Optimization of 3D Printed metal parts by Experimental characterization techniques

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Challenges
Due to the nature of the processes which make printing of metals possible, there are inherent weaknesses and inconsistencies within the finished product. For parts with intended single use, high risk applications, such as in aerospace and biomedical industries, a defect in a part can pose the possibility of a catastrophic failure. In order for single parts to be safe and reliable, the elimination of defects from the build process must be guaranteed. The current protocol is to manufacture multiple parts and have each one tested post manufacturing. The best part is then selected for use. This process is both costly and inefficient.

Solution
By fully analyzing both internal and external features on a microscopic level and identifying correlations between defects within the material and visual cues on the surface, algorithms can be calculated to detect defects during the printing process to increase overall quality and consistency, as well as the development of machine learning systems.

Techniques:
- **Microscopy**: Using a microscope to view and image surface features
- **3D Tomography**: Using non-destructive X-rays to produce full 3D images of the internal features of objects by analyzing the differences in transmission of energy waves through the material.
- **Metallography**: The study of characteristics and features of metals using microscopy
- **Digital Image Correlation (DIC)**: A method of measuring the surface of an object using optical cameras. This can be used to calculate deformities, displacement, stress/strain, or any movement within an object under load during testing.

Industry Partnerships

**CHARACTERIZATION DATABASE**

Defect Identifying Algorithms and Characteristic Tracking

Product Development

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