

Tim Newman

Data Science
Specialist

Automated Ultrasound at the NCC

Introduction

Angels trumpet

ML model based on A-scans

MAUDD

Automated deployment and data capture

Where next?

What does it mean and what do we want to do about it

Why automation?

Greying workforce

Everyone wants to retire and hard to get people to start

More parts

The rate at which composite parts are needed is going up

More complex

Each one is getting more complicated

Angels Trumpet

Raw unfiltered data

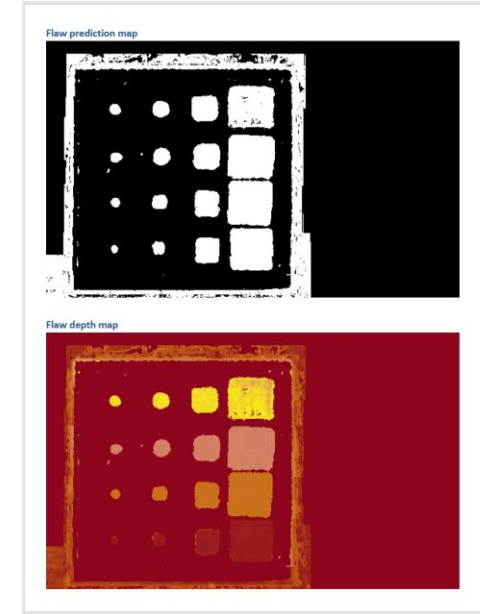
Hand labelled data set of $\approx 84K$ a-scans

2 Models

Classifier (flaw or not) and depth (what sample number is the problem)

Output is a report

Map of flaws then an enumerated list of flaws with statistics



Flaw descriptor
All flaws greater than 10mm²

	Image	min_x	max_x	min_y	max_y	width	height	area	mean_d	std_d	range_d	mean_prob
0		0	352	17	941	353	325	18318	0.11	0.057	0.445	0.957
1		241	305	125	184	65	60	3484	0.299	0.005	0.071	0.984
2		241	301	186	246	61	61	3426	0.163	0.004	0.104	0.971
3		242	304	59	117	63	59	3259	0.402	0.021	0.125	0.958

MAUDD

CIVC Cell

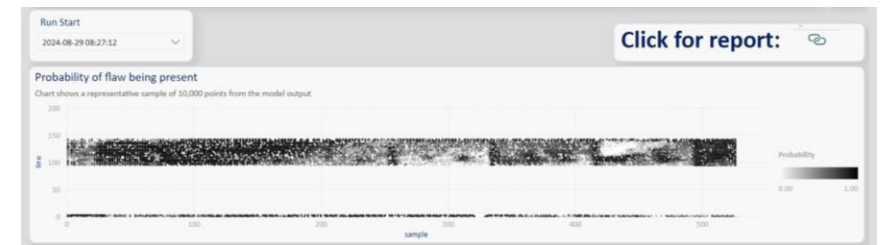
Robotic ultrasound scanner (right)

Continuous prediction

Capture data and save with model prediction

Display to PowerBI

A PowerBI report for each part and access to the full report



Why it sucks

Composite processes

Ply numbers, compaction, material etc

Part shape

Is there a flaw or is there a ramp

Subjective

Decisions on where a flaw is are subjective



How general is general enough

A universal model

A long way off

Specific part and process model

How general is general enough

Perfect is the enemy of good

All models are wrong some are useful

How it could not suck

Data fusion

Combine information (e.g. ply stack) with A-scan data

Different models

Kolomgorov Arnold Networks for signal processing

Lower the generalisation requirement

Try it for a specific production process

Let's collaborate

Academia

We have a machine and a gateway we can put models in to test at scale

Industry

We want to work on real parts

Study

There is enough here for at least one EngD

THANK YOU FOR YOUR ATTENTION

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