Transportation Geotechnical Asset Management: Role of Novel Materials, Robust Designs, Innovative Technologies and Tools

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Abstract

Sound and stable transportation geotechnical infrastructure assets are crucial for mobility, efficient logistics, and enhancing the economic growth of a region or a country. Transportation geotechnics plays a major role in the development of sound infrastructure, as they are the primary interface that supports pavements, runways, embankments, and bridge infrastructure. Most of these infrastructure distresses are attributed to underlying geotechnical factors, designs that do not account for soil variability and reliable characterization, over-reliance on characterization that is not performance-based, and a lack of integrating and understanding weather and environment patterns into designs. This lecture describes some of these fallacies and their impacts on current transportation infrastructure design and their performance. This discussion will explore potential research solutions arising from major advancements that describe various innovative composite materials designed to enhance underlying soil properties, as well as advancements in

durability studies to screen soil treatments and reinforcements. Field validation is key to understanding the effectiveness of these methods. The lecture will also cover new advancements and technologies, including remote sensing platforms such as uncrewed aerial vehicles (UAVs) and Interferometric Synthetic Aperture Radar (InSAR) data from satellites for health monitoring of the infrastructure. It will also demonstrate the application of machine learning models to process data, providing a better understanding of factors that lead to quick and reliable assessments of transportation assets, thereby enabling proactive management of infrastructure network systems. All these works presented in this talk are based on research works performed by the authors and the research student group.