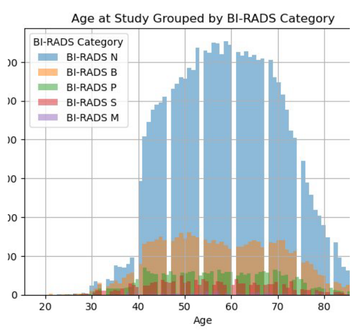
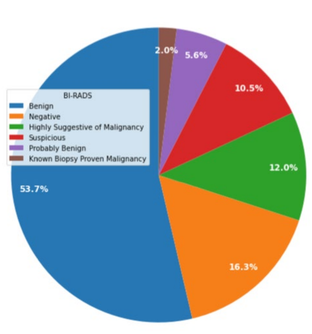
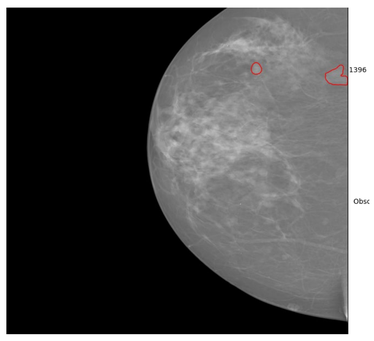
HSLU Hochschule Luzern

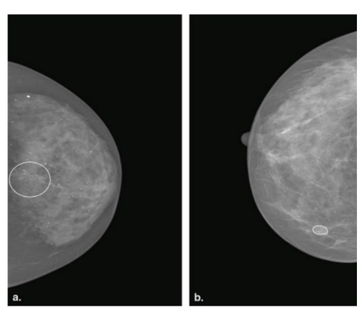
Technik & Architektur

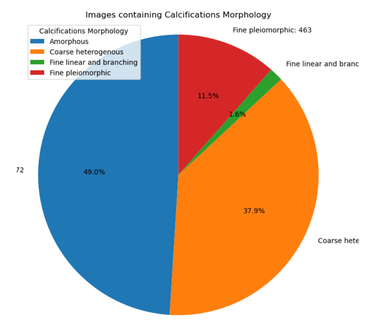
Pipeline for Mammography-Based Multi-Feature Classification and Automated Report Generation

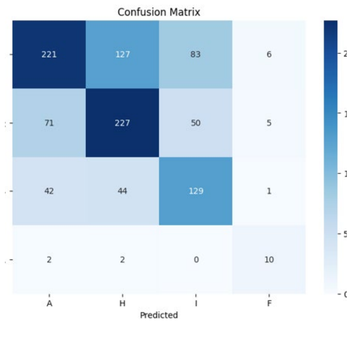


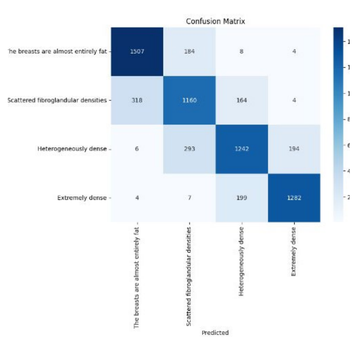


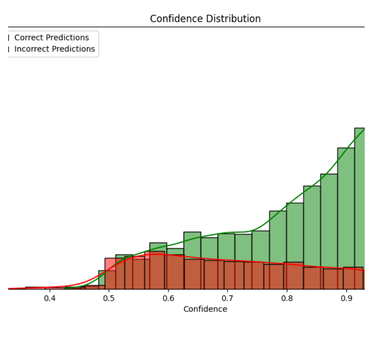


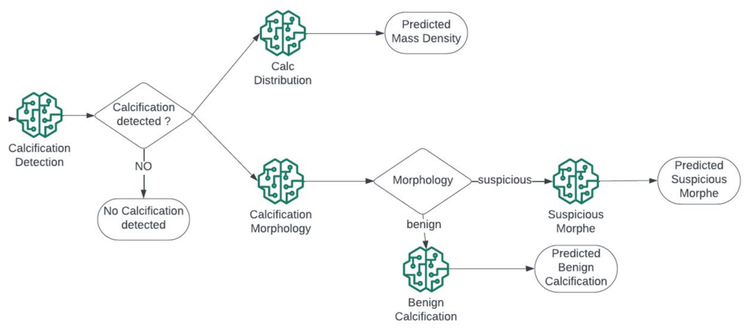


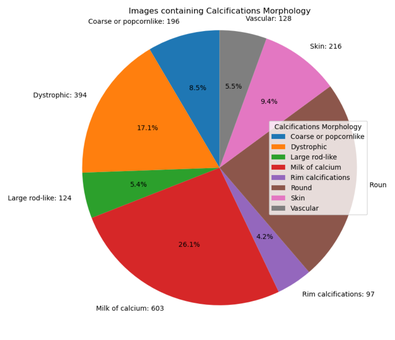


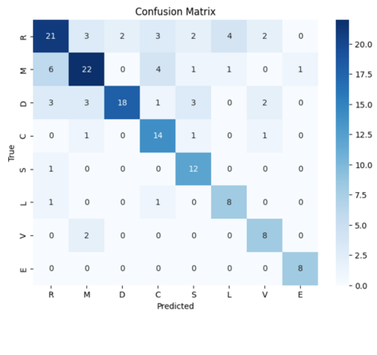


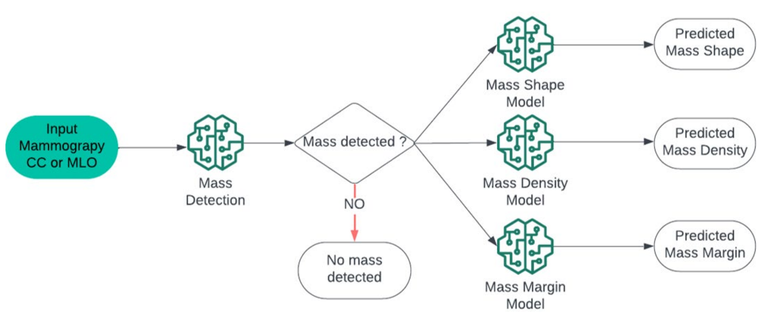


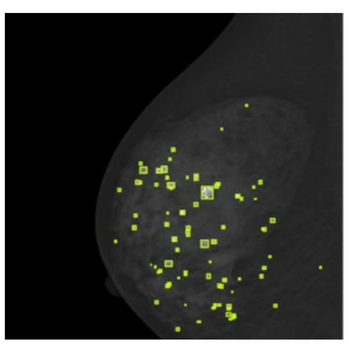


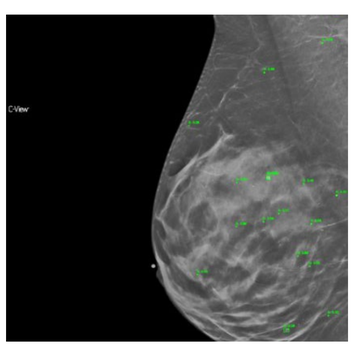


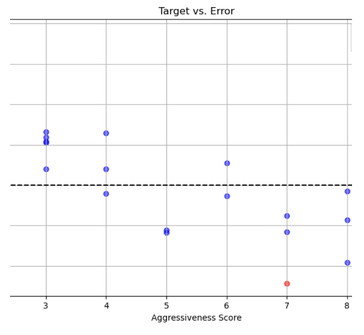


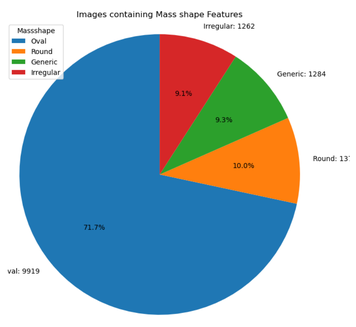


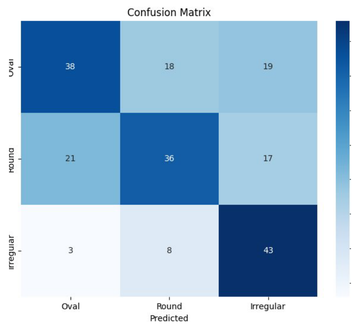


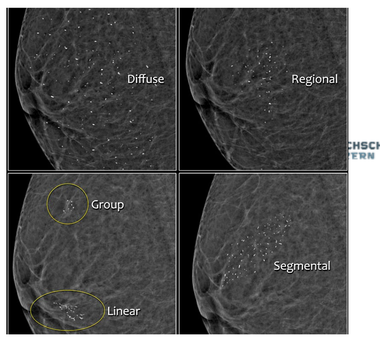


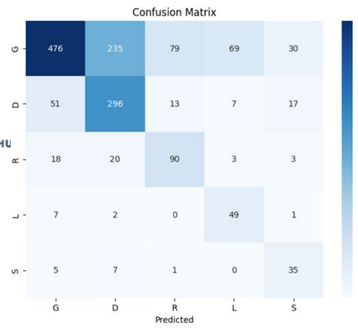


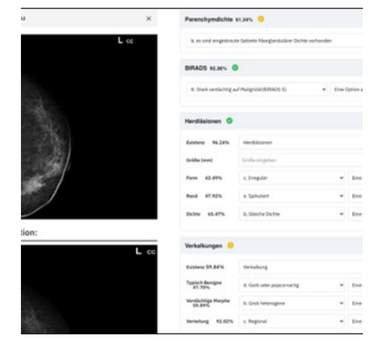


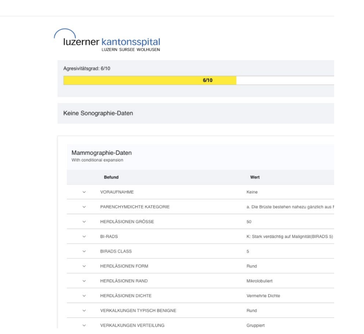












Problem Statement

Breast cancer diagnosis via mammography is crucial for early detection, yet its interpretation remains subjective. Radiologists extract BI-RADS features—such as mass shape, margin, and density—directly from the images, a process prone to variability and inconsistency. These features play a key role in assessing malignancy risk, but manual reading introduces potential for misclassification, especially in complex or ambiguous cases.

Despite the clinical value of BI-RADS and patient data (e.g., age and family history), current diagnostic workflows lack an automated, standardized approach to combine this information for assessing cancer aggressiveness. This limits the ability to prioritize high-risk cases early, particularly when pathology results are delayed. An AI-based system integrating image-derived BI-RADS features and clinical data can support radiologists in risk assessment and improve diagnostic consistency.

Solution Concept

This project presents a machine learning-based pipeline designed to support aggressiveness assessment in breast cancer by combining clinical and imaging data. Using computer vision models, key BI-RADS features—such as mass shape, margin, and density—are automatically extracted from mammography images. These features are then merged with patient demographics and family history to train a regression model that predicts tumor aggressiveness on a standardized scale.

Results

The breast composition model achieved state-of-the-art performance with 79% accuracy and F1-score, demonstrating reliable classification of tissue density. For mass characterization, models reached F1-scores of 57% (shape), 62% (margin), and 61% (density). The aggressiveness prediction model, trained on BI-RADS features and patient data, achieved a mean error of ±1.52 on a 10-point scale.

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