Subject: Re: Fourier analysis of the Data with some gaps
Posted by Kenneth P. Bowman on Mon, 13 Apr 2009 15:44:21 GMT
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In article
<7cfa22f4-1133-48a1-9562-a84a0d932a6e@i28g2000prd.googlegroups.com>,
 "duxiyu@gmail.com" <duxiyu@gmail.com> wrote:

> Dear all,
>
> I want to take FFT on the data.
> But there are some shorts data gaps during this data interval.
> How should I deal with these gaps?
>
> Best regards,
>
> jdu

This is a very general question and there is no unique answer. You
need to be aware of the characteristics of the data.

You can interpolate to fill the gaps. (Many methods.)

You can use least-squares instead of FFT.

You can use various smoothing estimators.

I'm sure others can suggest additional approaches.

Ken Bowman

Subject: Re: Fourier analysis of the Data with some gaps
Posted by R.G. Stockwell on Mon, 13 Apr 2009 16:10:35 GMT
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"Kenneth P. Bowman" <k-bowman@null.edu> wrote in message
news:k-bowman-5F7B9B.10442113042009@news.tamu.edu...
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> This is a very general question and there is no unique answer. You
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I agree, and would go a bit further. There is no unique answer, and
no good answer.

> You can interpolate to fill the gaps. (Many methods.)

This is fine if the gaps are not too common, or too large.

> You can use least-squares instead of FFT.

The Lomb Scargle technique is often misused in this case.
It does a fit of a _single_ sinusoid, and calculates the significance
of it. It should not be used to calculate the spectrum (which of course
is exactly what the Numerical Recipe book does).
An actual least squares fit to all the fourier components, where there
is gappy data, is almost always an ill posed matrix. The sinusoids are
orthogonal
with regular sampling, but when you remove a point in the time series, those
sinusoids are no longer orthogonal.

Perhaps a local spectral technique would be appropriate, which gives
one the spectrum where there is data, and gaps where there are gaps.

Cheers,
bob

Subject: Re: Fourier analysis of the Data with some gaps
Posted by duxiyu@gmail.com on Tue, 14 Apr 2009 06:37:02 GMT
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Thank you for your explanation.
I am very intertesting in the local spectral technique you mentioned.
Could you recommend some references about it?

Best regards,
jdu

On Apr 14, 12:10 am, "R.G. Stockwell" <noemai...@please.com> wrote:
> "Kenneth P. Bowman" <k-bow...@null.edu> wrote in

messagenews:k-bowman-5F7B9B.10442113042009@news.tamu.edu...
>
>
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>> In article
>> < 7cfa22f4-1133-48a1-9562-a84a0d932...@i28g2000prd.googlegroup s.com >,
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Subject: Re: Fourier analysis of the Data with some gaps
Posted by R.G. Stockwell on Tue, 14 Apr 2009 16:39:25 GMT
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<duxiyu@gmail.com> wrote in message
news:55d7a5d9-0fc3-462d-a680-3be22f337271@k19g2000prh.google groups.com...
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Could you recommend some references about it?

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jdu
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There is a lot. A straight forward Short Time Fourier Transform is simple and easy to understand. Simply parse the time series into small overlapping regions and FFT it.

There are wigner type transforms, that in my opinion are very useful for real data with noise.

There are wavelets (two disctinct branches, you'd want the CWT with morlet wavelets or perhaps mexican hat wavelets if you are interested in local spectra.
Orthogonal wavelets are not directly related to the fourier spectrum)

And there is the S-transform, which is combination of STFT and Wavelets, and has several advantageous characteristics.

http://www.cora.nwra.com/stransform/

cheers,
bob

PS disclaimer, the ST stuff is mine, so I may be a bit biased when I say it is superior to all other methods for the analysis of transient quasimonochromatic
signals in geophysical data. :)
Source code is available on that website.

Subject: Re: Fourier analysis of the Data with some gaps
Posted by duxiyu@gmail.com on Wed, 15 Apr 2009 07:36:29 GMT
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Thank you very much.

It is very helpful.

Best wishes,
jdu

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> <dux...@gmail.com> wrote in message
>
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