QuantImage v2: A Clinician-in-the-loop Cloud Platform for Radiomics Research

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Purpose or Learning Objective

First, to allow radiologists and nuclear medicine physicians to create patient cohorts and extract radiomics features from CT/PET/MR images. Second, to allow feature exploration using visualization tools and creating machine learning models for classification & survival tasks. This is achieved via an open-source web-based platform without the need for programming. Interactive visualization is crucial for exploring links between radiomics features and patient outcomes but is absent from many available radiomics tools.

Methods or Background

We used an existing open-source web-based tool (Kheops) that enables users to create, manage and share collections of DICOM images. In addition, we developed a user-friendly companion web platform (QuantImage v2) for radiomics feature extraction & management, predictive model building & validation, as well as interactive data visualization.

Results or Findings

After creating a patient cohort using Kheops, users extracted radiomics features using QuantImage v2 from CT/PET/MR images. Interactive visualization tools assisted users in feature selection for training machine learning models, e.g. by allowing users to filter features by imaging modality, region-of-interest & feature categories. Finally, the platform enabled real-time training & comparison of predictive models for classification and survival analysis tasks using several algorithms. The iterative process of feature exploration and predictive model building allowed identifying outliers, revealed intra-class group heterogeneity, and helped novice users to build better-performing models relying on fewer predictors.

Conclusion

The developed platform empowers clinical researchers with no background in programming to investigate and test radiomics models via an easy-to-use web interface. The novel feature visualization functionality helps identify salient features that produce well-performing predictive models. First user tests are encouraging, with feedback highlighting the ease of use and usefulness of the freely available tool.

Limitations

Currently, the platform cannot evaluate created models on independent test sets.

Ethics committee approval

N/A

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