Thesis schedule

General plan

Here is a table with an overview of my thesis schedule followed by some elaboration of the items used in the table.

Month	What to do
Nov	- Subject orientation - Literature reading - Understanding of topic - Deciding upon research question - Deciding upon method used
Dec	- Exploratory data analysis - Data preparation 1. Image enhancement (CLAHE algorithm) 2. Image segmentation (Region based method) - Data augmentation
Jan	- Modeling (replication) 1. Setting up AlexNet CNN architecture 2. Train the CNN on ImageNet dataset 3. Fine tune CNN and retrain on CBIS-DDSM database
Feb	4. Classifying using SVM 5. Comparing results with Dina A. Ragab et al. (2019) - Modeling (own idea) 1. Replace SVM classifier by LightGBM 2. Compare results with Dina A. Ragab et al. (2019)
Mar	- Writing 1. Introduction 2. Methodology 3. Results 4. Discussion 5. Conclusion 6. Abstract

Table 1: Note: Every month probably has literature reading, but it is not the main focus after November.

Exploratory data analysis. Find out what the data looks like, format, resolution, class distribution, missing data, outliers.
Image enhancement. Dina A. Ragab et al. (2019) uses an image enhancement technique to get the regions of interest clearer. For example, they remove noise from the images. The algorithm they follow for this is the CLAHE algorithm (Sahakyan & Sarukhanyan, 2012).
Image segmentation. The aim of image segmentation is to simplify the image by presenting it in an easily analyzable way. Dina A. Ragab et al. (2019) uses region based segmentation, i.e., they divide the image pixels with respect to their intensity level (pixel value) and use a certain threshold for it. As a result, the regions of interests (the tumors) get selected instead of the whole breast.
Data augmentation. The dataset contains a relatively small number of samples due to limited patient volume. Data augmentation is a method to increase the sample size of the dataset. Dina A. Ragab et al. (2019) uses an image rotation method: each image (of the training set) is rotated by 0, 90, 180, and 270 degrees. Hence, each image is augmented to 4 images.
AlexNet CNN architecture. There are many CNN architectures possible. A very common one that is used a lot is the AlexNet architecture. AlexNet has five convolution layers, three pooling layers, and two fully connected layers with approximately 60 million free parameters (Krizhevsky, Sutskever & Hinton, 2012). In the paper this architecture is used.
Train CNN on ImageNet dataset. The CNN is pre-trained firstly using the ImageNet dataset, which contains 1.2 million natural images for classification of 1,000 classes.
Fine tune CNN. The last fully connected layer is replaced by a new layer for the classification of two classes (instead of 1,000); benign and malignant masses.