

# **Multi-Building Network Web-based Digital Tool for Accelerating Building Envelope Retrofit for Energy Efficiency: Towards a Fully Automated Process**

Lynchburg, VA

To develop a web-based digital tool (WBDT), to accelerate, improve the quality of, and reduce costs of, building envelope retrofitting for energy efficiency. The digital tool, which will comprise distilled information as well as a raw database, is to be developed using: (a) aerial-based information and hyperspectral imagery collected using advanced computer vision hardware and nondestructive testing (NDT) sensors, (b) autonomous quadrotors, (c) high performance computing (HPC), (d) interpretable machine learning (IML), and (e) cloud database. In collaboration with the National Renewable Laboratory (NREL), the resulting digital tool will be made public and organized by zones or connected communities (CC). For each CC, the WBDT will be a go-to source to assist decision making for buildings that share comparable retrofit needs due to their geographical proximity, similar façades, and other resemblances. Furthermore, the proposed tool could be used by researchers and data analysts to advance knowledge on building science. The project has the potential to: (a) significantly improve building envelope retrofit processes, (b) provide a scalable solution that can be easily augmented and expanded, (c) provide a transferable model that could be implemented in other locations, (d) advance parameterization of the envelope auditing process, and (d) enable research on building science.

## **Key Project Members:**

- Hector Medina, PhD (Team Lead), Mechanical Engineering Professor in the School of Engineering at Liberty University (SOELU)
- Feng Wang, PhD, Computer Engineering Professor in the SOELU
- Kyung Bae, PhD, Electrical Engineering Professor in the SOELU
- Carson Farmer, Graduate Student in the Mechanical Engineering Program in the SOELU
- Ralph Baeza, PhD, Principal Engineer at TLC Engineering Solutions LLC
- Borja Lopez, President at Innerspec
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## **Supporting Partners:**

- Ultrasonic Technology solution.
- National Renewable Energy Laboratory