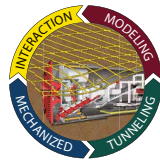


STATIK &
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SFB 837
Interaction Modeling in
Mechanized Tunneling

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REAL-TIME STRUCTURAL HEALTH ASSESSMENT OF SEGMENTAL TUNNEL LININGS

Doctoral defense by **NICOLA GOTTARDI**

Friday, 24.10.2025 – 14:30 - 18:30 – IC 02/158-88

The underground network has been constantly expanding, and one of the challenges is ensuring safety, operability, and durability of tunnels throughout their service life. In this context, structural health monitoring (SHM) plays a crucial role for the evaluation of the tunnel lining performance and safety. Tunnel lining health assessment faces unique challenges due to limited accessibility to critical areas and a sparse availability of measurement data compared to the complexity of the structural system. The objective of this thesis was to develop a framework to accomplish comprehensive SHM of segmental tunnel linings, by leveraging the benefits of

computational and surrogate models to accommodate a limited monitoring of the structure. Numerical simulations are employed to generate synthetic data, which are used to train surrogate models capable of reconstructing the lining structural state, accounting for possible damage, and its loading conditions based on limited measurements. The SHM framework proposed in this thesis, validated on experiments and a tunnel project, represents a flexible approach adaptable to various monitoring configurations, enabling real-time evaluations of the structural health of segmental linings to ensure tunnel operability and safety in a cost-effective manner.

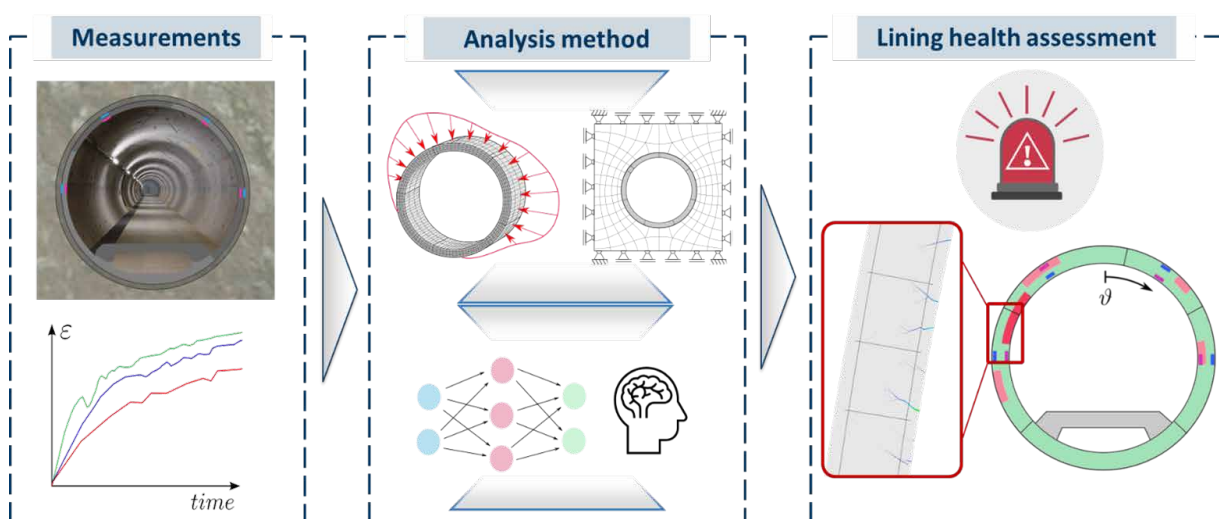


Figure: Framework structure for real-time structural health assessment of segmental tunnel linings.