

Project Title: Use Computer Vision to Design of Failure Detection System for FDM 3D Printers.

Supervisor: Prof. Yu Zou (MSE & MIE)

Disciplines Required: ME(3)

Start Date: Jan. 15 or 30, 2021

End Date: Aug. 31, 2021

Application documents: CV, transcripts, and a short summary of research experience (if available)

NDA: Yes

Project Description:

This research will develop a failure detection system for use in monitoring and adjusting the additive manufacturing (AM) process, increasing the productivity and quality of fused deposition modelling (FDM) 3D printing objects via the deep learning (DL) algorithm. Currently, the failure rate on a commercial FDM 3D printer is around 20%, due to the misalignment and errors caused by the lack of precision and controllability. Moreover, any existing pre-printing optimization techniques such as slice engine enhancement, pre-printing simulation, and slicing parameter optimization cannot automatically diagnose printing errors during the printing process, failing to boost the success rate effectively. Therefore, it is necessary to use advanced machine learning technology to identify the failure types and correct the printing process. This project includes the camera bracket design, image acquisition and annotation, model training and evaluation.

Project Deliverables:

The developed failure detection system can detect various common failures (not sticking on the bed, under/over-extraction, etc.), and alter the printing process according to the discovered failure types. This system also can be accelerated through GPU computing and provide real-time surveillance to the 3D printing status. The expected target of this system is to accomplish a fivefold decrease in the failure rate of printers.