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# The generalized mean value function approach: A new stastistical tool for the detection of weak signals in spectroscopy

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## Abstract

A 'universal' set of fitting parameters have been recognized (with the help of the eigen-coordinates method) which fit well to any random sequence of points. The methodology is developed within the space of moments and is based upon the definition of the correct fit to the generalized mean value (GMV) function. By fitting G(p) N it is possible to express quantitatively the reduced characteristics of any random sequence, thereby providing a possible instrument for differentiating between statistically close random sequences. It is suggested that this new approach might find application in certain spectroscopic measurements, in cases where the signal to noise ratio is low, but the stability of the noise and the influence of other external factors can be maintained. Those fitting parameters from the approximate analytical expression, which depend on the concentration of the small additive, can then be used for the construction of the quasi-monotonic line, defined as the calibration curve. In certain well-defined cases, the new approach might allow significant improvements in the sensitivity of analytical instrumentation particularly when the available analysis methodology itself is non-optimal or even considered unsuitable. To test this possibility we examined the application of the GMV method to the near-infrared detection of model micro-particles (in our case yeast cells) in an aqueous suspension, and thereby demonstrated the possibility of increasing the sensitivity of a certain spectroscopy by at least one order of magnitude.

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