

## Smart Robotic Biopsy Needle Path Planning for Lung Biopsy

NDR Medical Technology was founded in 2015 and developed the patented Automated Needle Targeting system (ANT) that can facilitate safe and accurate needle punctures to the organs such as lungs, kidney, pancreas and spine.

Integrating AI and robotics, they pioneer image guided robotic procedures with improved accuracy, precision and safety for patients.



*“Our project with AISG has helped us venture into new areas, successfully applying AI in medical robotics. It was a great experience partnering with AISG.”*

*Dr. S H Leong,  
Chief Scientific Officer*

### BACKGROUND

- Percutaneous image-guided biopsy has become a worldwide standard for accurate sampling of live tissue for diagnostic but there are still technology challenges to be overcome, e.g. accuracy of needle targeting and interpreting the correct lesion area for biopsy
- Current solution in the market i.e., remote-controlled robotic device is still heavily dependent on operator’s skills and experience to carry out needle positioning, which is tedious, costly, error prone and time consuming. Multiple needle pass attempts may also increase the risk of tumour cell seeding, among other complications.

### OUTCOMES

The AI solution enabled biopsy procedures to be more seamless and simplified, with the same accuracy and faster speed. This can improve the surgery yield, reduce false negative diagnosis, and relieve the heavy loading on Singapore’s hospital system.

The model was able to achieve high sensitivity on nodule malignancy evaluation and position estimation, reducing time and cost of filtering early stage critical cancers

Commenced First in Man trial in Japan in November 2022

Detected suitable nodule for biopsy and provided a safer path for needle puncture

### BUSINESS CHALLENGE

How can a robotics system that uses AI driven organ segmentation and lesion diagnosis coupled with image fusion (CT and MRI) be developed? How can AI enhance the accuracy of hardware and software components for lesion targeting?

### AI SOLUTION DEPLOYED

- An AI model to perform lung nodule detection and vessel segmentation using CT images was developed, based on the latest R-CNN and U-Net models at the time.
- The smart robotic guided system, Automated Needle Targeting for CT guided percutaneous procedures, was developed to provide trajectory path recommendations and assist physicians and interventional radiologists (IRs) in planning and accurate positioning of instruments during CT-guided percutaneous procedures