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Automatic diagnosis of pulmonary embolism by machine learning-based detection of pulmonary trunk

AzTE Case # M11-103

Inventors

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Invention Description

Pulmonary embolism is a common cardiovascular emergency with approximately 600,000 incidents and 200,000 deaths occurring annually in the United States. CT pulmonary angiography (CTPA) has become the reference standard for pulmonary embolism diagnosis, but this technique has several issues with interpretation of the intricate branching structure of the pulmonary vessels, artifacts that may obscure or mimic embolisms, suboptimal contrast, and inhomogeneities.

To overcome these shortcomings, researchers at Arizona State University have developed a machine learning-based approach for automatically detecting the pulmonary trunk. By using a cascaded Adaptive Boosting machine learning algorithm with a large number of digital image object recognition features, this method automatically identifies the pulmonary trunk by sequentially scanning the CTPA images and classifying each encountered sub-image with the trained classifier.

This approach outperforms existing anatomy-based approaches. It requires no explicit representation of anatomical knowledge and achieves a nearly 100% accuracy as tested on a large number of cases.

Potential Applications

- Diagnosis of pulmonary embolism
- Discrimination of pulmonary embolism from other hyperbaric injuries

Benefits and Advantages

- Outperforms existing anatomy-based approaches
  - Dynamically adapts to suboptimal image contrast
  - Discriminates artifacts that may obscure or mimic embolisms
  - Capable of detecting central pulmonary embolisms
  - Distinguishes the pulmonary artery from the vein to remove false positives
- Requires no explicit representation of anatomical knowledge
- Achieves nearly 100% accuracy as tested on a large number of cases

Intellectual Property Status:

Patent Pending

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