X-ray Dark-field CT Radiomics for Lung Phantom Assessment

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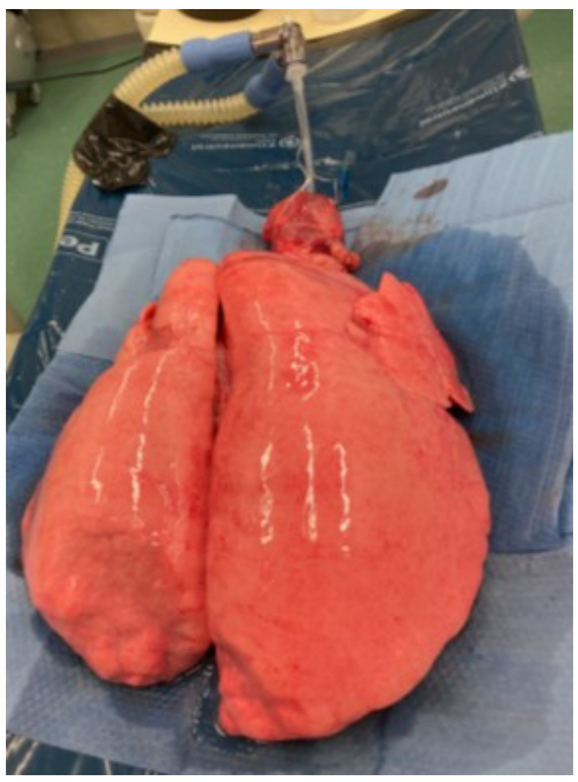
INTRODUCTION

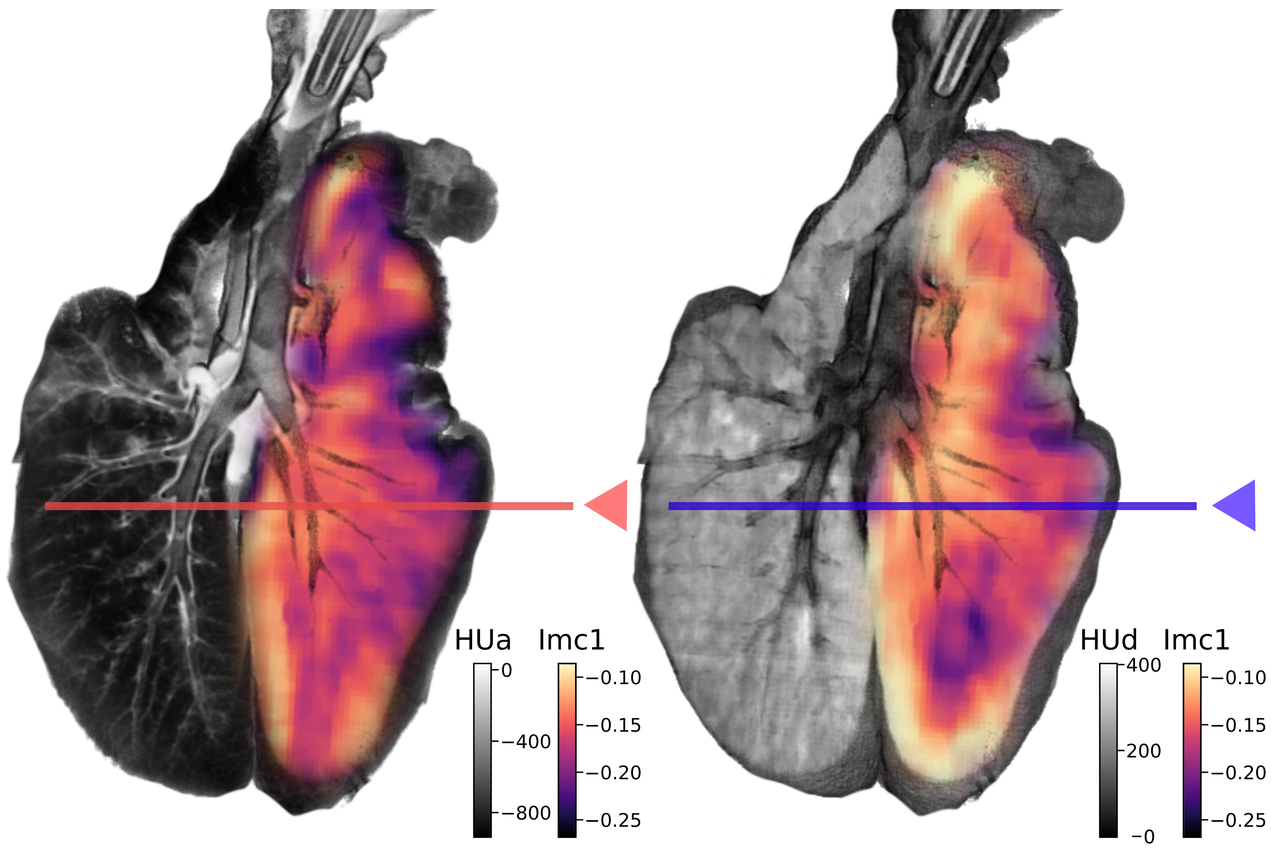
- **Dark-field X-ray imaging** provides contrast from small-angle scattering, enabling sensitivity to microstructural changes, particularly useful for **lung imaging**.
- Realistic **lung phantoms** are required for evaluating dark-field CT performance.
- This study assesses phantom materials by comparing their **texture features** with those of ventilated porcine lung tissue.

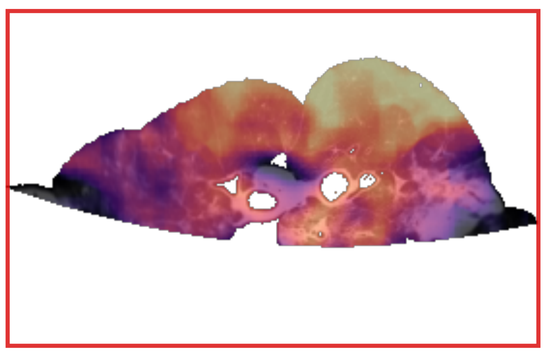


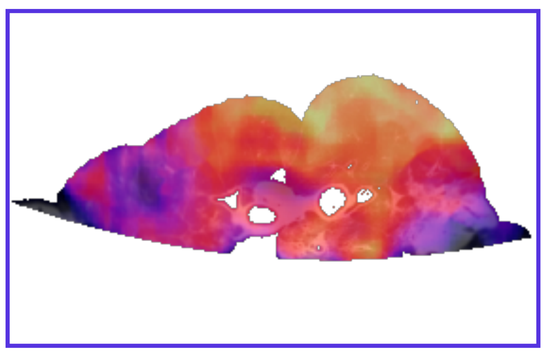
METHODS

- Imaging performed on a human-scale **dark-field CT prototype** at 80 kVp and 550 mA.
- Ex vivo porcine lungs, **ventilated at 10 mbar**, served as a biological reference dataset.
- **15 phantom materials** were scanned and analysed based on **102 radiomic texture features** extracted in both attenuation and dark-field channels.

RESULTS







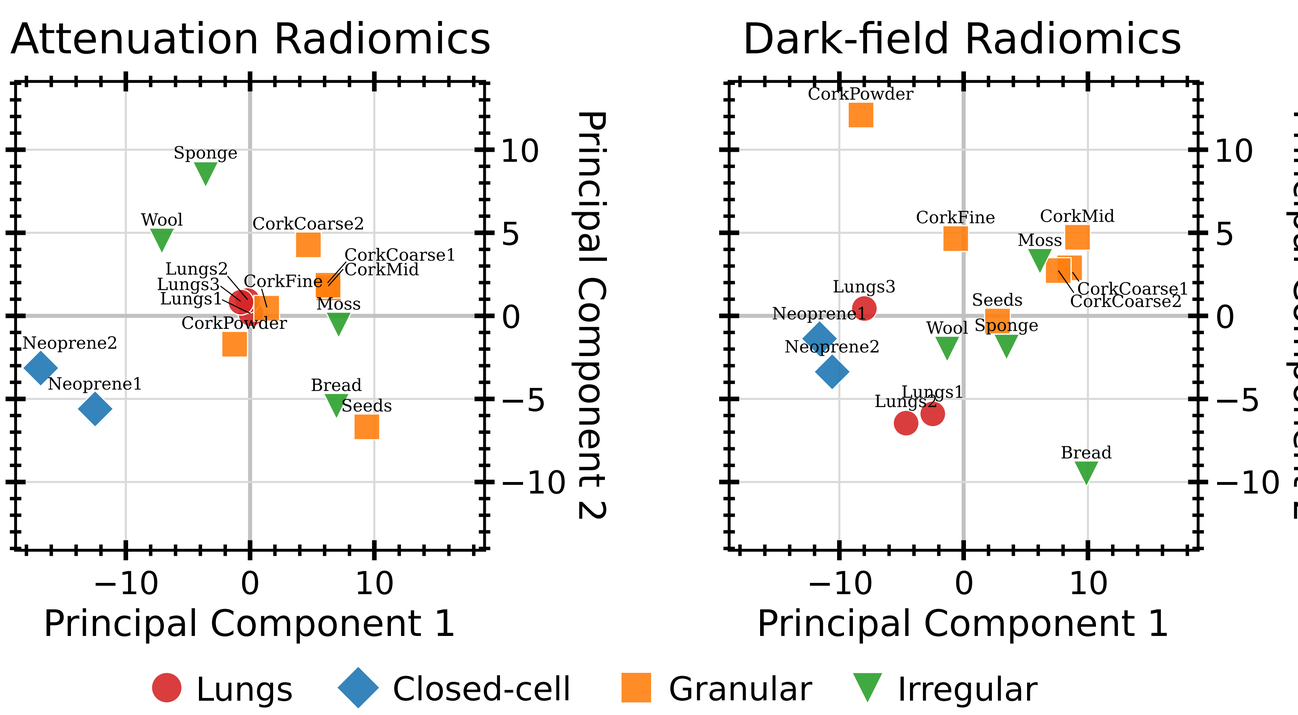


Figure: Comparison of phantom material and ventilated pig lungs using 3D reconstructions, slice views, texture maps, and PCA in both contrast channels.

CONCLUSION

- Dark-field-based radiomics features provides a robust framework for **quantitative phantom validation**.
- **Closed-cell foams** and wool show the strongest lung-like dark-field texture similarity, supported by multi-contrast PCA.

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