



TLS-Defo: Advanced Monitoring of Infrastructure

When: September 7-11, 2026

Duration: 5 days full-time

Where: University of Bonn, Germany

Motivation

This summer school is designed to get insights in using Terrestrial Laser Scanning (TLS) for deformation analyses. Participants will gain expertise in several stages of the process chain — from data acquisition and quality assessment to deformation quantification and interpretation.

Target Group

MSc and PhD students with a background in Engineering Geodesy, Geomatics, Remote Sensing, or Photogrammetry as well as in Earth Science and Structural and Civil Engineering with basic knowledge in TLS.

Participation Fee

700 Euro, covering accommodation, breakfast and lunch. Dinner will be provided on three days. In exceptional cases (valid justification needed), participants can apply for a scholarship via email to tls.defo.summer-school@uni-bonn.de

Keynote Lectures

Prof. Dr.-Ing. Heiner Kuhlmann, University of Bonn
Deformation Analysis Based on Terrestrial Laser Scanner Measurements: DFG Research Unit TLS-Defo

Prof. Roderick Lindenbergh, Ph.D., TU Delft
Lessons learned from Permanent Laser Scanning

Prof. Dr.-Ing. Manfred Bischoff, University of Stuttgart
On the Interplay of Design, Geometry and Analysis -- A Structural Mechanics Perspective

Excursions

Two excursions are offered during the summer school.

Postersessions

Each participant is required to present a poster about their work at their home institution (M.Sc. Thesis, PhD topic, ...).

Workshops

At summer school, each participant will attend at three workshops (one full day, two half day). Assignment of participants to workshop is based on indicated preferences. Confirmation will be provided in due time to allow for adequate preparation.

Full day workshops

Generating High-End Point Clouds – From Data Acquisition to Quality Assurance

- Acquire high-end georeferenced TLS point clouds, including measurement design
- Minimizing random and systematic errors due to measurement setup and data evaluation
- TLS calibration parameter estimation and impact analysis on point clouds using reference geometries

Point cloud-based Deformation Analysis – Standard procedures and advanced methods

- Point cloud comparison methods (C2C, C2M, M2M, M3C2) for deformation analysis.
- Advanced feature-based and surface-based (B-spline) statistical approaches.
- Practical exercises and comparison of all methods using real data.

Half day workshops

Freeform surface representation from TLS-Point clouds

- B-spline-based surface reconstruction from TLS point clouds for deformation analysis.
- Practical application on test specimen: from data acquisition to parameter estimation including model selection and quality assessment
- Basis for advanced point cloud-based deformation methods.

Learning geometry - a practical introduction to Neural Distance Fields

- Introduction to Neural Distance Fields (NDFs) as neural implicit models for representing complex geometry.
- Hands-on training of NDFs from point cloud data while exploring key architectural and training parameters.

- Group discussion on how parameter choices influence the resulting geometric representation.

Low-cost LiDAR for geodetic monitoring: errors, limitations and capabilities

- Comparison of low-cost LiDAR and high-end TLS for deformation analysis of structures.
- Practical acquisition and evaluation of point clouds to assess accuracy and detect deformations
- Discussion of limitations and suitable monitoring applications.

Analysis of deformation of cylindrical objects based on the expansion of point clouds onto a plane

- Acquisition of dense point clouds using terrestrial laser scanning and analysis of deformations in cylindrical objects.
- Expansion of 3D surfaces onto a plane to enable improved visualization of measurement results and deformation analysis.
- Point cloud processing and deformation/intensity analysis using measured and provided datasets.

Detailed information

<https://www.tlsdefo.de/summer-school-2026>

Application

Application is only possible via this form at [\[link\]](#)

Required documents

- Curriculum vitae
- Motivation letter (max. 0,5 page)
- Description of research focus (max. 0,5 page)
- (Unofficial) transcript of records

Application deadline

April 15, 2026

Notifications of acceptance

May 18, 2026

Scientific Organizers

Prof. Dr.-Ing. Heiner Kuhlmann, University of Bonn (Chair)
Prof. Dr.-Ing. Christoph Holst, TU Munich
Prof. Dr.-Ing. Hans-Berndt Neuner, TU Wien
Prof. Dr.-Ing. Volker Schwieger, University of Stuttgart

Website: <https://www.tlsdefo.de/summer-school-2026>

Contact: tls.defo.summer-school@uni-bonn.de