Virtual NLST: Towards Replicating National Lung Screening Trial

CENTER FOR VIRTUAL IMAGING TRIALS

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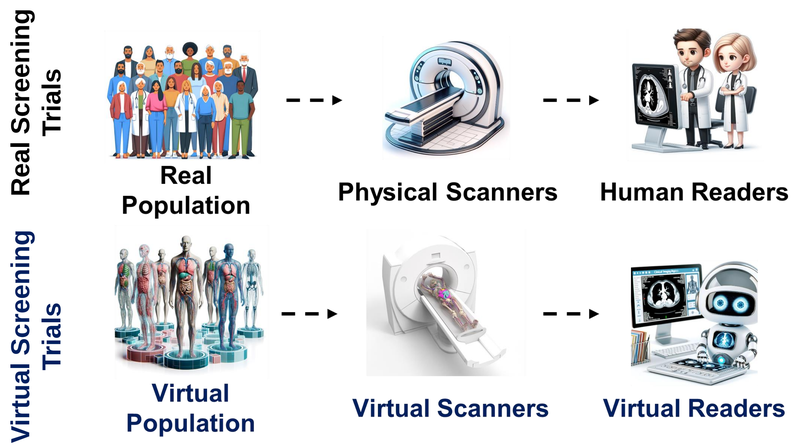
Introduction

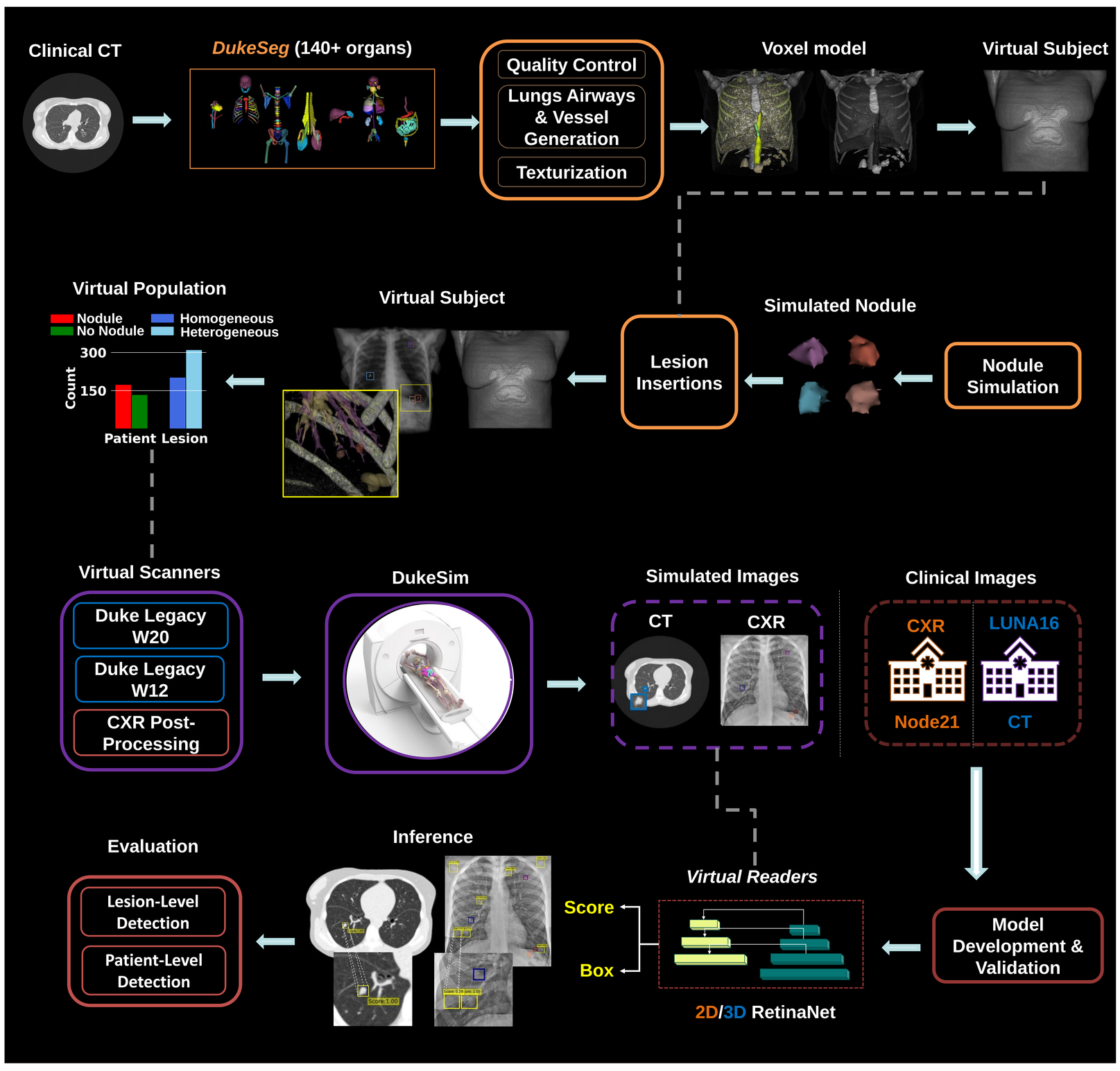
Traditional screening trials tend to be sluggish, costly, and frequently deficient in definitive evidence, all the while subjecting participants to ionizing radiation.

Virtual Imaging Trials, or **VITs**, provide a computational substitute for clinical trials. Our VIT platform meticulously mimics essential components of the imaging process, encompassing everything from **virtual patients** and **scanners** to **simulated readers**.

Purpose: To authenticate our VIT platform by replicating the results of the **National Lung Screening Trial** (NLST) for lung cancer screening through the emulation of low-dose computed tomography (**CT**) and chest radiography (**CXR**) procedures.

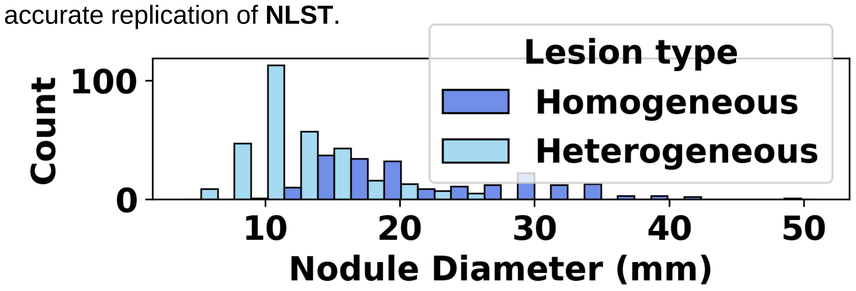


Methods



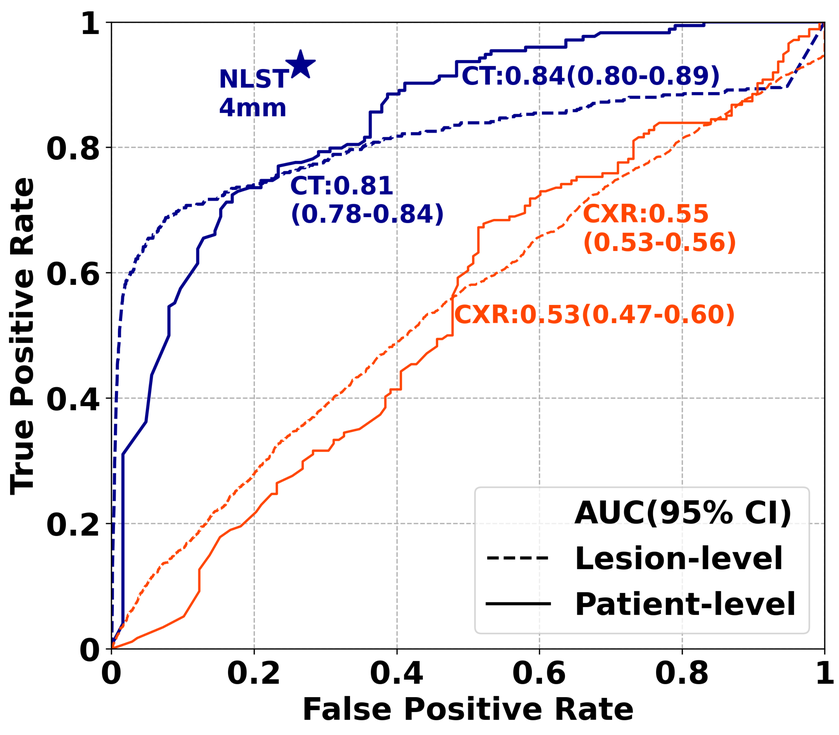
Study Sample

The methodology entails generating **313 distinct computational phantoms (age: 59 ± 14 years, sex: 44% female)**, among which **174 are embedded with 512 simulated lung nodules**, encompassing both **homogeneous (n=202)** and **heterogeneous (n=310)** types with varying diameters, representing a comprehensive range of characteristics for accurate replication of **NLST**.



Results

- ***Lesion-level** (**dotted line**) analysis evaluates virtual readers' accuracy **for each lesion**, while **Patient-level** (**solid line**) analysis aggregates these findings to assess overall diagnostic performance per patient. **CT** (**blue ROC**) **significantly outperforms CXR** (**orange** ROC).*



Conclusions

Results demonstrated the **CT outperformed the CXR** in **Nodule detection** which is consistent with the performance seen in the real lung screening trials.

VITs usually focus on the task of lesion detection. Future work will extend VITs **beyond lesion detection** to emulate clinical trials by evaluating patient-level outcomes, like **cancer diagnosis**.

In conclusion, the transformative potential of virtual imaging trials in advancing evidence-based medicine, offers an efficient and ethically conscious approach to medical research and development.

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CVIT Resources

Duke UNIVERSITY | PRATT SCHOOL of ENGINEERING | Duke Radiology, Duke University School of Medicine

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