

The QuantImage v2 Online Platform for Interactive Radiomics AI Education and Advanced Model Interpretation

Lluís Borràs Ferrís^{*1,2}, Adriano Dias¹, Jakub Mlynář¹, Mélanie Champendal^{3,4}, Ricardo Ribeiro³, John O. Prior^{2,4}, Mario Jreige², and Adrien Depeursinge^{1,2}

¹Institute of Informatics, University of Applied Sciences Western Switzerland (HES-SO Valais-Wallis), Sierre, Switzerland

²Nuclear Medicine and Molecular Imaging Department, Lausanne University Hospital (CHUV), Lausanne, Switzerland

³School of Health HESAV School of Health Sciences Vaud, HES-SO University of Applied Sciences and Arts Western Switzerland

⁴Faculty of Biology and Medicine, University of Lausanne, Lausanne, Switzerland

Purpose

With the rapid integration of AI into clinical medical imaging, developing educational tools for clinicians and students to understand and interpret AI models via hands-on experience has become of highest priority. Previous studies using the QuantImage v2 for teaching (>60 students) have shown that users' understanding of radiomic concepts is closely related to their ability to analyze performance metrics, highlighting the need for improved visual and interactive tools to support explainability [1]. This work presents novel QuantImage v2 functionalities designed to improve understanding and interpretation of radiomics model performance and feature behavior in both educational and research settings.

Materials and Methods

This work builds on QuantImage v2 [2], an open-source platform for developing radiomic models from various modalities (e.g. MRI, CT, PET). The feature explorer and model building modules were adapted for improved presentation of the model metrics and visualization plots for advanced feature and model interpretability. To explore the relationship between features and outcomes, the existing heatmap is complemented by a two-dimensional Uniform Manifold Approximation and Projection (UMAP) [3]. Usability of the new version was reassessed in an initial teaching session.

^{*}lluis.borrasferris@hevs.ch

Results

The model interpretability plots were often mentioned as helpful for understanding model interpretability. The UMAP visualizations also complemented the heatmap in identifying patterns and discriminative feature collections. Users reported that having practical lessons, training the models and interpreting their performance helped solidify concepts as well as important pitfalls related to AI.

Conclusion

The new QuantImage v2 modules improve the interpretability of radiomics AI workflows by offering hands-on and intuitive visualizations of model performance and feature behavior, supporting transparent model development in the educational context.