

# AIE231: Neural Networks

Assistant Professor. Mohamed Ghetas

# **Enhancing Breast Cancer Detection: Utilizing CNNs for Advanced Analysis of Whole Slide Images**

# Team Members:

Nnnnnnnnnnnnnnn

Nnnnnnnnnnn nnnnn

## Abstract:

This project aims to enhance breast cancer detection in histopathological images by leveraging deep convolutional neural networks (CNNs). The primary objective is to develop a robust computational model capable of accurately identifying invasive ductal carcinoma (IDC) regions within whole slide images (WSIs). The methodology involves a thorough data preprocessing pipeline, encompassing resizing and contrast enhancement, followed by dataset loading and augmentation. A novel CNN architecture, featuring residual connections, is proposed, comprising multiple residual blocks with convolutional layers, batch normalization, and ELU activation, alongside max pooling and global average pooling layers. Training the model involves utilizing the RMSprop optimizer and binary cross-entropy loss, while integrating early stopping and learning rate reduction techniques. The evaluation process employs metrics like accuracy, precision, recall, and ROC curve analysis on a dedicated test dataset. The expected outcome is the development of an effective CNN-based approach, which holds promise for improving breast cancer detection accuracy, ultimately contributing to earlier diagnosis and enhanced patient outcomes.

## Chapter 1 - Introduction:

* *Problem Identification:*

The problem addressed in this project revolves around the accurate detection of invasive ductal carcinoma (IDC) regions within histopathological images of breast cancer specimens. Identifying IDC regions is crucial for determining the aggressiveness grade of breast cancer and guiding treatment decisions. However, manual identification by pathologists is time-consuming and prone to subjectivity. Automated methods for IDC detection are therefore desirable to enhance efficiency and reliability in breast cancer diagnosis.

* *Problem Statement:*

The issue this project seeks to resolve is the need for a robust computational approach to accurately identify IDC regions within whole slide images (WSIs) of breast cancer specimens. Current methods for automated IDC detection often lack the necessary precision and reliability, leading to potential misdiagnosis and delayed treatment. Developing a computational model capable of effectively distinguishing IDC-positive regions from IDC-negative regions in histopathological images is essential for improving the accuracy and efficiency of breast cancer diagnosis.

* *Proposed Solution:*

To tackle the identified problem, this project proposes the development of a deep convolutional neural network (CNN) architecture specifically tailored for IDC detection in histopathological images. The proposed solution involves comprehensive data preprocessing techniques, including resizing and contrast enhancement, to prepare the dataset for training. A novel CNN architecture with residual connections will be designed and trained using a combination of RMSprop optimizer and binary cross-entropy loss. The model will incorporate advanced techniques such as early stopping and learning rate reduction to optimize performance. Evaluation of the model will be conducted using metrics such as accuracy, precision, recall, and ROC curve analysis on a dedicated test dataset. Through this approach, the project aims to provide an accurate and reliable computational tool for IDC detection in breast cancer histopathological images, ultimately contributing to improved patient outcomes and clinical decision-making in breast cancer diagnosis and treatment.

Top of Form