Year 10 – Project Update

- **10a.002.TAU_WP1: COVID-19 Severity Grading Using Chest X-ray Images**

Project Team

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Project Goals & Novelty of Approach

Accurate and fast detection of coronavirus disease 2019 (COVID-19) has utmost importance to prevent the spread of the disease.

The proposed Self-organized Operational Neural Networks (Self-ONNs) aims to segment COVID-19 pneumonia and discriminate it from other thoracic diseases using chest X-ray (CXR) images.

The largest CXR dataset with around 10,000 COVID-19 positive CXRs for the purpose of COVID-19 pneumonia segmentation and detection will be publicly available to the research community.

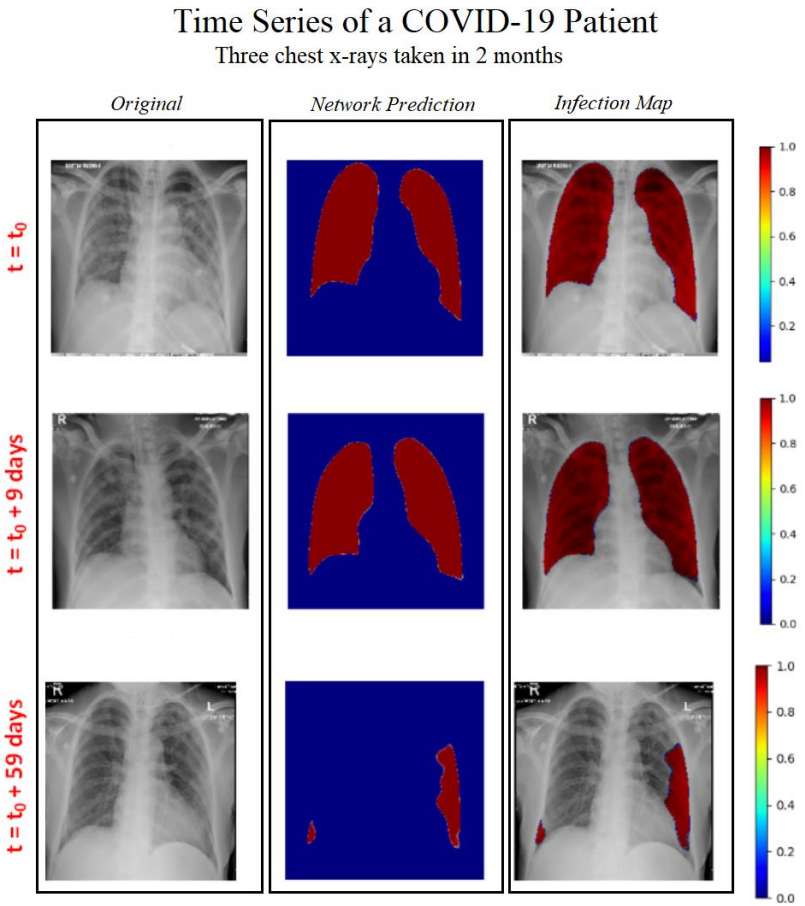
Benefits to IAB

Time-efficient and robust COVID-19 diagnosis that will overcome the spread of the disease.

Easy-to-use tool in health care centers, hospitals, and airports for the COVID-19 detection.

Patient monitoring during treatment via severity grading feature.

The largest chest X-ray dataset for the COVID-19 pneumonia segmentation and detection will be shared with the research community.



Project Accomplishments

- Dataset extension

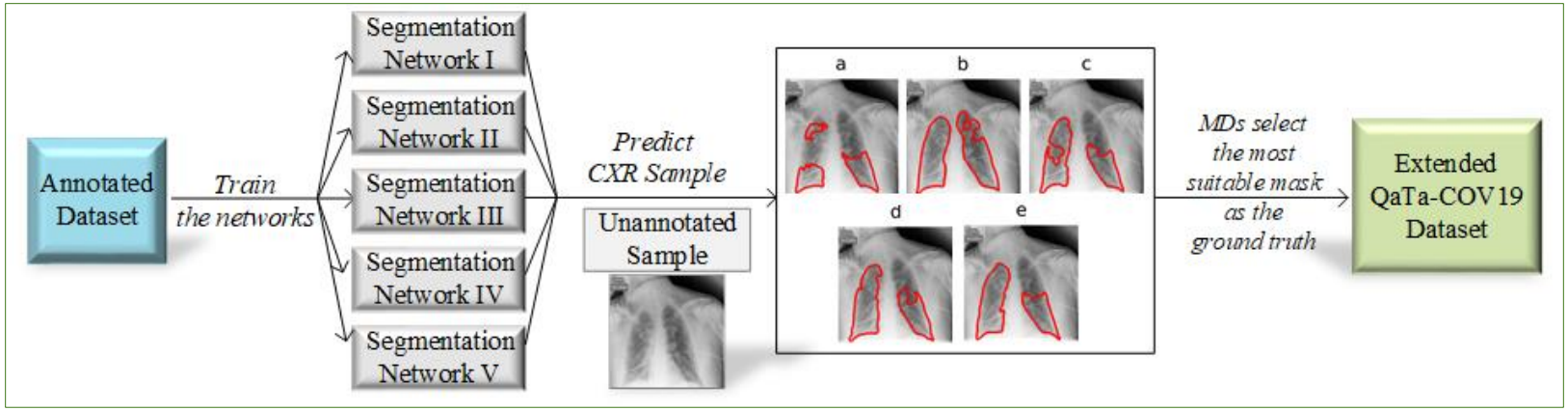


Table: Details of the dataset utilized for training the segmentation networks.

Data	Training Samples	Augmentation	Augmented Training Samples	Test Samples (Extended Data)
Control Group*	12,544	×	12,544	×
COVID-19	**2951**	✓	12,544	**6307**
Total	15,495		25,088	6307

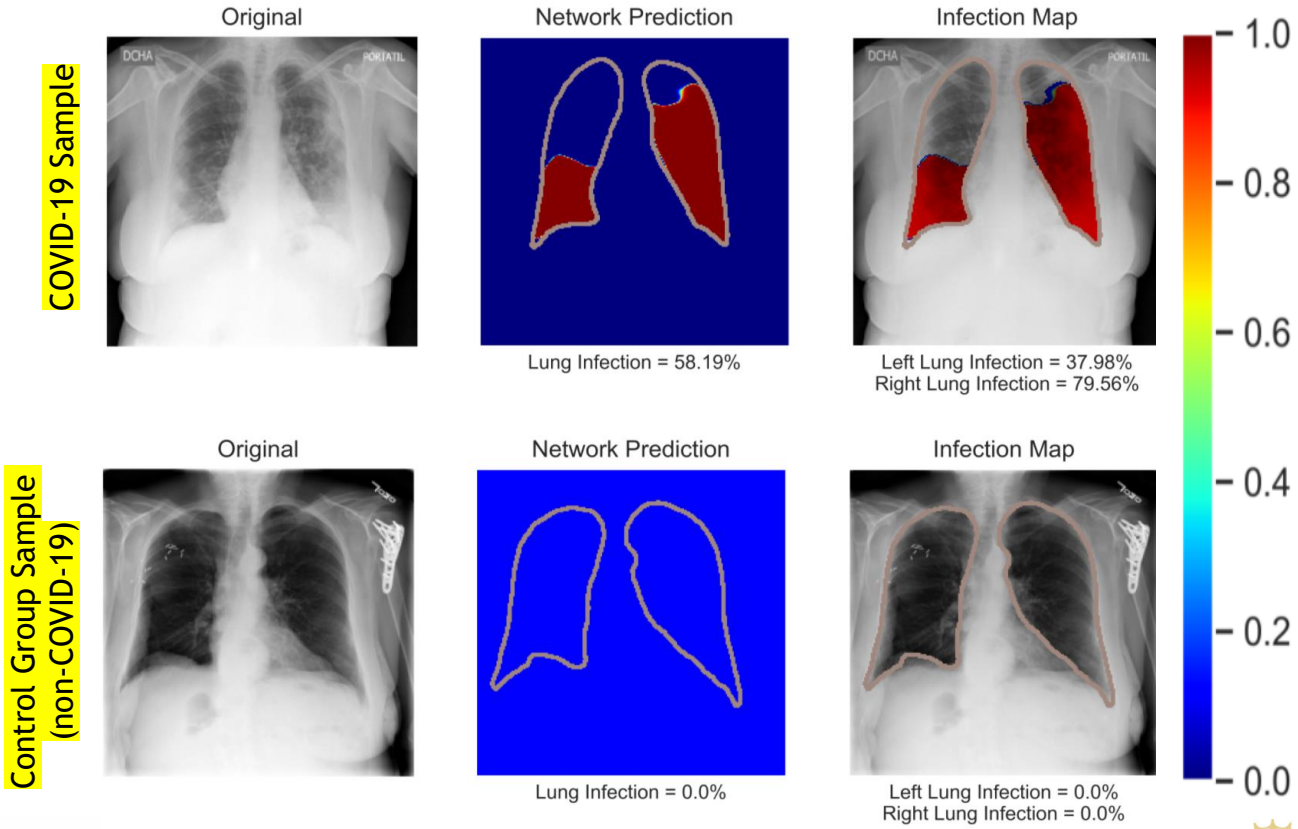
*Control group is formed by the chest x-rays of healthy subjects only since COVID-19 can be discriminated easily.

Accomplishment: In total, 9258 COVID-19 positive chest x-rays with their corresponding segmentation masks

Research Results

- Severity grading analysis

Merging the outputs of the infection map generator network and lung segmentation network for severity grading analysis, i.e., the percentage (%) of pneumonia inside lungs.



Next Steps/Deliverables & Timeline

Next Steps/Deliverables	Start Date	Completion Date
Dataset Extension	September 2021	Completed
Severity grading analysis	September 2021	Completed
Baseline models: State-of-the-art segmentation model implementations by transfer learning	December 2021	March 2022
Proposed model: Self-ONN implementation	March 2022	June 2022
Publication of the results	June 2022	Sept 2022

Questions?