

BIOGRAPHICAL SKETCH

Zhicheng Zhang was born in Zibo, Shandong Province, China on September 8, 1991. He attended elementary school in Zhonghe Street Elementary School in September 1998 and graduated from Zibo No. 6 Middle School in June 2010. The following September he entered Shandong Normal University, Shandong Province, China; and in August 2012 he transferred to East Tennessee State University in the United States, where he earned his Bachelor of Science in Physics in 2015. He went on to earn a Master of Science degree in Mechanical Engineering from Tennessee Technological University in 2019, and Zhicheng anticipates earning his Ph.D. in Engineering with an area of focus in Mechanical Engineering in May 2022.

EDUCATION

Ph.D. Engineering
Tennessee Tech University, 2019 – 2022 (expected)

M.S. Mechanical Engineering
Tennessee Tech University, 2017 – 2019

B.S. Physics
East Tennessee State University, 2012 – 2015

B.S. Physics
Shandong Normal University, 2010 - 2014

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College of Engineering

TENNESSEE TECH

The Department of

Mechanical Engineering

Announces the Dissertation Defense of

Zhicheng Zhang

In Partial

Fulfillment of the Requirements

For the degree of

Doctor of Philosophy in Engineering

March 24, 2022

9:00 a.m.

Held in

Brown Hall, Room 236

Tennessee Tech University

Zoom Link: <https://tntech.zoom.us/j/5706264721>

FIELD OF STUDY

Mechanical Engineering

DISSERTATION TOPIC

Using Machine Learning Algorithms to Predict the Quality of Parts Fabricated by Low-cost Metal Material Extrusion Method

EXAMINING COMMITTEE

Dr. Ismail Fidan (Co-Chairperson)

Dr. Muhammad Ismail (Co-Chairperson)

Dr. Michael Allen

Dr. Andy Pardue

Dr. Ahmad Vasselbehagh

ABSTRACT

Additive manufacturing (AM) is a layer-by-layer manufacturing process, its applications are growing sharply in almost every field of daily life. There are various methods of AM, and Material Extrusion (ME) is the most widely used one. Low-cost Metal ME (LCMME) is a new ME technology used to fabricate metal composite parts using sintered metal infused filament material. During LCMME process, the samples fabricated need to be sintered in order to remove the internal polymer. Of course, the actual dimensions of the samples will change after the sintering operation. It is also evident that the sintered parts do not have the same mechanical properties with the pure metal parts fabricated by the traditional manufacturing processes. In this research, several Machine Learning algorithms are used to do prediction based on the collected data to predict the dimensional changes before and after sintering. Then the surface roughness and microstructure of the final parts are analyzed to evaluate the quality of final parts fabricated via LCMME process.