

## PARIS: Precise Air-sealing Robot for Inaccessible Spaces

Team: NU Team PARIS (Boston, MA)

Retrofitting small residential buildings is the largest and most cost-effective decarbonization opportunity for the state of Massachusetts, as they comprise over 60% of statewide building sector emissions. Uninsulated, leaky attic crawlspaces are a major source of heat loss, contributing up to 15% of heating/cooling costs. However, retrofitting these spaces poses many challenges as they may be inaccessible, crowded with obstacles, and contain hazardous materials (e.g., vermiculite in existing insulation) and electrical hazards from wiring remnants. To address these challenges, **the team will develop a Precise Air-sealing Robot for Inaccessible Spaces (PARIS)**, which can traverse over ceiling joists, create a 3D feature map of existing conditions via sensor-fusion, and seal identified gaps with spray foam sealant. To address these challenges, **the team will develop a Precise Air-sealing Robot for Inaccessible Spaces (PARIS)**, which can traverse over ceiling joists, create a 3D feature map of existing conditions via sensor-fusion, and seal identified gaps with spray foam sealant. The platform will be available commercially for under \$10,000 and its autonomy will allow workers to complete other retrofit tasks while PARIS is in operation. The team will validate PARIS via increasingly more challenging testbeds (Phase 1: ideal environment free of obstacles / Phase 2: actual home environment). In addition, the team will collaborate with Massachusetts Clean Energy Center and Revise, major players in home energy assessment and retrofitting in Massachusetts, for commercialization. **PARIS will contribute to the objective of the E-ROBOT Prize** by 1) removing human workers from hazardous attic crawlspaces, 2) generating a 3D feature map to identify gaps in need of air-sealing, and 3) leveraging control of spray foam sealant for targeted air-sealing.

### Key Project Members

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### Partners:

- **Massachusetts Clean Energy Center (MassCEC)**, State Economic Development Agency, Boston, MA, Website: <https://www.masscec.com/>
- **Revise**, Home Energy Assessment Company, Haverhill, MA, Website: <https://www.callrevise.com/>