

Application of Data Analytics to Additive Manufacturing

**Achievement:** Developed both static and streaming data heuristics for analytically making recommendations about when to halt an advanced manufacturing build as well as identifying build areas for further investigation.

**Significance and Impact:** Current trends in advanced manufacturing largely rely on microstructural analysis of builds in order to improve the manufacturing process. This work demonstrates that a multipronged approach which includes the use of data analytics can provide additional insight into failures. The research provides tools to automate precursor steps and hone in on areas of concern, thereby reducing the analysis time and pinpointing areas of concern.

**Research details:**

- Performed data cleaning and analysis; investigated and identified trends and patterns in the data.
- Developed and tested hypotheses for failure indicators using build data but without failure data.
- Identified areas of concern (possible failure regions) and validated results with patterns determined independently by SMEs.

**Sponsor/Facility:** Work was performed at ORNL. It was sponsored by DOE.

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**Overview:**

Recent advances in additive manufacturing have led to many success stories of large 3D printed objects (e.g., the Shelby Cobra car) and leave the industry poised for rapid growth. One of the many challenges is the certification process, which currently must be done for each part. During the build progression, many parameters have the potential to influence the formation of defects as well as the final geometry. While a large focus has been placed on understanding the microstructural properties from a material science perspective, the vast quantities of data generated during the build have largely been unexploited. This work describes a multi-pronged approach for data discovery, engaging multiple analytic tools as well as a framework to ingest and house the data itself in an effort to identify areas for potential improvement and promote the potential for advanced defect detection.