

# Improved NDT Detection and Probabilistic Failure Prediction for Interacting Pipeline Anomalies



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## Main Objective

This project was awarded to Prof. Vikas Srivastava in order to (1) increase accuracy in nondestructive ultrasonic testing (UT) for flaw detection and (2) develop probabilistic failure prediction model for pipelines.

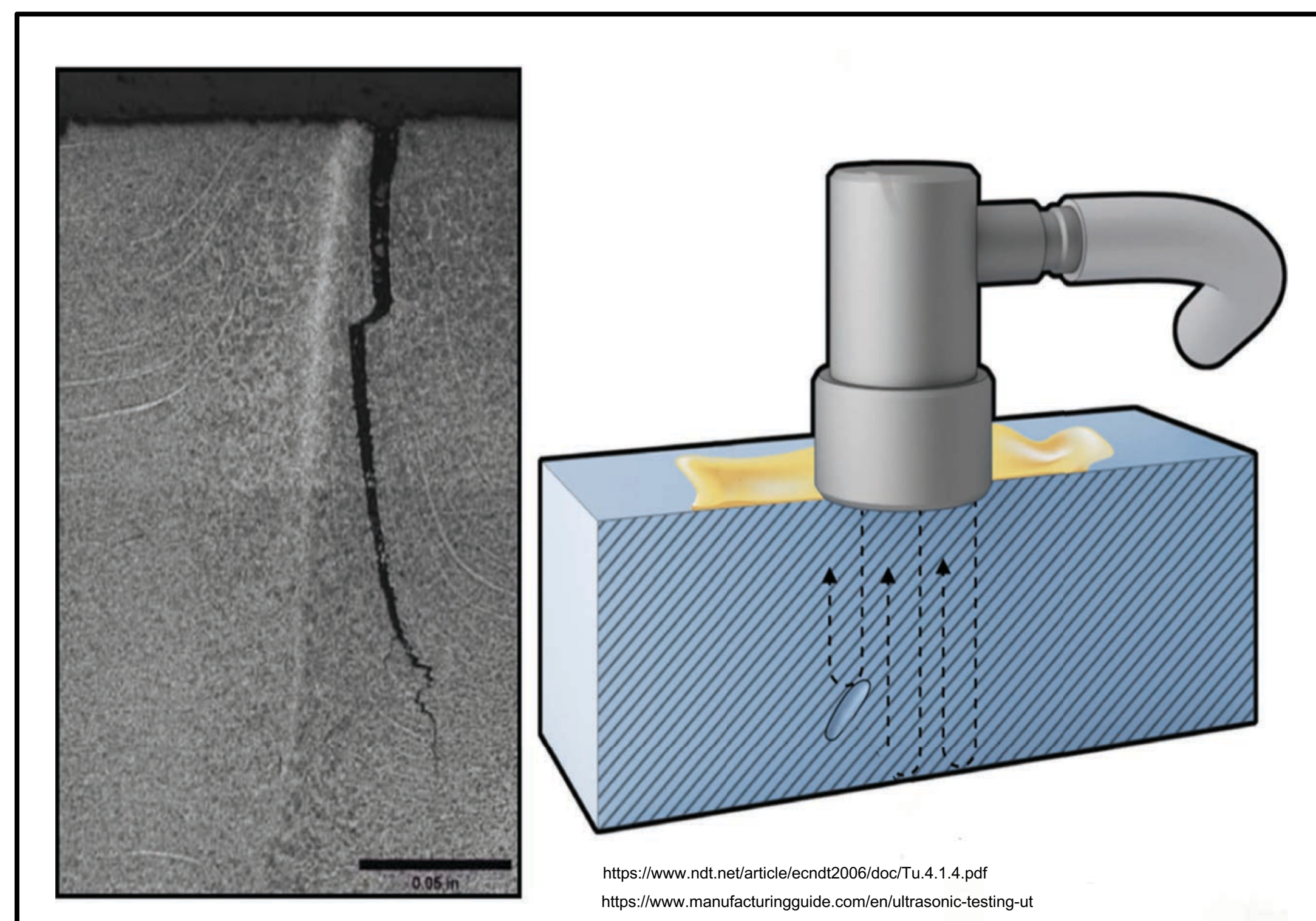


Figure 1. Flaw in pipeline and UT

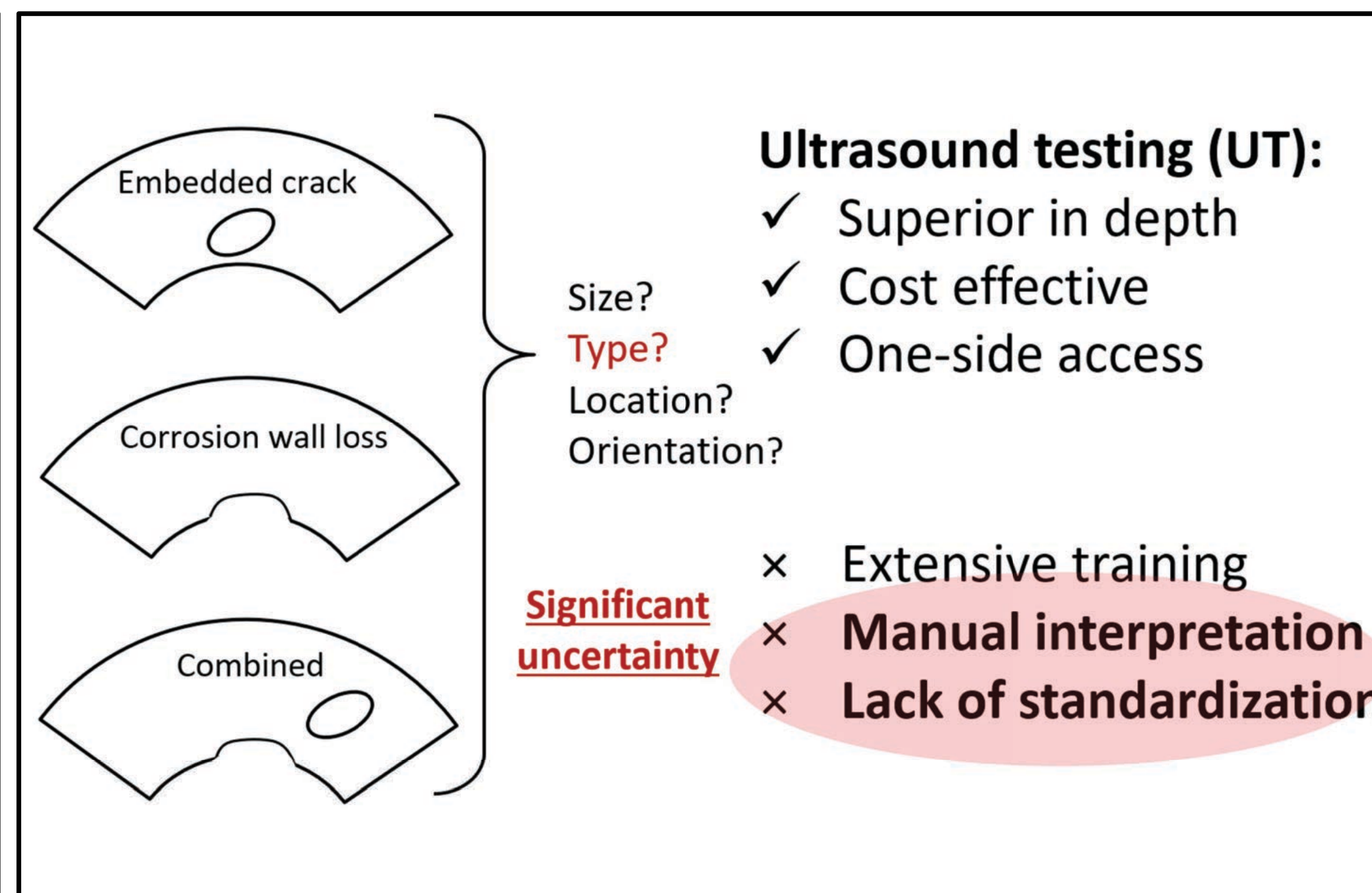


Figure 2. Flaw type and uncertainty in UT

## Project Approach/Scope

- Simulation data and neural network to improve flaw detection accuracy
- Develop improved damage model for pipeline failure prediction.

### Major tasks:

- Simulation capability for ultrasound
- Train and validate neural network
- UT validation experiments
- Physics-driven damage model
- Probabilistic failure equation

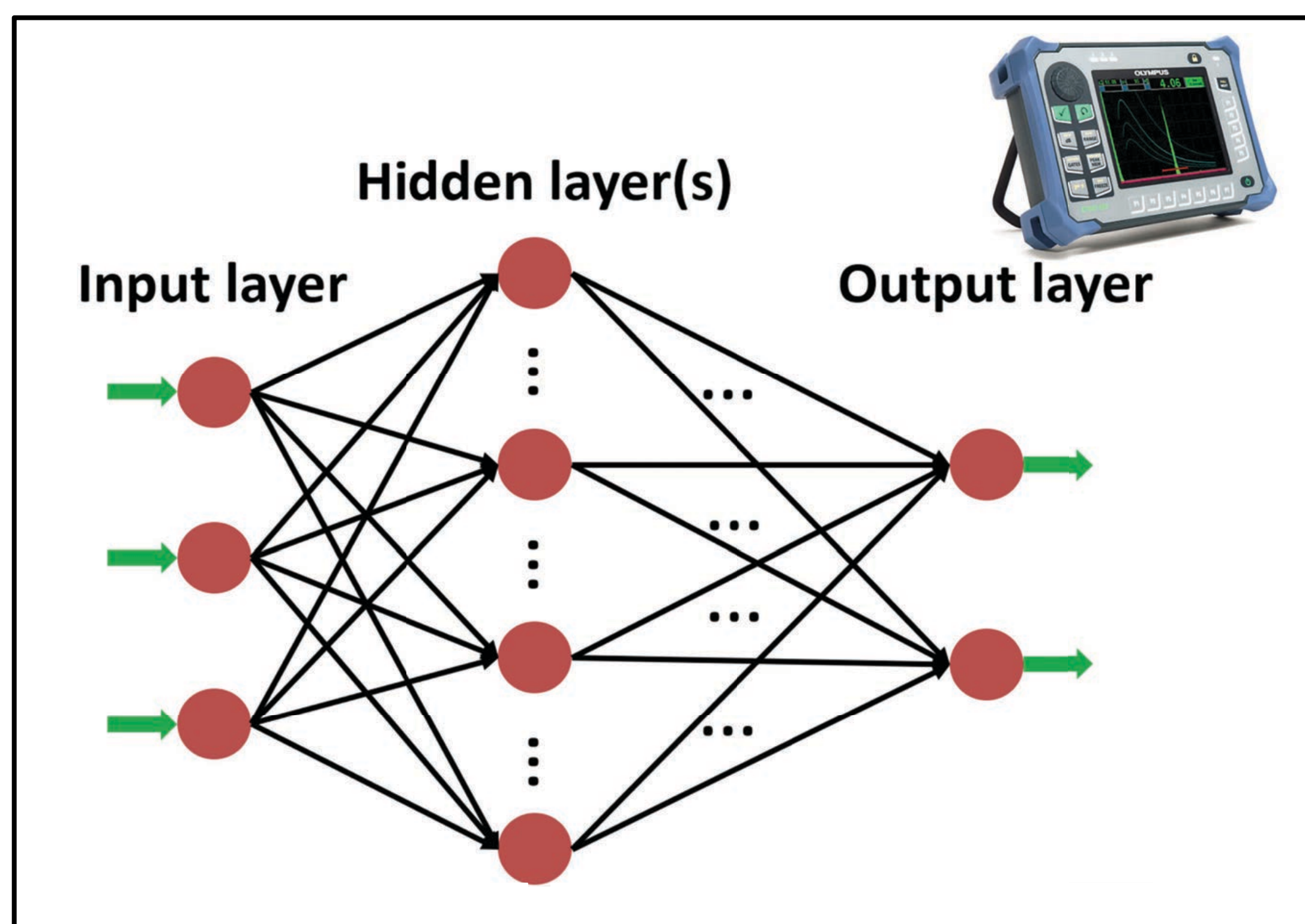


Figure 3. Neural network schematic

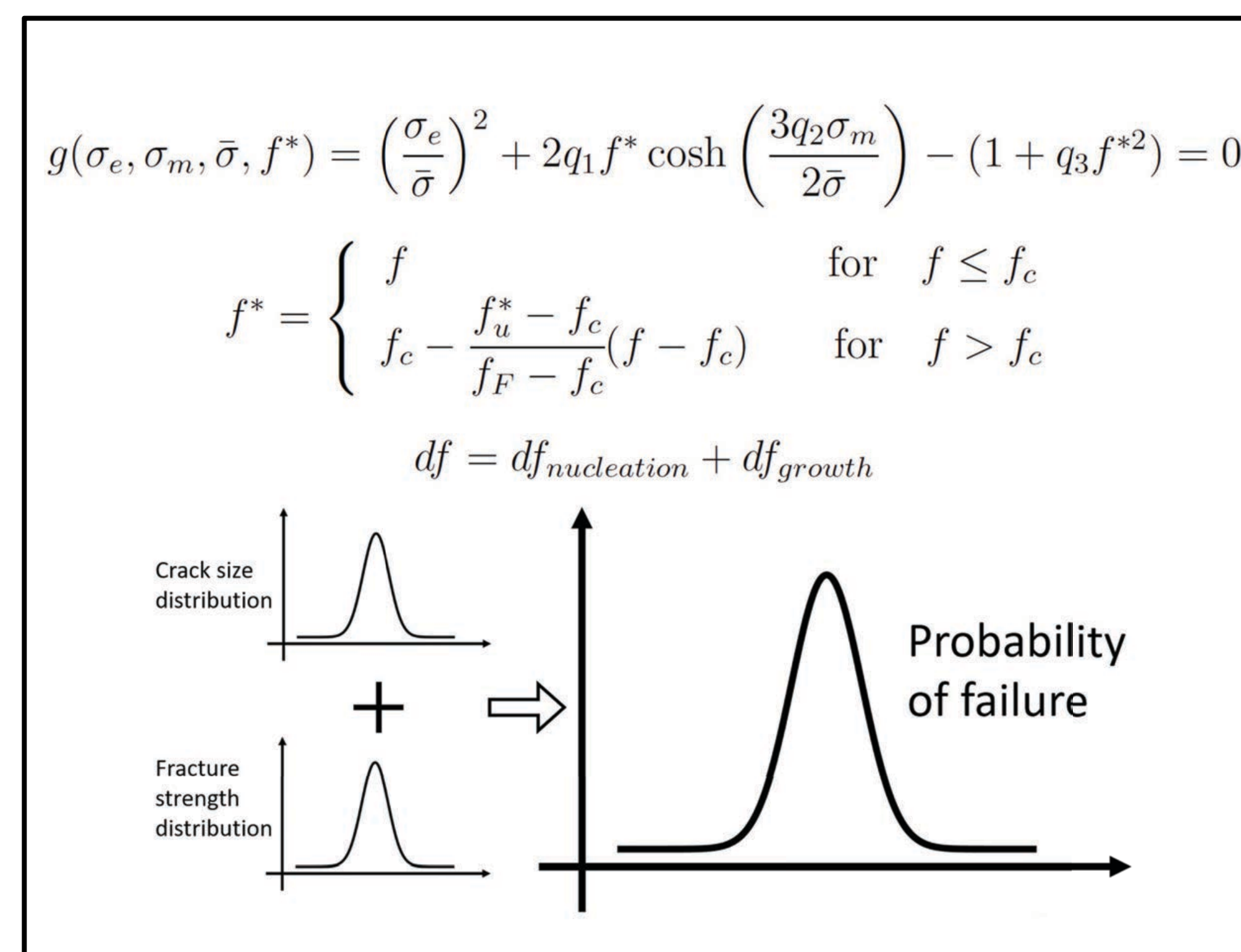


Figure 4. GTN model and probabilistic failure prediction

## Expected Results or Results to Date

- Finite element analysis (FEA) for ultrasound testing is established
- Currently running FEA for flaws with various sizes, locations and orientations
- Large simulation dataset will be created for neural network
- Training, validation and testing will be performed using neural network

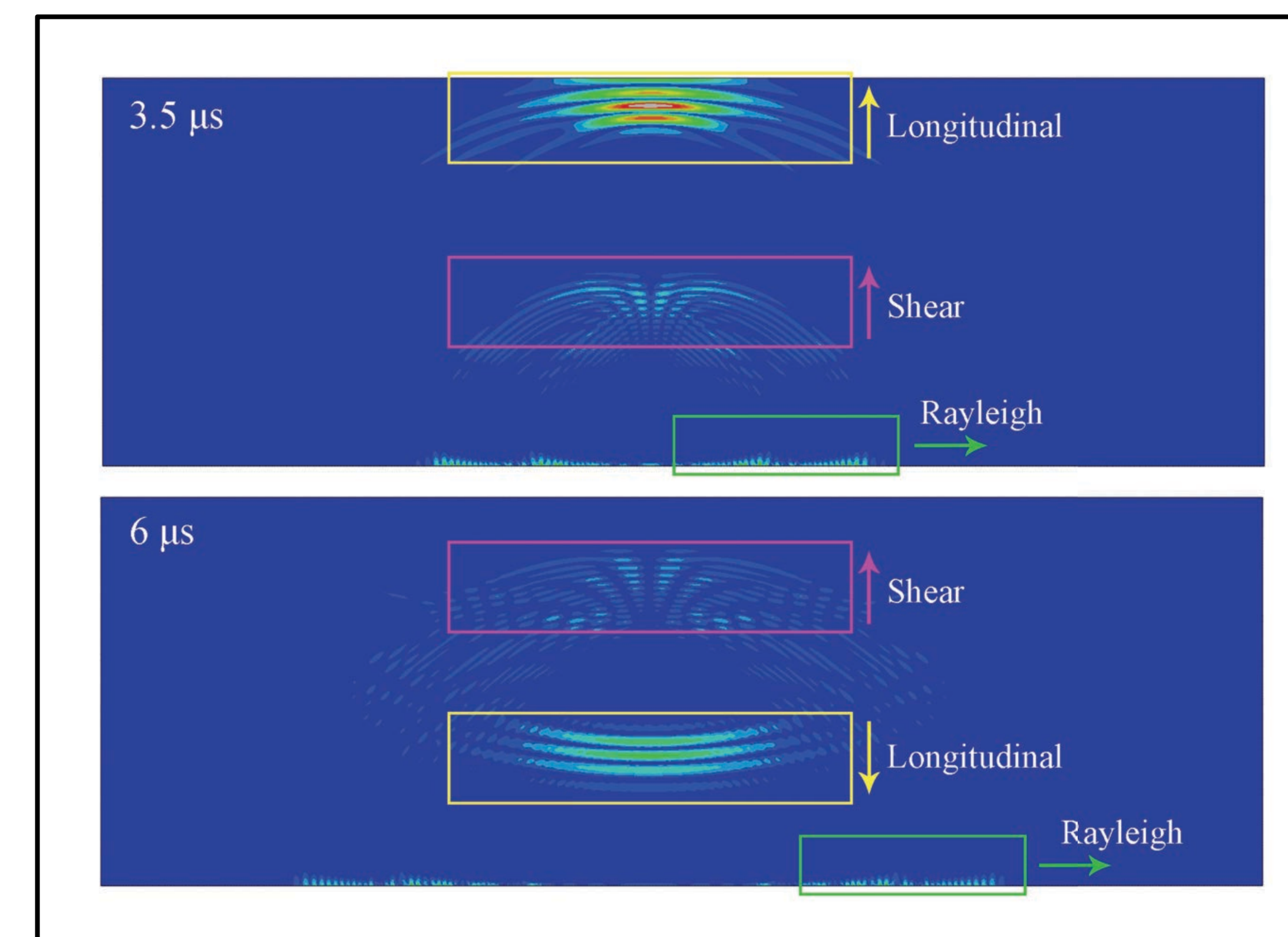


Figure 5. Modes of wave in simulation

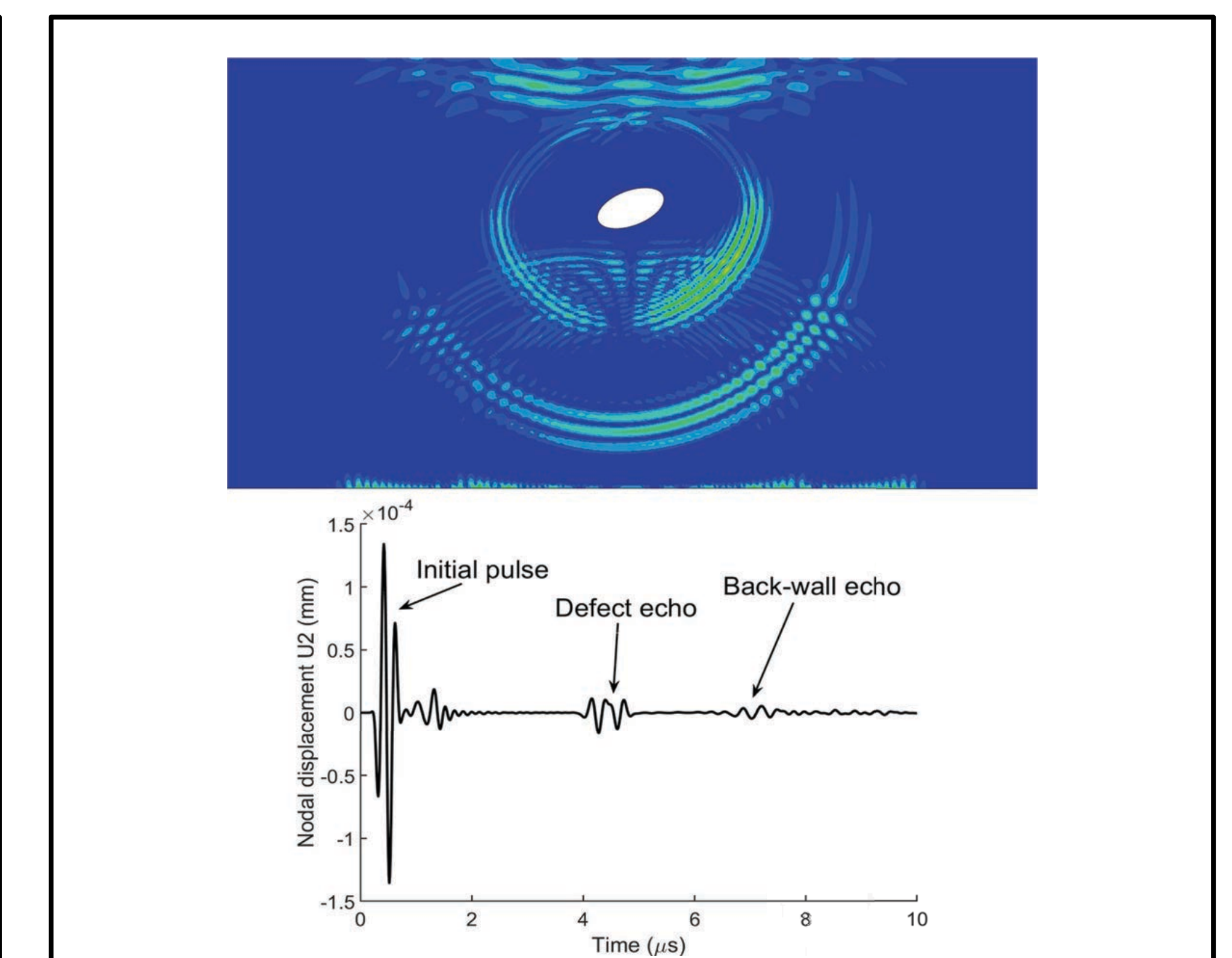


Figure 6. A-scan signal of flaw

## Acknowledgments

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## References

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## Public Project Page

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