Cyber-Enabled Online Quality Assurance for Scalable Additive Bio-Manufacturing (Bio-AM)

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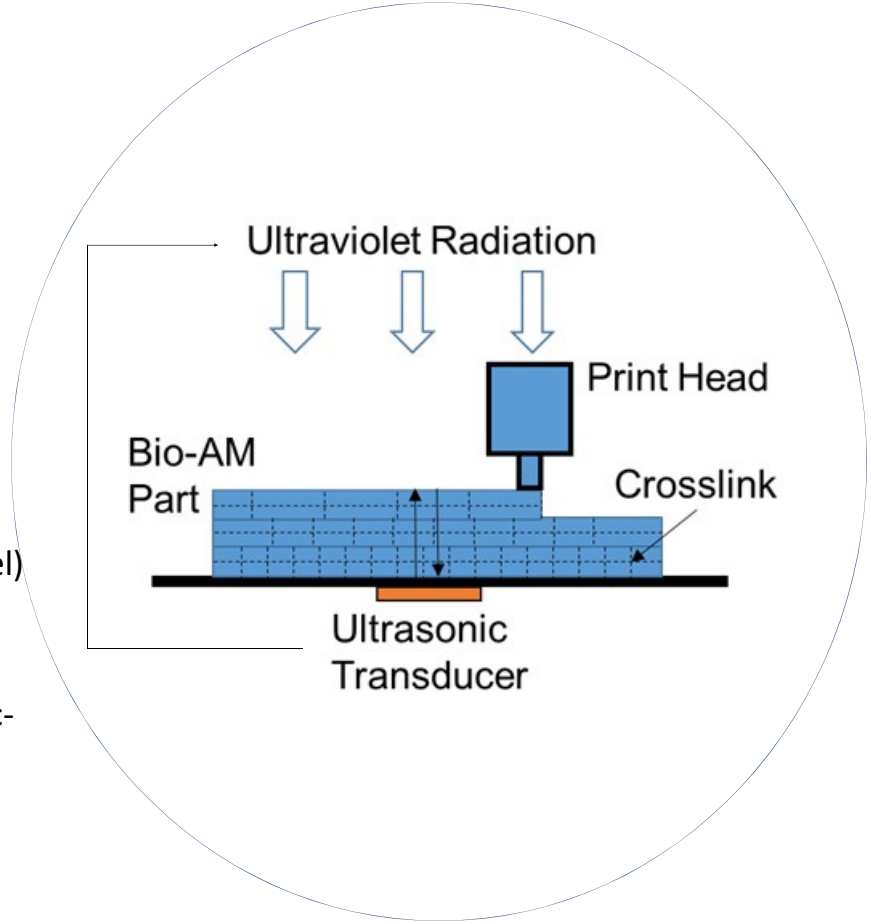
Challenge:

- Quality of additively biomanufactured tissues is limited.
- Lack of monitoring and control for additive biomanufacturing processes.
- In situ monitoring of material property data (quality measures) from soft materials.

Solution:

- Cantilever sensor-based closed-loop of printed material (hydrogel) mechanical properties
- Real-time sensing of hydrogel mechanical properties and structure data using piezoelectric-excited millimeter cantilever sensors.



Scientific Impact:

- Creation of sensor-based methods and high-throughput approaches for soft material characterization.
- Development of control strategies for similar cyber-physical processes (e.g., material processing or biological system oriented)

Broader Impact:

- Creation of new tools and processes for online monitoring of soft material rheological properties and closed-loop controlled
- This work benefits: users of hydrogels (e.g., researchers); the material processing community; and manufactures of hydrogel-based products (Bio-AM industry).
- Multiple graduate and UG students.
- Helped move BioAM processes from open- to closed-loop (novel abilities to monitor and control quality of engineered tissues).

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