

# HOMework 3

## Correlated Noise LSP

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**Astronomy  
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### Unevenly-sampled signals: a general formalism for the Lomb-Scargle periodogram

R. Vio<sup>1</sup>, P. Andreani<sup>2,3</sup>, and A. Biggs<sup>4</sup>

<sup>1</sup> Chip Computers Consulting srl, Viale Don L. Sturzo 82, S. Liberale di Marcon, 30020 Venice, Italy  
e-mail: [robertovio@tin.it](mailto:robertovio@tin.it),

<sup>2</sup> ESO, Karl Schwarzschild strasse 2, 85748 Garching, Germany

<sup>3</sup> INAF - Osservatorio Astronomico di Trieste, via Tiepolo 11, 34143 Trieste, Italy  
e-mail: [pandrean@eso.org](mailto:pandrean@eso.org)

<sup>4</sup> ESO, Karl Schwarzschild strasse 2, 85748 Garching, Germany  
e-mail: [abiggs@eso.org](mailto:abiggs@eso.org)

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#### ABSTRACT

The periodogram is a popular tool that tests whether a signal consists only of noise or if it also includes other components. The main issue of this method is to define a critical detection threshold that allows identification of a component other than noise, when a peak in the periodogram exceeds it. In the case of signals sampled on a regular time grid, determination of such a threshold is relatively simple. When the sampling is uneven, however, things are more complicated. The most popular solution in this case is to use the *Lomb-Scargle* periodogram, but this method can be used only when the noise is the realization of a zero-mean, white (i.e. flat-spectrum) random process. In this paper, we present a general formalism based on matrix algebra, which permits analysis of the statistical properties of a periodogram independently of the characteristics of noise (e.g. colored and/or non-stationary), as well as the characteristics of sampling.

**Key words.** methods: data analysis – methods: statistical



Roberto Vio