

THE COMBINED USE OF INTERFEROMETRIC SATELLITE DATA AND ARTIFICIAL INTELLIGENCE TECHNIQUES FOR THE STRUCTURAL HEALTH MONITORING OF THE BUILT ENVIRONMENT

PhD Course in Structural and Geotechnical Engineering and Seismic Risk

Dr. Andrea Miano

Abstract:

The need for increasingly widespread security checks, based on the high vulnerability of the Italian built heritage (buildings and infrastructures), represents a stimulus for the search of advanced techniques for the structural monitoring at different scales (individual construction or territorial level). In this context, the optimization of the combined use of interferometric satellite data and artificial intelligence techniques is appealing for the purpose of the continuous monitoring of the built environment. The seminar will include a background on the interferometric techniques to obtain the data, a discussion on the elaboration and interpretation of such data and finally the application of machine learning techniques to urban and regional levels to detect criticalities in the structures/infrastructures involved in the portfolio of the constructions. The analysis of the deformation evolution of selected buildings (both at single construction level and at a territorial level) will be presented in terms of velocity/displacement rates and statistics on the satellite measurements. Synthetic deformation maps of the areas will be then retrieved to identify critical structures/infrastructures. The seminar will also show practical applications of machine learning unsupervised algorithms applied to three areas within the city of Rome (Italy), imaged by the COSMO-SkyMed SAR satellite constellation from ascending and descending orbits (in the time interval 2011–2019).