

# Statistical test for anomalous diffusion based on empirical anomaly measure for Gaussian processes

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## Abstract

The anomalous diffusion processes have found many practical applications in real-life data analysis. They manifest themselves in non-linear second moment. The main challenge is the proper identification of the type of the anomaly. The statistic that can be useful for this purpose is empirical anomaly measure (EAM), presented in [Katarzyna Maraj et al 2021 J. Phys. A: Math. Theor. 54 024001]. Based on our newest research, we provide probabilistic properties based on quadratic form for Gaussian processes of empirical anomaly measure ( $\widehat{AM}_X(\tau)$ ). Another important result is the construction of the statistical test for anomalous diffusion based on EAM. We check its effectiveness for simulated and real biological data. We also compare our test with this based on empirical autocovariance-based method. The utilized empirical anomaly measure is represented as the convolution of the empirical autocovariance function (ACVF) with appropriate time lags. For this reason, the presented statistic carries more informative than the classical ACVF.