DSF Maths Notation Primer

Chris McCaig

1 Basic Functions

$y = f(x)$ – $f(x)$ is any function of x
e.g. $f(x)) = mx + c$ – function of a straight line

2 Sets

$\mathbb{R}$ – the set of real numbers
$\mathbb{R}_{>0}$ – the set of positive real numbers
$\mathbb{R}^n$ – the set of tuples of n real numbers
$\mathbb{R}^{n \times m}$ – the set of 2d arrays of real numbers, n rows m columns
$(\mathbb{R}^n, \mathbb{R}^n) \rightarrow \mathbb{R}$ – map (function) that takes two tuples of n real numbers and outputs a real number

3 Vectors

$\boldsymbol{x}, \boldsymbol{y}$ – vectors given as lower case bold letters

e.g. $\boldsymbol{x} = [x_1, x_2, x_3, ..., x_n]$
$||\boldsymbol{x}||$ – norm (magnitude) of x

– lots of different definitions for this. Most obvious version is the $||x||_2$ (Euclidean norm), which is basically Pythagorus's Theorem in n dimensions
i.e. $||\boldsymbol{x}||_2 = \sqrt{(x_1^2 + x_2^2 + x_3^2 + ... + x_n^2)}$

4 Sigma - Σ

Σ – This Greek letter is called Sigma and represents a summation function
Σx is equivalent to `np.sum(x)` where x is some array/list of numbers

Σ can be accompanied by limits for some element of what is being summed
$\Sigma_{i=0}^{5} x$ – sum $x(i)$ (x is a function of i) for all values of i from 0 to 5 inclusive

5 Trigonometric functions

$\sin, \cos, \tan$ – basic trigonometric functions (hopefully familiar from school). You may be used to using these with angles in degrees but we'd more usually use radians where 2π `radians` $= 360°$