * C$$

In this figure we try some random linear combinations using unbounded values for a, b, c. We see that points are spread both inside and outside the unit cube.

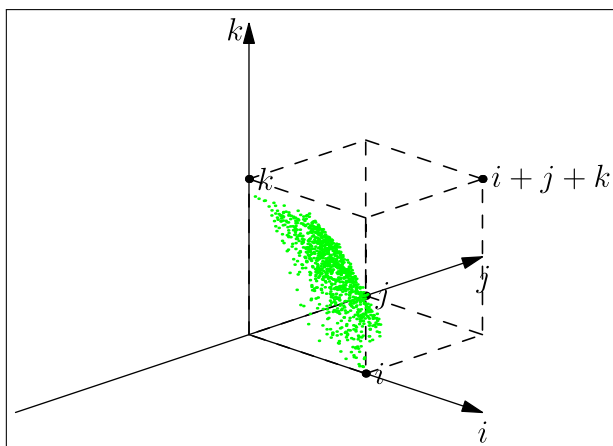In the second attemp we try to normalize the three weights as their sum in 1.

$$a + b + c = 1$$
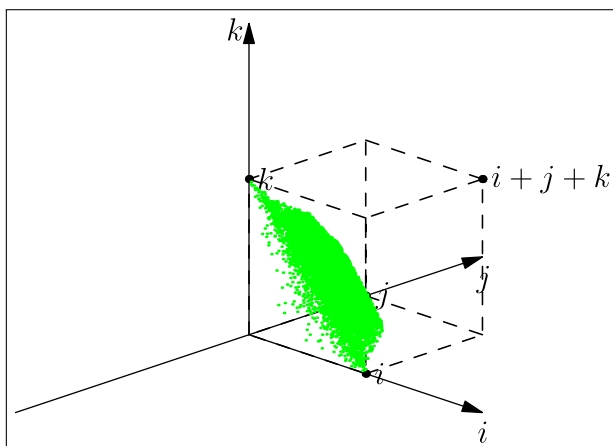
$$a = \frac{a}{a + b + c}$$
$$b = \frac{b}{a + b + c}$$
$$c = \frac{c}{a + b + c}$$

We can see that altought all random points fall inside the but they are not as spread as possible. We have a filling that they do no span all possible

cubes. Which makes sense given that as x and y approaches 0.5, z converges to zero.

This figure is the same as above but with more random points.

And the following figure is when we bound the random points to the interval $[0, 1]$.