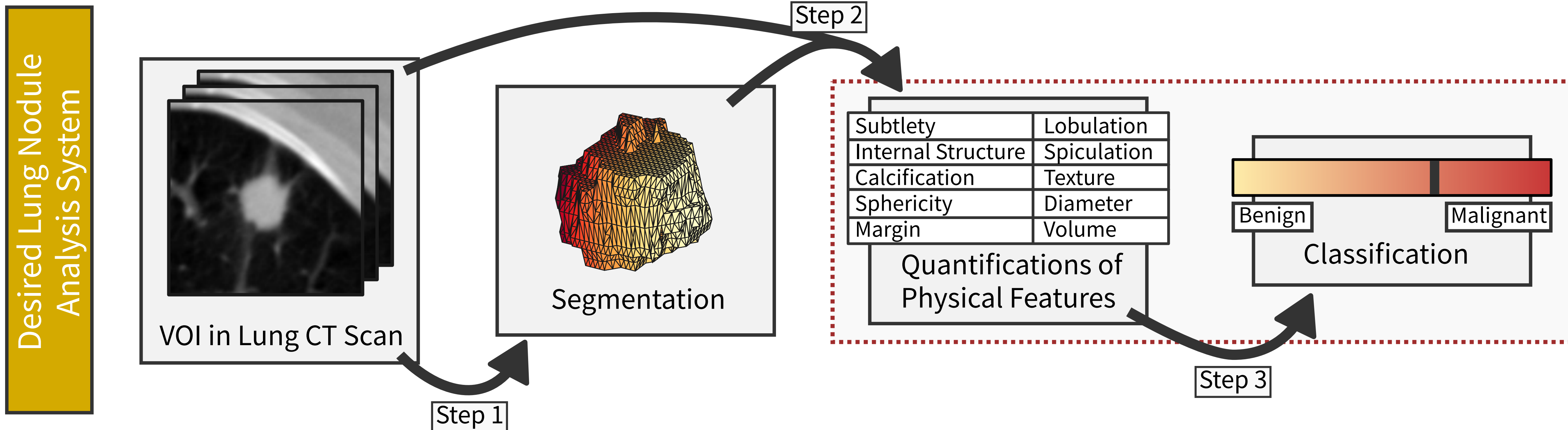


# Lung nodule malignancy classification using diagnostic image features

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## Objectives of this Work [1]

1. Can a mapping for performing **Step 3** be obtained that is **sufficiently accurate**?
2. Do limitations on classification accuracy exist?
3. Which input features are most influential on accuracy?

[1]: Hancock, M. C. and Magnan, J.F. Journal of Medical Imaging 3.4 (2016): 044504-044504

## Data

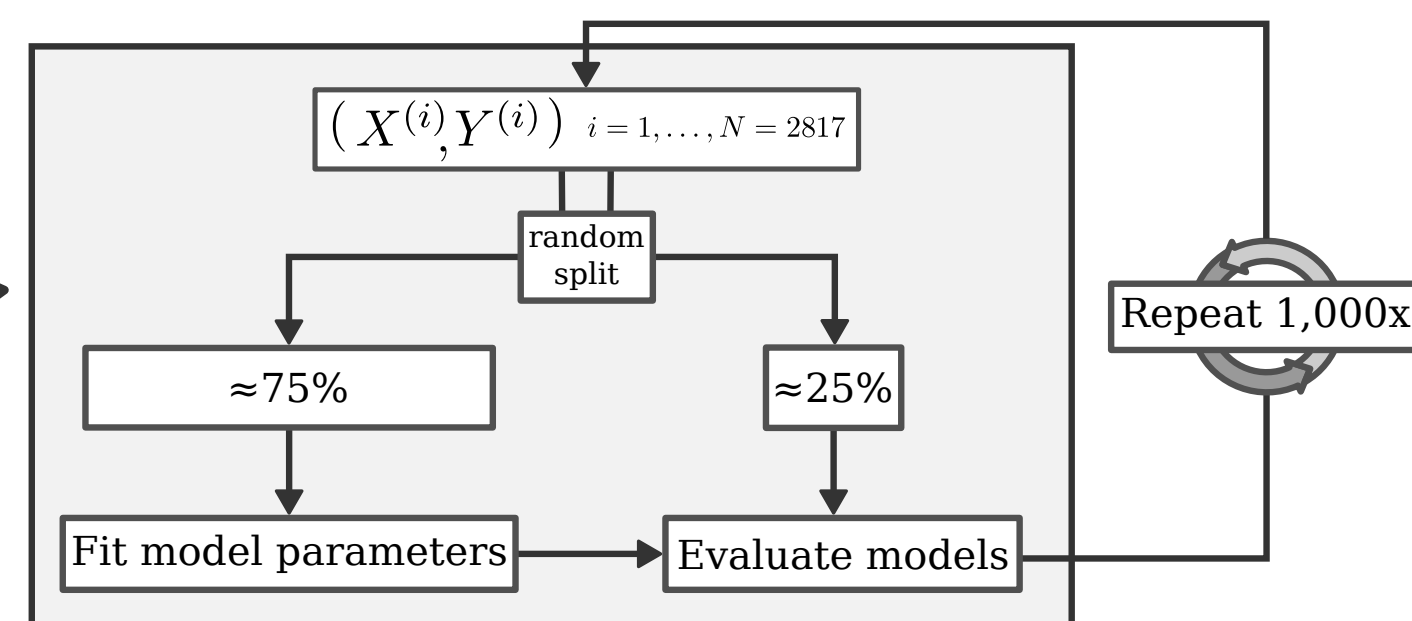
- ▶ 2,817 annotations of lung nodules by radiologists obtained and processed from LIDC dataset [2]
- ▶ Inputs: Quantifications of nodule features
- ▶ Output: {0,1}, 0 = 'benign', 1='malignant'

[2]: Armato, Samuel G., et al. Medical physics 38.2 (2011): 915-931.

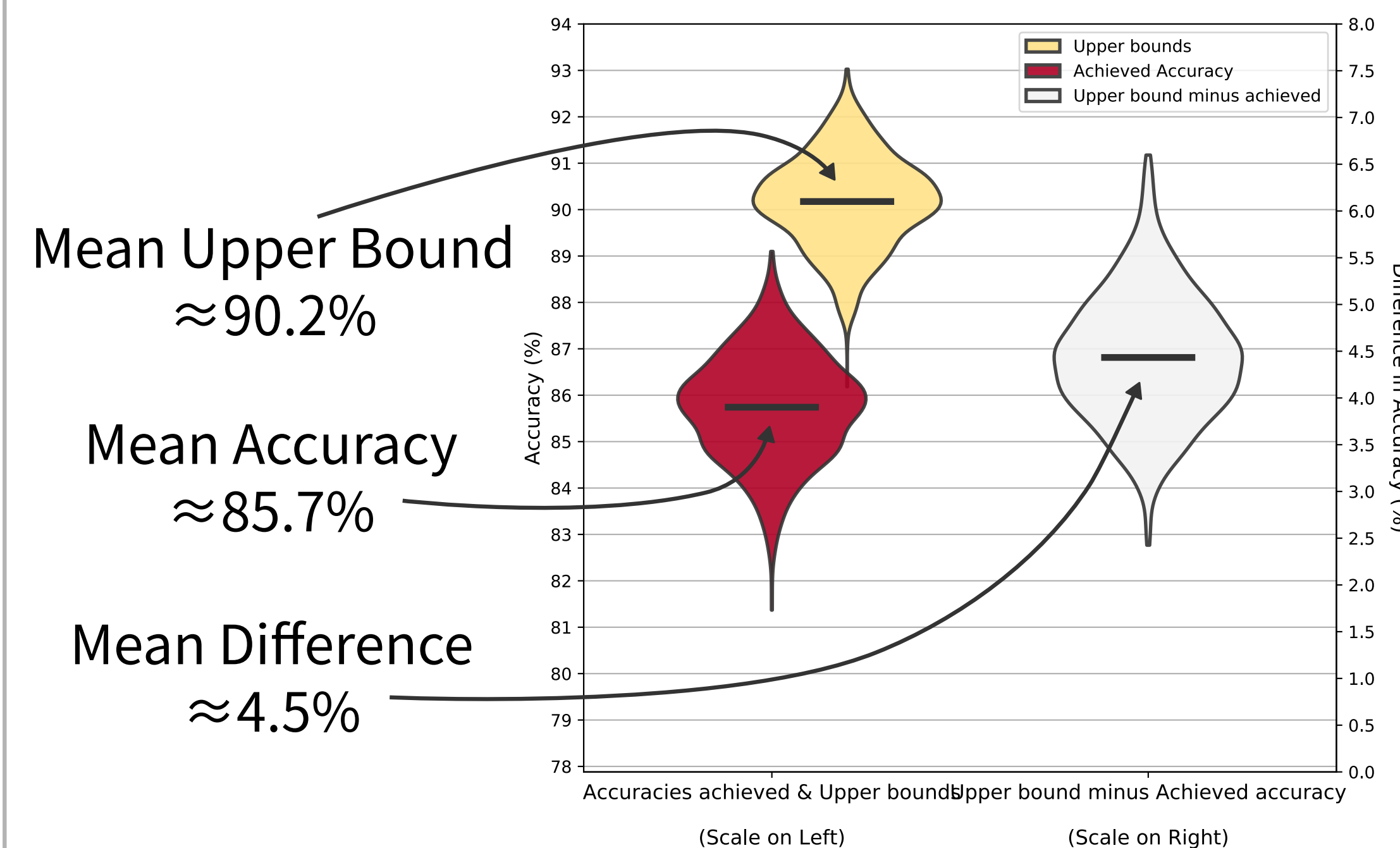
## Methods

- ▶ Binary classification via Random Forest method [3]
- ▶ Analysis of input vectors yields upper bounds on classification accuracy
- ▶ Monte-Carlo cross-validation to assess models and analyze feature importance

[3]: Breiman, Leo. Machine learning 45.1 (2001): 5-32.

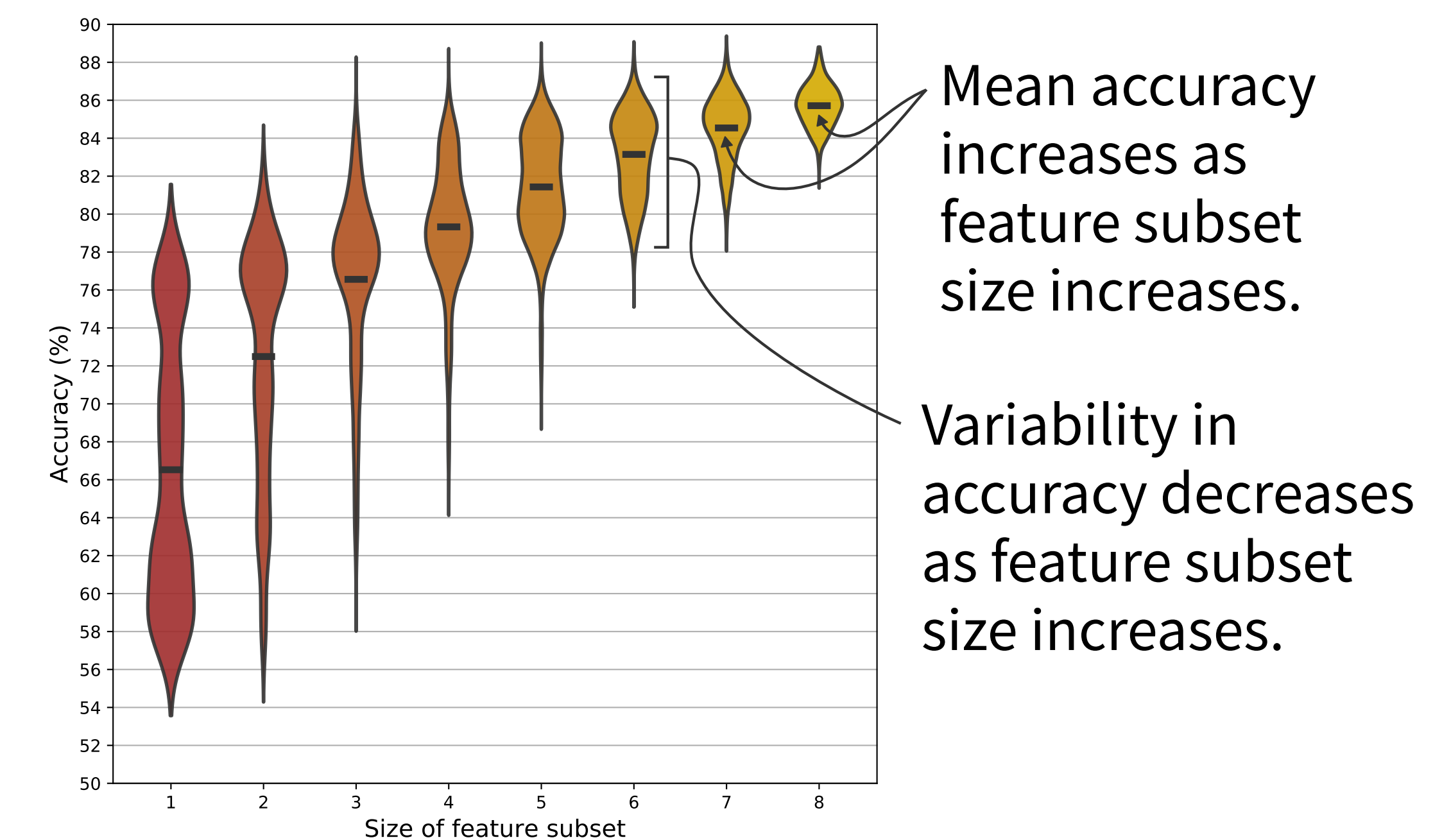


## Model Assessment



- ▶ Mean accuracy increases to  $\approx 88.1\%$  when diameter and volume features included (not shown above).
- ▶ Mean AUC score  $\approx 0.95$  (not shown above) competitive with other published results that include non-diagnostic, image-derived inputs.

## Feature Relevance



- ▶ Global feature ranking computed from combination of two metrics for assessing feature significance.
- ▶ Ranking (most to least significant): (1) Spiculation, (2) Lobulation, (3) Subtlety, (4) Calcification, (5) Margin, (6) Texture, (7) Sphericity, (8) Internal Structure