V4 Institute

Driven by… NCDMM NATIONAL CENTER FOR DEFENSE MANUFACTURING AND MACHINING

Project: Manufacturing Design Type Certification

INTRODUCTION

Project Description

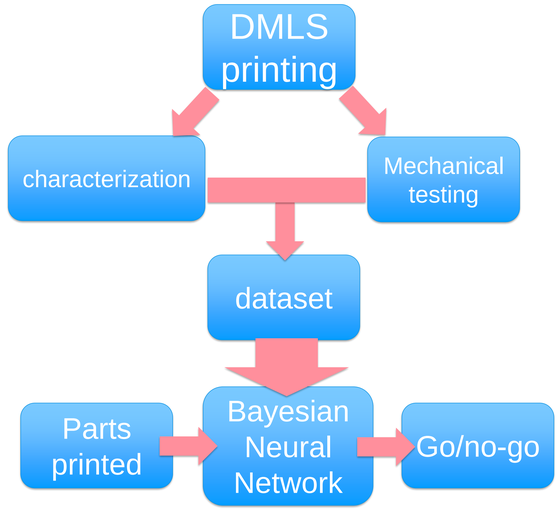
The goal of this project is to develop a modeling tool that will predict mechanical material properties of printed components that may contain one or more dimensional or structural defects. The modeling tool will reduce the amount of physical testing and printing of multiple iterations of components by 1) reducing the need for exhaustive mechanical performance testing; and 2) assessing the empirical impact of defects on the subsequent mechanical performance properties possibly widening or restricting the acceptance criteria of AM components with known defects. Project will be performed within the V4I Framework.

System of Interest

Long term: aerospace engine bracket and medical implants.
Short term: Direct Metal Laser Sintering (DMLS) printed tensile bars

Question being Answered

Can we use reduced order neural network model to increase confidence of quality control?



EXPECTED BENEFITS OF THE PROJECT

Use Case: Linkage between microstructure and mechanical properties
Optimize printer parameters to achieve desirable properties
Reduction of product development cost and time
Aid faster evaluation of the quality of the printed parts
Facilitate decision making to accept/reject a printed part

V4i: Continued development and practice with the V4i Framework and its value through the demonstration with the DMLS printed part study and other cross industry Use Cases (to be defined)

PROJECT APPROACH SUMMARY

- Establish Project related V4i Framework deliverables
- DMLS print tensile bars with variable printing parameters
- Perform extensive characterization of the microstructure
- Analyse statistically the fingerprints of microstructures
- Perform mechanical tests of printed samples
- Establish neural network model linking microstructure to mechanical property

Estimated Project Duration: 12 months after Project Agreement execution

FUTURE WORK

Demonstrate V4i value through cross industry Use Cases

- Aerospace parts
- Medical implants

PROJECT TEAM

- University of Notre Dame
- Johnson & Johnson
- Rolls-Royce Corp.