MODELING ADDITIVE MANUFACTURING PERFORMANCE

Utilizing LLMs and ML to predict material performance in cold spray manufacturing processes

WPI

Rubble to Rockets (R^2)
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The Research Group

- **DARPA-funded program**
- WPI (PI: Danielle Cote), Citrine Informatics, and others

The Problem

- Metal alloy performance in additive manufacturing processes can differ greatly from traditional methods
- Cold spray additive manufacturing is increasingly used in defense applications, but not much data for many materials in how new alloys behave
- Build a model to predict cold spray performance from traditional performance

The Process

- Rapidly built complex **database** of cold spray **properties** using large langue models (LLMs)
- Integrated databases of traditional alloy properties and simulation tools
- **Assessed** uncertainty of cold spray performance from data and simulations

The Outcome

- Database includes ~50x more documents, ~23x more experiments, and ~10x more parameters than previous cold spray databases
- Robust prediction of cold spray performance, including uncertainties

Broad Range of Alloy Classes