**Supplementary Material**

**Supplementary file** Details of random forest classification model construction

**Supplementary Table 1** Descriptive Statistics for PRM Parameters at the Level of Right/Left Lung and Five Lobes for 561 Non-COPD Subjects

**Supplementary Table 2** Ten Features with the Highest Contribution for Classification under Thresholds of 72%, 80% and 95%

**Supplementary file**

# Material and Methods

***Random Forest Classification Model construction***

The parameter “bootstrap” is set TRUE as default, indicating that the independent decision trees are trained on random subsets of training data sampled with replacement. The parameter “max\_samples” was set “None” as default, meaning that every independent decision tree is trained with all training samples. The parameter “max\_features” was set to “auto”, so the independent decision trees are trained with 9 features (square root of the total feature number). The criterion is set to “gini“, meaning the function to measure the quality of a split is Gini impurity. The formula of Gini impurity is given below:

, where is the probability of a certain classification i, is the number of classes. When the model splits a decision tree, it chooses a threshold such that the Gini impurity is reduced as much as possible.

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| **Supplementary Table 1 Descriptive Statistics for PRM Parameters at the Level of Right/Left Lung and Five Lobes for 561 Non-COPD Subjects** | |
|  | Non-COPD group (n=561) |
| RtLung Volume(cc) | 2319.08±564.94 |
| RtLung Emphysema Volume(cc) | 50.51±64.98 |
| RtLung fSAD Volume(cc) | 299.27±317.60 |
| RtLung Normal Volume(cc) | 1922.34±510.06 |
| RtLung Uncategorized Volume(cc) | 46.95±48.66 |
| RtLung Emphysema Volume(%) | 1.95±2.15 |
| RtLung fSAD Volume(%) | 12.73±12.87 |
| RtLung Normal Volume(%) | 83.50±13.73 |
| RtLung Uncategorized Volume(%) | 1.83±1.61 |
| LtLung Volume(cc) | 1964.66±529.49 |
| LtLung Emphysema Volume(cc) | 54.11±77.28 |
| LtLung fSAD Volume(cc) | 248.01±285.25 |
| LtLung Normal Volume(cc) | 1615.05±463.74 |
| LtLung Uncategorized Volume(cc) | 47.49±48.95 |
| LtLung Emphysema Volume(%) | 2.43±3.02 |
| LtLung fSAD Volume(%) | 12.28±13.35 |
| LtLung Normal Volume(%) | 83.11±14.66 |
| LtLung Uncategorized Volume(%) | 2.18±1.84 |
| RtUpper Volume(cc) | 887.32±242.44 |
| RtUpper Emphysema Volume(cc) | 22.57±35.85 |
| RtUpper fSAD Volume(cc) | 137.07±148.85 |
| RtUpper Normal Volume(cc) | 709.18±210.62 |
| RtUpper Uncategorized Volume(cc) | 18.49±20.43 |
| RtUpper Emphysema Volume(%) | 2.18±2.76 |
| RtUpper fSAD Volume(%) | 14.92±15.13 |
| RtUpper Normal Volume(%) | 81.01±16.20 |
| RtUpper Uncategorized Volume(%) | 1.89±1.71 |
| RtMiddle Volume(cc) | 414.22±127.76 |
| RtMiddle Emphysema Volume(cc) | 16.64±21.11 |
| RtMiddle fSAD Volume(cc) | 94.11±79.71 |
| RtMiddle Normal Volume(cc) | 296.01±110.5 |
| RtMiddle Uncategorized Volume(cc) | 7.46±10.35 |
| RtMiddle Emphysema Volume(%) | 3.76±3.84 |
| RtMiddle fSAD Volume(%) | 22.40±16.67 |
| RtMiddle Normal Volume(%) | 72.19±18.28 |
| RtMiddle Uncategorized Volume(%) | 1.65±1.84 |
| RtLower Volume(cc) | 1017.54±295.84 |
| RtLower Emphysema Volume(cc) | 11.30±18.83 |
| RtLower fSAD Volume(cc) | 68.08±113.96 |
| RtLower Normal Volume(cc) | 917.15±269.58 |
| RtLower Uncategorized Volume(cc) | 21.00±22.58 |
| RtLower Emphysema Volume(%) | 0.97±1.42 |
| RtLower fSAD Volume(%) | 6.56±10.09 |
| RtLower Normal Volume(%) | 90.67±10.83 |
| RtLower Uncategorized Volume(%) | 1.79±1.64 |
| LtUpper Volume(cc) | 1075.02±288.52 |
| LtUpper Emphysema Volume(cc) | 39.63±58.21 |
| LtUpper fSAD Volume(cc) | 184.59±194.30 |
| LtUpper Normal Volume(cc) | 824.96±244.17 |
| LtUpper Uncategorized Volume(cc) | 25.84±27.42 |
| LtUpper Emphysema Volume(%) | 3.21±3.78 |
| LtUpper fSAD Volume(%) | 16.43±15.94 |
| LtUpper Normal Volume(%) | 78.13±17.58 |
| LtUpper Uncategorized Volume(%) | 2.22±1.94 |
| LtLower Volume(cc) | 889.64±286.19 |
| LtLower Emphysema Volume(cc) | 14.48±28.92 |
| LtLower fSAD Volume(cc) | 63.42±105.78 |
| LtLower Normal Volume(cc) | 790.09±261.82 |
| LtLower Uncategorized Volume(cc) | 21.65±23.79 |
| LtLower Emphysema Volume(%) | 1.44±2.49 |
| LtLower fSAD Volume(%) | 7.01±10.91 |
| LtLower Normal Volume(%) | 89.45±12.19 |
| LtLower Uncategorized Volume(%) | 2.10±1.87 |
| Note: Data are mean ± standard deviation. | |

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| **Supplementary Table 2 Ten Features with the Highest Contribution for Classification under Thresholds of 72%, 80% and 95%** | | | | | |
| 72% | | 80% | | 95% | |
| Feature | Feature Importance | Feature | Feature Importance | Feature | Feature Importance |
| Age | 0.056 | Age | 0.041 | RtLower Emphysema Volume(%) | 0.026 |
| WholeLung Volume(cc) | 0.031 | LtLower Emphysema Volume(cc) | 0.026 | LtLowerEmphysema Volume(%) | 0.024 |
| WholeLung Emphysema Volume(%) | 0.030 | RtLower Emphysema Volume(%) | 0.024 | LtLower Normal Volume(cc) | 0.022 |
| RtLower Emphysema Volume(%) | 0.026 | LtLower Normal Volume(cc) | 0.023 | LtLower Emphysema Volume(cc) | 0.021 |
| LtLower Normal Volume(cc) | 0.024 | RtUpper Normal Volume(cc) | 0.023 | LtLung Normal Volume(cc) | 0.021 |
| RtLower Volume(cc) | 0.024 | LtLower Emphysema Volume(%) | 0.021 | LtLower fSAD Volume(%) | 0.020 |
| RtLung Normal Volume(cc) | 0.023 | RtMiddle Volume(cc) | 0.021 | RtLower Emphysema Volume(cc) | 0.020 |
| RtUpper Volume(cc) | 0.021 | RtLower Normal Volume(%) | 0.020 | WholeLung Volume(cc) | 0.019 |
| WholeLung Normal Volume(%) | 0.021 | WholeLung Volume(cc) | 0.020 | RtUpper Uncategorized Volume(cc) | 0.019 |
| LtLower Normal Volume(%) | 0.021 | RtLower Emphysema Volume(cc) | 0.020 | RtMiddle Emphysema Volume(cc) | 0.018 |
| Values are kept to three decimal places. | | | | | |