

# AI-Driven Development of Digital Twins of the Built Environment

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**Abstract:** Automation of the process of extracting features and objects from remotely sensed geospatial data is seen as the Holy Grail by the Built Environment research community and industry. Unfortunately, the current workflows and procedures to develop 3D models of the Built Environment require substantial manual effort. Those processes that are automated are limited to small datasets that are not representative of the current point clouds and other data being acquired or needed for Building Information Modeling (BIM). They are also limited in the types of objects that can be modeled. To this end, this study aims to develop a more holistic Scan-to-BIM process with two primary goals: (1) provide a scan-to-BIM validation tool by compiling a sizable collection of benchmark datasets with annotated point cloud scans and corresponding BIM models, creating a prototype validation server with metrics related to parameters of interest to stakeholders (e.g., evaluate the accuracy of modeled door widths, which are important to ADA compliance assessment), and (2) develop a prototype tool to implement a holistic Scan-to-BIM framework to rapidly and reliably generate BIM models from scan data that can be used not only to facilitate the development of the benchmark datasets but also used by stakeholders. A comprehensive cloud-based service for Scan-to-BIM is currently being built and it will be deployed to serve the Architectural/Engineering/Construction (AEC) community, and ultimately public as these models can decrease construction or renovation project costs of public infrastructure funded with taxpayer's money. Users would be able to select desired algorithms for key stages of the Scan-to-BIM framework based on their performance for specific applications and use cases.

**Bio:** Dr. Yelda Turkan is an associate professor in the School of Civil and Construction Engineering at Oregon State University. She holds a PhD in Civil Engineering from the University of Waterloo in Canada. Dr. Turkan's research interests and experience are centered on the areas of remote sensing, and information technology (IT) applications for construction engineering and management, and resilient Built Environment. She leverages tools such as BIM, lidar, augmented and mixed reality (AR/MR) to innovate planning, monitoring, and controlling construction operations, and improve decision making in the Built Environment. She leads a research team conducting research in automation and IT in construction domain. Dr. Turkan has over 80 publications. She is an Associate Editor for ASCE OPEN Journal since 2023. Also, she has been serving on the editorial board for Advanced Engineering Informatics Journal since 2020. Her research program has produced more than a \$3.5 million in grant support, and supported by agencies including the NSF, FHA, and the National Cooperative Highway Research Program among others. Dr. Turkan is the vice president of the International Association for Automation and Robotics for Construction (IAARC). She also serves as the vice-chair of the ASCE Computing Division Executive Committee.

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