Deep learning improves sensitivity of UIP classification on CT
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Introduction
• In the correct clinical context, confident identification of a usual interstitial pneumonia (UIP) pattern on computed tomography (CT) is sufficient to diagnose idiopathic pulmonary fibrosis (IPF) without surgical lung biopsy
• However, visual assessment of CT is subjective and its overall sensitivity for a histologic UIP diagnosis is limited
• We developed a computer algorithm for prediction of UIP from CT and tested its accuracy against histologic diagnosis, visual CT assessment, and presence of the MUC5B promoter variant

Methods
• Using a multiple instance learning (MIL) paradigm, we trained a deep learning (DL) model for classification of UIP from CT
• The MIL algorithm was trained using n=1,770 chest CT exams with binary UIP labels (+/-)
• The model was tested, using Receiver Operating Characteristic (ROC) and Decision Curve Analysis (DCA), in a separate group of n=128 CTs with radiologist visual assessment, histologic diagnosis and MUC5B genotype

Results
• In the testing cohort, visual radiologic UIP diagnosis agreed moderately with histologic UIP (sensitivity 0.31, specificity 0.88) and MUC5B (sensitivity 0.29, specificity 0.82)
• The MIL algorithm showed improved sensitivity for histologic UIP (sensitivity 0.66, specificity 0.81) and MUC5B genotype (sensitivity 0.64, specificity 0.67) compared to visual CT assessment

• The authors met criteria for authorship as recommended by the International Committee of Medical Journal Editors (ICMJE). This was a collaborative research study where Boehringer Ingelheim Pharmaceuticals, Inc. (BIP) was involved in the design, analysis or interpretation of the results but was not the regulatory sponsor. It was given the opportunity to review the paper for medical and scientific accuracy as it relates to BIP substances, as well as intellectual property considerations.

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