

# Codifference as a practical tool to measure interdependence

Dr. hab. inż. Agnieszka Wylomanska,  
Faculty of Pure and Applied Mathematics,  
Hugo Stein-haus Center,  
Wroclaw University of Technology, Poland

Correlation and spectral analysis represent the standard tools to study interdependence in statistical data. However, for the stochastic processes with heavy-tailed distributions such that the variance diverges, these tools are inadequate. The heavy-tailed processes are ubiquitous in nature and finance. We here discuss codifference as a convenient measure to study statistical interdependence, and we aim to give a short introductory review of its properties. By taking different known stochastic processes as generic examples, we present explicit formulas for their codifferences. We show that for the Gaussian processes codifference is equivalent to covariance. For processes with finite variance these two measures behave similarly with time. For the processes with infinite variance the covariance does not exist, however, the codifference is relevant. We demonstrate the practical importance of the codifference by extracting this function from simulated as well as real data taken from turbulent plasma of Fusion device and financial market. We conclude that the codifference serves as a convenient practical tool to study interdependence for stochastic processes with both infinite and finite variances as well.