Building Digital Site Twins Using Geospatial Data and Artificial Intelligence

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Abstract:

Geospatial data applications often demand highly accurate 3D and physical representations, and precise feature distributions (e.g., vegetation and soil types, structures, land cover, etc.) that match the real world. Furthermore, for predictive and planning applications, the ability to modify these features and their distributions specifically or statistically is vital.

Recent advancements in Artificial Intelligence (AI) and Computer Vision, have enabled accurate and efficient processing, analysis, and segmentation of diversely sourced multi-spectral imagery. Duality has been exploring applications of deep learning and generative AI models for extracting layered, semantic information from available data, and using it to build digital "site" twins. These Site Twins incorporate and align all source data (e.g., elevation data, satellite and aerial images, road networks, etc.) into editable layers that can be recombined and recomposed to simulate predictive scenarios. This AI pipeline is already successfully employed in Duality's work, including OGC's Wildfire Disaster Planning (DP23) project.

This presentation covers:
● Deep Learning and Generative AI models for Object Detection, Pixel and Object Classification.
● Source data layers and resolution considerations.
● End-to-end demo on analyzing source-data and creating Site Twins using Duality's Falcon platform.
● Applied work in City Planning scenarios (traffic, flood, and evacuation) for a 200 sq-km city developed in partnership with Amazon Web Services (pending partner approval).