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Bridge Monitoring with the Help of Local Distance Correlation

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When analyzing sensor data, it is important to distinguish between environmental effects and actual defects of the structure. Ideally, sensor data behavior can be explained and predicted by environmental effects, for example via regression. However, this is not always the case, and explicite formulas are often missed. Then, comparing the behavior of environmental and sensor data can help to identify similarities. To do so, a classical approach is observing the correlation. Nevertheless, this only captures linear dependencies. Here, the concept of distance correlation as introduced by Székely et al. (2007) comes into play. It is not only not restricted to linear dependence, but it is also able to detect independence and does not require normality. To respond to another particularity of sensor data, that is local stationarity, we use the extension of Jentsch et al. (2020) of this concept, the so-called local distance correlation. We show different examples of application in the field of bridge monitoring from finding similarities and anomalies in sensor outputs over the determination of time spans for temperature transfer up to possible alarm concepts for long term surveillance.

Type of presentation

Talk

Classification

Both methodology and application

Keywords

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