Video: the MALAB sum function (4:28 min)

Slide 1 “MATLAB sum function” (00:00):

This video introduces the MATLAB sum function. We’ll start by talking a little bit about what a function is, then we’ll apply some to 2D arrays. We’ll also look at some special cases, such as what happens when you don’t give a dimension argument, or when you apply sum to row and column vectors. Finally we’ll introduce two methods for finding the total for all elements in a 2D array.

Slide 2 “What is a function?” (00:30):

When we write a piece of code to solve a problem, we refer to specific variable names. A function is a separate piece of code that can be used with different variables. We can reuse code by creating a function for it. MATLAB provides many built in functions, and we can also build our own. Once we defined a function, we can treat it as a black box without worrying about how it does its work. In this example we defined a function called “mystuff” with one input parameter A and one output B. We use a function in MATLAB by giving the function name followed by the variables or values we want to substitute for the function parameters. The function inputs are sometimes called arguments, and they must be in a specific order for the function to work correctly.

Slide 3 “MATLAB sum function” (01:26):

Many functions such as the MATLAB sum function are designed to work on 2D arrays. Let’s look at an example. The array A is a two dimensional array. It has two rows and three columns. The dim argument of sum indicates which dimension to sum over. “sum(A,1)” sums over dimension 1. It produces a single row, which is the column sum of A. Similarly, “sum(A,2)” sums over the columns of A to produce a single column. For 2D arrays, use a dim value of 1 to sum across the rows and a dim value of 2 to sum across the columns.

Slide 4 “MATLAB sum function (2D no dim)” (02:05):

Now let’s look at what happens when the dim argument is omitted. When A is a two dimensional array, we sum along dimension 1 so sum of A is the same as “sum(A,1)”. Here’s the general rule; when dim is omitted, we collapse along the first non-singleton dimension. For 2D arrays, this is the row so we form the column sum.

Slide 5 “MATLAB sum function (column)” (02:34):

The same rules apply when A is a single column. “sum(A,1)” sums along dimension 1 to give a single value. “sum(A,2)” sums along dimension 2 leaving the array intact. “sum(A)” sums along dimension 1, also giving a single value. Column vectors have a first non-singleton dimension of 1. For column vectors, when you don’t give the dimension, you add up all the values in the array.

Slide 6 “MATLAB sum function (row)” (03:12):

For row vectors, the situation is just the opposite. “sum(A,1)” leaves the row vector A intact while “sum(A,2)” sums over the columns to produce a single vector. “sum(A)” for row vectors is the same as “sum(A,2)”. The first non-singleton dimension for row vectors is 2, and omitting dim gives a row sum that is summed along dimension 2.

Slide 7 “Adding up all elements of a 2D array Method 1: Apply sum twice” (03:44):

Now we’ll look at two ways to add up all the elements in a two dimensional array. The first method applies the sum function twice. When we apply sum to the 2D array A, we get a single row. Applying sum to this row produces a single value, the total of A.

Slide 8 “Adding up all elements of a 2D array Method 2: Convert to column” (04:06)

The second method rearranges A to form a single column, and then applies sum to the result. We use the linear representation A(:) to form a single column from the values of A, then we can sum to get the value.