AutoNDE (Automatic Non-Destructive Evaluation) is an application containing a unique explainable AI for interpreting data collected with linear PAUTs (Phased Array of Ultrasonic Transducers). The development has been undertaken by using **Innovate UK** grants (for £1 M in total) to train the app on quality lab data. The data were produced by experts from CEA, Doosan Power Systems, TWI and Westing-house.

AutoNDE has been so far trained to character-ize fatigue, rough and stress-corrosion cracks as well as corrosion. Its module FFS_Assess can assess fitness for service of corroded vessels using ASME or BS EN stand ards. The AI modules of AutoNDE are custom Decision Trees, which are based on "if... then" rules and therefore, produce explainable results. It is a vailable online and as a stand-alone app.

Corrosion Assessment & Crack Characterization

AutoNDE contains a module FFS_ASSESS, which is capable of stitching individual scans into a large scale image of the vessel wall and then deciding which areas require assessment based on a minimum allowable thickness process.

Any area identified as needing assessment andcontaining no data contaminated by data from failed scans are assessed individually as per the standards.

In the event of an area failing to meet the requirements, an image of this area and details of the assessment are added to the report along with recommendations for rerating the vessel or else repair. The remaining life calculation is made, based on the corrosion rate identified by a human inspector, to provide a recommendation for the next inspection date.

The module capable of crack characterization combines signal processing, image processing and AI (in the form of an expert system) algorithms. It incorporates a novel flaw characterization algorithm, a modified variant of TFM (Total Focusing Method) and takes into account undulations in inspection surface and back-wall: First it uses the probe to locate a set of points on each surface and then it interpolates each surface using a polynomial of a degree identified automatically

When the same defect is imaged at different angles, whether using MTFM or different positions of the physical probe, comparing these images allows us to assess the subjective probability of the characterization being correct.
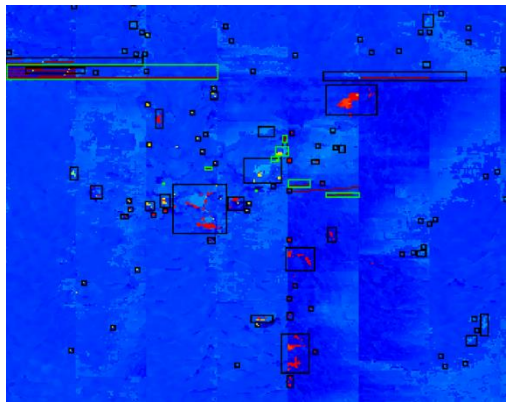
Corrosion Map
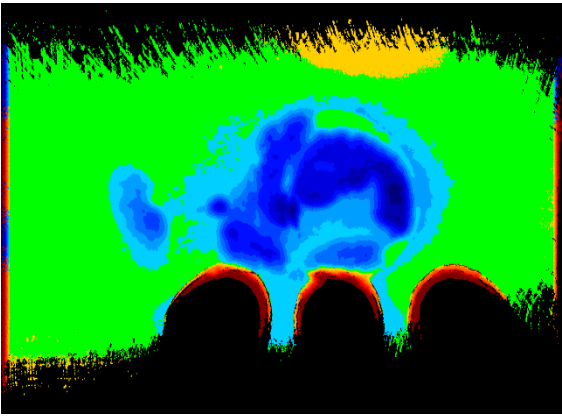
A Portion of the GUI
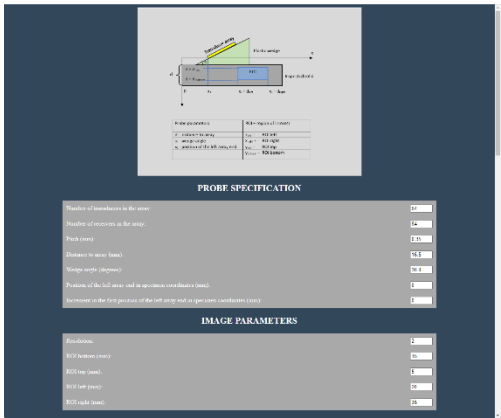
Composite Corrosion Map

Sample Report on a Rough Crack