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Rethinking Statistics in a Digitalized World: the potential of Latent Variables Multivariate Statistical Models in Industry and Health 4.0

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We are living in a new era of digitalization, where there is a prevailing belief that, due to the sheer volume and speed at which data is generated, emerging technologies based on artificial intelligence are now capable of solving major problems across various domains (finance, society, industry, healthcare, etc.) solely through the analysis of empirical data—without the need for scientific models, theory, experience, or domain knowledge. The idea is that causality no longer matters; only simple correlation does. Some even go so far as to claim that Statistics is dead, having been rendered obsolete by the rise of Data Science. They view Statistics as outdated and statisticians as overly specialized professionals, skilled in techniques that are no longer useful and concerned with issues that seem irrelevant given the complexity of 21st-century challenges.

In this talk, I will attempt to shed light on the reasons behind these beliefs and share my perspective on the key factors that could help Statistics regain its societal recognition and its critical role as a key component in successfully addressing many of the problems facing our society. Most of these insights come from the teachings of Professor George EP Box, who has been one of the most influential people in my professional career.

In particular, I will address the potential of Latent Variables Multivariate Statistical Models to address some of the key challenges in Industry and Health 4.0. Among these, I will highlight the development of imaging biomarkers for early cancer diagnosis using non-orthogonal PCA, as well as constrained process optimization, raw material design space definition, and the development of a latent space-based multivariate capability index using historical data via Partial Least Squares (PLS) Regression. These approaches leverage the ability of PLS to model causality in latent space, even from historical data, which is characteristic of these highly digitalized environments.

Special/ Invited session

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Classification

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Presenter: FERRER-RIQUELME, Alberto J. (Universidad Politecnica de Valencia)**Session Classification:** Box Medal