



Convolutional Neural Network-based medical  
checkup system for Pigmented Skin Lesions  
Classification.

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# Abstract

The study targets the binary classification of malignant breast cancer with limited annotated data. Breast cancer is one of the common kinds of cancer and is the high cause of mortality among women. The classical identification methods require the specialist to review the microscopic images of cytological images which is a tedious and time consuming process. The primary objective of the study is to develop the automated analysis model framework for classification from microscopic cytopathological images in an efficient manner. The model framework can be applied to perform the analysis at scale without need of the specialists. In order to perform classification, there exists various solutions, one of which includes training the convolutional neural networks from scratch which requires fine-tuning hyper-parameters and requires the annotated data in huge quantities. In this research, a framework has been provided to apply the transfer learning based solution from the source histopathological dataset to the target cytological images. The framework relies on transfer learning in which the weights obtained from the pre-training phase are used in the model training with both complete fine-tuning which targets the complete network and updates the weights using the backpropagation throughout the network and partial-fine tuning, which only targets the last few layers as part of the experiments. The proposed framework contains a total eight phases as part of the classification pipeline to provide the mechanism for the binary classification of breast cancers with transfer learning. All the implementation details of the study can be obtained from <sup>1</sup> footnote link.

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<sup>1</sup><https://github.com/ma-shamshiri/Compatible-domain-Transfer-Learning>

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# Chapter 1

## Introduction

### 1.1 Problem Statement

The problem of breast cancer among women has been a major concern and leading cause of the mortality rate. According to the WHO(World Health Organization) on the global scale around 502,000 cases of breast cancer among women are reported each year (Jelen, Fevens, and Krzyzak, 2008). Furthermore, on the localized national scale, as per the anticipated reports from the Canadian cancer society, 28,600 women will be detected with malignant breast cancer, representing 25% of the overall new cancer cases detected by the Canadian Cancer Society Society (2020).

Moreover, according to the study conducted in the United Kingdom, the health care agency NHS had reported that 47% trusts do not have the specialized nurses across the country. The lack of specialized medical staff members who can detect breast cancer at the early stage contributes to higher mortality rates (Tan et al., 2017). The classical identification methods require the specialist to review the microscopic images of cytological images which is an inefficient manner even for the trained and qualified medical professionals with appropriate domain knowledge. The problem can be solved using the automation with the CNN and implying the computer vision algorithms to provide the computer aided solution. Convolutional neural networks, which are specific kinds of artificial neural networks, extract data patterns from the images using the convolutional layers and further pass the extracted features to the fully connected layers of the network to learn the features (Wani et al., 2020). However, such networks

## 1.1. PROBLEM STATEMENT

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are highly reliant on the large volumes of the datasets with appropriate quality which is difficult to obtain in the real world systems.

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