Show that where a and b are both vectors

First let’s define a and b as column vectors with m entries:

More concretely:

Then:

Another way of writing this is:

In this form it is easy to see that:

We know that

Show that for two matrices of the same order

First let’s define a and b as matrices of the same order:

For me, it made the notation much simpler if I thought of a and b as a collection of column vectors. That means for both a and b, I have n column vectors, each of which has m entries. I also define AT similarly:

Just to be concrete:

Now it is easy to see that the left-hand side breaks down as follow:

We can look at the right-hand side now:

If is a real matrix, then the matrix is positive semidefinite.

First, let’s define the matrix to be

To test if a matrix H is positive semidefinite, we need to prove that for any vector ,

Okay, in this case , so we need to prove the following:

(1)

First, let’s define

Then

Okay, now let’s substitute y into (1):

A probability problem

What we want to find:

What we know:

Well, looks like we need to use Bayes Rule:

In our case, this becomes:

We have pretty much everything we need, EXCEPT . I found this by filling out the matrix:

Let’s solve the joint probabilities first:

And then &

Now let’s get back to solving Bayes rule:

Stats operations using linear algebra