
Subject: Re: Decompose a matrix

Posted by [jameskuyper](#) on Wed, 19 Dec 2007 13:16:00 GMT

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d.poreh@gmail.com wrote:

```
> Folks
> I have a problem could anyone help me?
> Let:
> A = [[ 0,0,1], $
>      [ 0,1,0], $
>      [ 0,0,0]]
> B = [0.5,0.5,1]
>
> ; Decompose A
> SVDC, A, W, U, V
> ; Solve A.X=B
> X=SVSOL(U, W, V, B)
> new_B=A##X
> IDL> print,new_B
>    0.500000
>    0.500000
>    0.000000
> Why new_B is not equal to B' ?
```

Because there is no value of X such that $A.X=B$. That's because one of the eigenvalues of A is 0. What this means is that while the possible values for X fill a three-dimensional universe, the possible values for $A.X$ only cover a flat two-dimensional plane within that universe. Whenever B is not on that plane, $A.X = B$ cannot be solved. Matrix inversion fails in this case, because A doesn't have an inverse. What SVD does in this case is calculate the value of X such that $A.X$ comes as close to B as possible while remaining on that flat plane. That is the advantage of using SVD over ordinary matrix inversion techniques.

Of course, a better solution is to re-define your problem so an exact solution is possible.

Subject: Re: Decompose a matrix

Posted by [Spon](#) on Wed, 19 Dec 2007 14:08:43 GMT

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On Dec 19, 12:15 pm, d.po...@gmail.com wrote:

```
> Folks
> I have a problem could anyone help me?
> Let:
> A = [[ 0,0,1], $
>      [ 0,1,0], $
```

```
> [ 0,0,0]
> B = [0.5,0.5,1]
>
> ; Decompose A
> SVDC, A, W, U, V
> ; Solve A.X=B
> X=SVSOL(U, W, V, B)
> new_B=A##X
> IDL> print,new_B
> 0.500000
> 0.500000
> 0.000000
> Why new_B is not equal to B' ?
> Thanks for any help in advance
> Cheers
> Dave
```

A simple workaround (read: cheat) is to make sure your Eigenvalues are `_close_` to zero rather than equal to zero. I guess it depends on how accurate you need your results to be :-)

```
A*=1.0
A[0,2]+=0.01
SVDC, A, W, U, V
X=SVSOL(U, W, V, B)
PRINT,TRANSPPOSE(A##X)
IDL> 0.500000 0.500000 1.00000
```

You'd probably want to do the whole thing in double precision so you could use a smaller zero-offset.

Take care,
Chris
