Predicting COPD severity from airway structure in CT images

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COPD

Causes of COPD

- Bronchitis
  - Exposure to lung irritants
  - Genetic
- Emphysema
  - Exposure to lung irritants
- Asthma
  - Environmental Triggers
GOLD Stage

• **Stage 1:** Very mild COPD with a FEV1 about 80 percent or more of normal.

• **Stage 2:** Moderate COPD with a FEV1 between 50 and 80 percent of normal.

• **Stage 3:** Severe emphysema with FEV1 between 30 and 50 percent of normal.

• **Stage 4:** Very severe COPD with a lower FEV1 than Stage 3, or those with Stage 3 FEV1 *and* low blood oxygen levels.

https://lunginstitute.com/blog/gold-copd-stages/
Goal:

Identify contributing features in airway branches that affect COPD severity
Data: Vida® Airway Segmentations

• Labeled Anatomical Segments

• Fixed resolution 512x512

• Voxel size varies between subjects

• Clinical Data from SPIROMICS Study
**Methods**

- **Images**
  - Voxel size
  - Airway volume
  - Segments

- **Clinical**
  - Age
  - BMI
  - FEV1
Results:

- **Right Lung**
  - Airway Volume vs. Voxel Size

- **Left Lung**
  - Airway Volume vs. Voxel Size

- **Voxel Size > 0.225**
  - Airway Volume vs. Voxel Size for Stages 0 to 4
Conclusion

• No surprising trends have emerged but some have confirmed

• Airway volume decreases as COPD severity increases

• Age and BMI are not indicative of COPD severity

• Time to use more advanced methods to crunch the data