## Subject: pseudo code for doing SVD on 2D sparse array Posted by erano on Sun, 21 Dec 2008 11:41:55 GMT

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Hi,
I wish to solve Ax=B
A is sparse array (size m\*n), in format of [x\_index, y\_index, value]
B is vector length m
x is unknown vector length n
n=1,000,000
m=2\*n

better to help with IDL code, but any idea is welcome!

Eran

Subject: Re: pseudo code for doing SVD on 2D sparse array Posted by Brian Borchers on Sun, 21 Dec 2008 14:46:45 GMT View Forum Message <> Reply to Message

On Dec 21, 4:41 am, erano <eran.o...@gmail.com> wrote:

- > Hi,
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- > B is vector length m
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- > n=1,000,000
- > m=2\*n

>

The title of your posting refers to the SVD, but the body of the posting indicates that you want to solve a linear system of equations, perhaps in the least squares sense.

Unfortunately, computing the SVD of your 2,000,000 by 1,000,000 sparse matrix is utterly impractical- it would require the storage of a 1,000,000 by 1,000,000 fully dense matrix and a 2,000,000 by 2,000,000 fully dense matrix, which would take up about 2.4e13 bytes of storage...

Finding a least squares solution to the system of equation should probably be done using an iterative method such as Isqr. In order to do this, you'll first want to convert your data into a MATLAB sparse matrix with

As=sparse(A(:,1),A(:,2),A(:,3));

```
Then solve with
```

```
x=lsqr(As,b);
```

Since your matrix is extremely large, this could take a long time or simply fail to converge. If so, you might want to loosen the default tolerance, introduce a preconditioner, etc. The documentation on lsqr explains how to do these things.

Subject: Re: pseudo code for doing SVD on 2D sparse array Posted by spellucci on Sun, 21 Dec 2008 16:30:22 GMT View Forum Message <> Reply to Message

```
In article <fb7c56d7-4124-4228-949b-aeb66116d298@t39g2000prh.googlegroups.com>,
Brian Borchers <br/> <br/>borchers.brian@gmail.com> writes:
> On Dec 21, 4:41 am, erano <eran.o...@gmail.com> wrote:
>> Hi.
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>> x is unknown vector length n
>> n=1.000.000
>> m=2*n
>>
> The title of your posting refers to the SVD, but the body of the
> posting indicates that you want to solve a linear system of equations,
> perhaps in the least squares sense.
>
this is only the (unfortunately usual) sloppy kind to write down a
linear least squares problem
> Unfortunately, computing the SVD of your 2,000,000 by 1,000,000 sparse
> matrix is utterly impractical- it would require the storage of a
> 1,000,000 by 1,000,000 fully dense matrix and a 2,000,000 by 2,000,000
> fully dense matrix, which would take up about 2.4e13 bytes of
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> Finding a least squares solution to the system of equation should
> probably be done using an iterative method such as lsqr. In order to
> do this, you'll first want to convert your data into a MATLAB sparse
> matrix with
>
> As=sparse(A(:,1),A(:,2),A(:,3));
```

> Then solve with

> x = lsqr(As,b);

- > Since your matrix is extremely large, this could take a long time or
- > simply fail to converge. If so, you might want to loosen the default
- > tolerance, introduce a preconditioner, etc. The documentation on lsqr
- > explains how to do these things.

## without matlab:

Isgr is available also through netlib (f77 code) but what about netlib/svdpack, which has code just for this problem? Isgr for such a large column space might run into trouble.

hth peter

Subject: Re: pseudo code for doing SVD on 2D sparse array Posted by Jeremy Bailin on Mon, 22 Dec 2008 15:07:25 GMT View Forum Message <> Reply to Message

On Dec 21, 6:41 am, erano <eran.o...@gmail.com> wrote:

- > Hi.
- > I wish to solve Ax=B
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- > B is vector length m
- > x is unknown vector length n
- > n=1,000,000
- > m=2\*n

> better to help with IDL code, but any idea is welcome!

> Eran

You said a couple of weeks ago that you'd gotten LINBCG to work on this... what problems are you having with it?

-Jeremy.

Subject: Re: pseudo code for doing SVD on 2D sparse array Posted by Evgenii Rudnyi on Mon, 22 Dec 2008 15:17:43 GMT View Forum Message <> Reply to Message

## Spellucci) wrote:

> In article < fb7c56d7-4124-4228-949b-aeb66116d...@t39g2000prh.googlegroup s.com >,

```
Brian Borchers <br/>
<br/>
borchers.br...@gmail.com> writes:
>> On Dec 21, 4:41 am, erano <eran.o...@gmail.com> wrote:
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> without matlab:
> Isgr is available also through netlib (f77 code) but
> what about netlib/svdpack, which has code just for this problem?
> Isgr for such a large column space might run into trouble.
> hth
> peter
It could be easier to compile SVDLIBC rather than the original SVDPACK
http://tedlab.mit.edu/~dr/SVDLIBC/
make under Cygwin happens to be enough and then
$ ./svd -r sth -o tt dat1.txt
seems to solve the problem matrix dat1.txt from SVDPACK
A good reference to SVD where I have found the link to SVDLIBC
http://en.wikipedia.org/wiki/Singular_value_decomposition
Best wishes,
Evgenii
http://MatrixProgramming.com
Subject: Re: pseudo code for doing SVD on 2D sparse array
Posted by erano on Tue, 23 Dec 2008 14:58:00 GMT
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On Dec 22, 5:07 pm, Jeremy Bailin <astroco...@gmail.com> wrote:
```

```
Page 4 of 5 ---- Generated from comp.lang.idl-pvwave archive
```

>> Hi,

> On Dec 21, 6:41 am, erano <eran.o...@gmail.com> wrote:

```
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>> Eran
> You said a couple of weeks ago that you'd gotten LINBCG to work on
> this... what problems are you having with it?
>
> -Jeremy.
```

Well, Yes and Not.

Basiclly, the LINBCG is working after the adding, but for large array the output seems with mistakes in some rows... so I'm looking for something better