# Reliability quantification of Structural Health Monitoring on a test bridge using POD

**yogi Jaelani[1], Sylvia Kessler[1], Vamsi Krishna Rentala[2], Daniel Kanzler[2]**

[1]Department of Civil Engineering, Helmut Schmidt University/University of the Federal Armed Forces, Hamburg, Germany, [1]-, Applied Validation of NDT (AV-NDT), Germany

Structural Health Monitoring (SHM) is a well-established method for infrastructure assessment that continuously gather data of the structure as basis for condition assessment. One of the main aims of SHM in health assessment is the ability to detect and to localize damage. Damage detection methods can be classified into two main categories, physically based approaches, which focus on the finite element model and structural identification techniques, and data-based approaches, which rely on data collection and signal processing. Regarding the approaches, one of the main challenges of damage diagnosis is the lack of data from damaged states, thus making it difficult to validate new approaches in the research and development stage. However, the successful deployment of SHM systems on real civil infrastructure depends mainly on the reliability of the SHM itself. For non-destructive testing (NDT) systems, the Probability of Detection (POD) is an accepted approach for quantifying the reliability of defect detection. In contrast to NDT, there is no generally applicable procedure to assess the reliability of SHM systems. Several studies developed models for POD applied to SHM, such as Length at Detection (LaD) and Random effects Model (REM) but not for civil engineering structure (e.g., bridges). To address these issues, a vibration-based monitoring campaign is conducted on a two-span test bridge in damaged and undamaged conditions. The recorded data captures long-term ambient data under changing environmental conditions, as well as short-term ambient data from four damage scenarios with well-defined damage scenarios. The current work shows the reliability assessment of SHM using POD models based on the vibration-based monitoring data including data from a calibrated FE model of the test bridge.