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STATISTICAL ANALYSIS OF CENSORED DATA

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ABSTRACT

The measurements of a quantity, which can be out of the range of a measuring tool results in the so called nondetects. For randomly fluctuating lower/upper range such results are called random left/right censored data. The nondetects, which in fact represent a lack of data, carry for random censoring important information on a distribution of a measured quantity. In the lecture it will be discussed how the appropriate statistical analysis of random censored data can account for the nondetects. This statistical problem was solved more than half of a century ago by inventing the non-parametric Kaplan-Meier (KM) estimator, which the most famous statistical tool for analysis of duration of events in survival/failure analysis having many applications in medicine, engineering, economics and social sciences. Application of the idea of censoring in physics is quite new, which is surprising due to the fact that typical sensitivity or resolution limited physical measurements are usually random left censored data. As an example, it will be demonstrated in the lecture how the random left censoring can be used in the x-ray fluorescence analysis (XRF) applied to study the trace elements in biomedical samples. In particular, we show that even for quite high censoring fraction, say tens percent, the mean value of concentrations of studied trace elements can be estimated quite accurately, at a few percent level. Additionally, a comparison of two sets of censored measurements can be done using non-parametric Mantel-Haenszel log-rank test. This means that the censored data can be statistically fully analyzed in a non-parametric manner, which is very important feature. Finally, in the lecture both the general aspects as well as the historical development of random censoring will be shortly addressed.

REFERENCES

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