

## Research project and supervisory team

### Scholarship:

22CBIGE\_PH03 / PhD Scholarship in Machine Learning and Ultrasonic Sensing to Monitor Extrusion Processes

<b>Supervisory Team</b>	<a href="#">Dr. Philip Hall</a> <a href="#">Dr. Nicholas Waston</a> <a href="#">Dr. Zheng Wang</a>
<b>Short introduction &amp; description of research project</b>	<p>Extrusion is an industrial process utilising temperature and pressure to force feed materials through a die to produce materials of a specific geometry. These processes are commonly used in sectors such as polymers and food and drink. One challenge is in ensuring the final extruded materials are homogenous and free of internal defects. This is usually performed via offline non-destructive testing, however there is a need for real-time, in-line methods to reduce waste and costs.</p> <p>Ultrasonic sensors, utilising low power, high frequency mechanical waves are ideal in-line sensing technology due to their low cost and ability to operate non-invasively on a wide range of equipment including extruders. However, there is lack of suitable data analysis methodologies to correlate recorded ultrasonic signals with material properties.</p> <p>Machine Learning is a type of Artificial Intelligence that utilises predictive algorithms for classification or regression problems. The advantages of ML techniques include the volume and variety of data they can process and their ability to improve as more or better data becomes available. Machine learning has been utilised in a variety of manufacturing applications but have not been applied to monitor extruded materials using ultrasonic sensors.</p> <p>This project will focus on understanding the general steps required for ultrasonic sensors and machine learning to be successfully used to monitor the consistency of extruded composite materials. The project will include experimental data collection using ultrasonic sensors fitted to an extruder in addition to machine learning modelling.</p>
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