**Affine combination of two points**

Suppose we are given two points **p** and **q (assume these are represented by vectors in Rn)**. Now a vector from **p** to **q** is given by **q - p**. Now a point **z** on the line segment connecting the two points can be found by starting from **p** and going some distance in the direction of **q-p** vector (in other words adding a scalar multiple of **q-p** to **p**).

**z** = **p** + α **(q - p)** = α **q + (**1**-** α)**p**

**q-p**

**q**

**z** = **p** + α **(q - p)**

**p**

Now is the scalar multiple α is between 0 and 1 we get any point in the line segment connecting **p** and **q. In that case,** α **q + (**1**-** α)**p is called a Convex combination.**

In case of convex combination, we can also write,

**z** = λ **p + (**1**-** λ)**q**  where 0 ≤ λ ≤ 1,to represent the same point as **z** = α **q + (**1**-** α)**p** (just use, λ = 1- α)

For example,

Suppose p = [2 4]T and q = [16 8]T. then

**z** = 0.25 **p** + 0.75 **q** = [0.5 1]T + [12 6]T = [12.5 7]T (assume, α = 0.75 or as λ = 0.25)

Now, in case of general affine combination α does not have to be between 0 and 1.

What point do we get if α > 1 or α < 0?