Institut für Photogrammetrie
und GeoInformation

Leibniz Universität Hannover

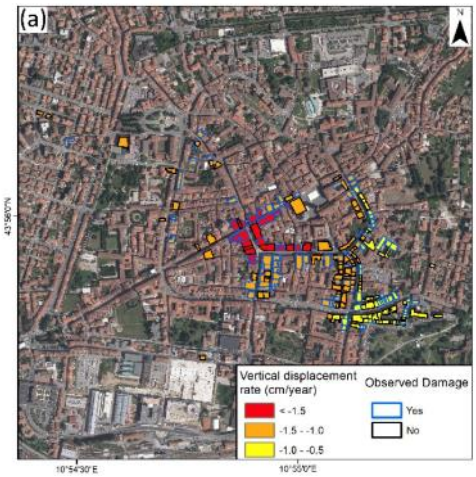
Risk Assessment of Buildings in Active Mining Areas Using Sentinel-1 InSAR Observations

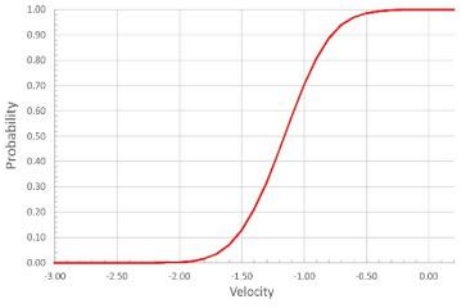
Active mining areas are prone to ground deformations, posing risk to the buildings and infrastructure. Traditional risk assessment methods often lack enough spatial and temporal resolution needed for a comprehensive risk assessment. Interferometric Synthetic Aperture Radar (InSAR) presents a promising solution by offering high-resolution surface deformation measurements. This proposed master thesis aims to use Sentinel-1 InSAR observations to assess the risk of mining-induced surface deformation to buildings in active mining areas through a combination of deformation gradients, building footprints, and additional relevant data.

To accomplish this goal, InSAR surface deformation observations from the European Ground Motion Service and German Ground Motion Service will be employed to estimate deformation gradients. Building footprints will be extracted from datasets provided by Google and Bing, supplemented by official building footprint data and additional information about property characteristics. Subsequently, risk assessment models based on traditional risk matrix and machine learning models will be developed to estimate the risk posed to buildings by surface deformation. Field observations of mapped building damages will be utilized to validate and refine the risk assessment model.

Throughout this thesis, the student will engage in the practical application of InSAR time series analysis as a powerful tool for geodetic measurements. They will have a unique opportunity to apply InSAR observations to real-world scenarios, gaining valuable insights into the dynamics of active mining areas. An ideal candidate for this thesis possesses proficient knowledge in Python or Matlab programming, with a willingness to further develop their expertise in Machine Learning. This thesis will be supervised by Dr.-Ing. Mahmud Haghshenas Haghighi and Prof. Mahdi Motagh.

Figure 1: An example of InSAR vertical displacement rate linked to building damages. Source: Ezquerro et al., 2020.





Fakultät für Bauingenieurwesen und Geodäsie

Institut für Photogrammetrie und GeoInformation
Prof. Dr.-Ing. habil. Christian Heipke

Dr.-Ing. Mahmud Haghshenas Haghighi
Tel. +49 511 762 - 2567
E-Mail: mahmud@ipi.uni-hannover.de

10.12.2024

Besucheradresse:
Nienburger Straße 1
30167 Hannover
www.ipi.uni-hannover.de