Subject: Re: fast svdc for Singular Value Decomposition?
Posted by on Mon, 03 Dec 2012 13:35:03 GMT
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Den måndagen den 3:e december 2012 kl. 09:41:18 UTC+1 skrev ivitseva:
> Dear All,
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> I'm running a Singular Value Decomposition in IDL using the svdc routine. The goal is to perform an extended EOF analysis (or extended PCA).
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> My input is a covariance matrix built from two time series images, each with 348 bands and with a spatial dimension of ns=360 columns * nl=180 rows.
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> Is there maybe a fast way to perform this decomposition?
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> Thank you very much in advance,
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la_svd is a better routine (see other recent thread) but I don't think it's faster by orders of magnitude. If you need that, generally your matrix has to have some special properties that you can exploit. For example, if it is block diagonal you should be able to calculate the svd of the

blocks and then combine the results into the svd of the whole matrix.

Subject: Re: fast svdc for Singular Value Decomposition?
Posted by ivitseva on Mon, 03 Dec 2012 17:16:30 GMT
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Thanks, I've tried la_svd as well but I had the same problem, indeed it isn't faster.

To be honest I do not understand what you mean under "calculating svd of teh blocks and then combine the results".

Could you please be more specicif?

Cheers,
Eva

On Monday, December 3, 2012 2:35:03 PM UTC+1, Mats Löfdahl wrote:
> Den måndagen den 3:e december 2012 kl. 09:41:18 UTC+1 skrev ivitseva:
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Subject: Re: fast svdc for Singular Value Decomposition?
Posted by DavidF[1] on Mon, 03 Dec 2012 17:28:45 GMT
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Have you had a look at this article:

http://www.idlcoyote.com/code_tips/eof_analysis.html

There is a trick described there for creating the covariance matrix that makes calculating the eigenvalues extremely fast (25 minutes the conventional way, verses seconds the fast way). It has been a LONG time since I did that, so I'm not sure I can help very much. About all I remember is that the Wilks book mentioned there, where I learned the trick, was worth about 10 times what I paid for it! :-)

Cheers,

David

Subject: Re: fast svdc for Singular Value Decomposition?
Posted by ivitseva on Mon, 03 Dec 2012 18:10:26 GMT
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Hi David,

I did not only look at it but implemented it as well. Then I compared your script with mine on a very small subset, and indeed the leading modes are very similar. However, only the leading modes, i.e. the first dimension, are the same, all the others are different. Your scripot is great, it is extremely fast, and is very useful if only the first dimension is of interest but I need to extract several dimensions.

I've written Excelsis or whatever the name now to ask for help, they are looking at it now. There must be a fast solution, don't hate me but I've run it in Idrisi that took about a minute. Or, as I wrote, Envi does it as well very fast if your time series is a layersctack of the two input series.

Anyway, thanks for your answer, I hope for a positive feedback from the company.

Cheers,
Eva

On Monday, December 3, 2012 6:28:45 PM UTC+1, Coyote wrote:
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Subject: Re: fast svdc for Singular Value Decomposition?
Posted by on Mon, 03 Dec 2012 20:40:11 GMT
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Den måndagen den 3:e december 2012 kl. 18:16:30 UTC+1 skrev ivitseva:
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Well, it only applies if your matrix is block diagonal. If it's not, then forget it.

So, assuming your matrix A is indeed block diagonal with blocks A1, A2, ... AN along the diagonal. Consider the SVD equation A = U W VT and write it in block diagonal form. Make U and V block diagonal with blocks the same size as those of A and numbered the same way. Also split the diagonal W matrix the same way. Then you'll notice that due to the off-diagonal zeros the SVD equation holds for each block index separately, i.e., Ai = Ui Wi ViT. So you can calculate the SVD of the Ai separately and put together the U, W, and V matrices from the results, which is faster than SVD of the entire A in one go due to the non-linearity of the problem.

Note that the singular values in W will not come out sorted in order of significance, so there is one additional step of book keeping where you sort W and reorder the columns of U and V appropriately.

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