

**Wiener Biometrische Sektion
der Internationalen Biometrischen Gesellschaft
Region Österreich – Schweiz**

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Einladung zum

Biometrischen Kolloquium

am Mittwoch, dem 27. April 2005, 16:15 Uhr

im Seminarraum (88.03.513) der
Besonderen Einrichtung für Medizinische Statistik und Informatik der
Medizinischen Universität Wien
Spitalgasse 23, 1090 Wien

Es spricht Herr Dipl. Ing. Bernhard Spangl vom Institut für Statistik
der Universität für Bodenkultur Wien zum Thema:

**On Robust Spectral Density Estimation with
Applications to the Analysis of Heart Rate Variability**

Wir ersuchen um zahlreichen Besuch für diesen sehr interessanten
und aktuellen Vortrag.

Karl Moder
Präsident

Werner Brannath
Sekretär

On Robust Spectral Density Estimation with Applications to the Analysis of Heart Rate Variability

Spangl B*, Dutter R

**University of Natural Resources and Applied Life Sciences, Vienna*

The analysis of heart rate variability as non-invasive method is increasingly used in medicine. In the present paper we concentrate on the frequency-domain analysis of short-term heart rate variability measurements (cf. Hartikainen et al., 1998).

The spectral density function is a commonly used tool when analyzing time series in the frequency domain. In order to get a robust estimate of the spectral density function, it turned out that cleaning the time series in a robust way first and calculating the spectral density function afterwards leads to encouraging results. Tatum and Hurvich (1993) propose a frequency domain approach to the problem of cleaning outliers in time series. They use robust regression to fit a sine and cosine coefficient at each Fourier frequency. These coefficients are then inverse Fourier transformed to get a filtered version of the data. On this basis, a cleaned version of the data is constructed in which most of the original series is unchanged and outliers have been replaced by a linear interpolation of all non-contaminated data points.

Following the idea above we present this method applied to simulated and real data. As a special practical application we focus on actual heart rate variability measurements of diabetes patients. The results of the proposed method are compared with those of conventional non-robust methods and another robust one proposed by Martin and Thomson (1982).

Literatur:

Hartikainen JEK, Tahvanainen KUO, Kuusela TA. Short-term Measurement of Heart Rate Variability. In: Malik M, editor. Clinical Guide to Cardiac Autonomic Tests. Dordrecht: Kluwer; 1998; 149-176.

Martin RD, Thomson DJ. Robust-resistant Spectrum Estimation. IEEE Proceedings 1982; 70(9):1097-1115.

Tatum LG, Hurvich CM. A Frequency Domain Approach to Robust Time Series Analysis. In: Morgenthaler S, Ronchetti E, Stahel WA, editors. New Directions in Statistical Data Analysis and Robustness. Basel: Birkhäuser; 1993; 195-203.