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Techniques of AI Project Report

SVM-assisted breast cancer detection

Techniques of ai Project 2019

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# Introduction

## Project description

The goal of the project is to implement a machine-learning assisted algorithm that helps detect whether a patient has breast cancer or not, based on the analysis of characteristics extracted from the 3D models of microcalcifications present in the patient’s breast tissue.

## Implementation

For the realization of the project, an SVM was chosen as the machine-learning method used to classify the microcalcifications. The model was trained and tested with the given data set of 3562 microcalcifications, each having 150 characteristics.

The tests were realised using a patient-by-patient basis, a 10-fold stratified test as well as a 96-fold stratified test (simulating a patient-by-patient test).

Various kernels (linear, 2-poly, 3-poly) and parameters were extensively tested and graphed, in order to find the optimal implementation for the classification.

## Diagnosing the patient

Once the algorithm was implemented and well-tested, the program diagnoses the patient using the same characteristics as the ones used in the training data set. The diagnosis is based on the number of microcalcifications detected as malignant, and the SVM’s prediction performance in the various tests.

# Implementation details

The chosen implementation for the analysis and classification of microcalcifications is an SVM algorithm to separate between the two following classes: malignant or benign.

The choice for the algorithm is loosely based on a research paper [[1](https://www.researchgate.net/publication/7979354_A_Study_on_Several_Machine-Learning_Methods_for_Classification_of_Malignant_and_Benign_Clustered_Microcalcifications)] in which the SVM method is concluded to be the most accurate machine-learning method for breast cancer detection.  The paper is only used as a guideline for this project, as they do not use the same type of data for the classification.

For the project, Python and scikit-learn are the main tools used for the implementation. The module wraps both liblinear and libsvm, which are regarded as the best tools for SVMs currently available for the language, and it optimizes memory allocations with the wrappings. It is one of the better libraries in terms of performance. It is also open-source and considered well-documented.

The program allows the user to initialize the SVM with either a linear or a polynomial kernel which uses the given error-compensation parameter (C parameter) for the requested predictions. The user needs to input both the training file (training\_data.xlsx) and the patient file when initializing the prediction agent.

# Financial Statements

## Statement of Financial Position

* Liabilities
* Statement of Financial Position
* Ownership Equity

## Statement of Comprehensive Income (Profits and Losses)

* Income
* Expenses
* Profits

## Statement of Changes in Equity

Well, it wouldn’t be an annual report without a lot of numbers, right? This section is the place for all those financial tables.

To get started with a table that looks just like the sample here, on the Insert tab, click Tables, then choose Quick Tables.

Table Heading

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| --- | --- | --- | --- |
| Description | Revenue | Expenses | Earnings |
|  |  |  |  |
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|  |  |  |  |

## Statement of Cash Flows

* Operating
* Investing
* Financing

# Notes to Financial Statements

## Accounts

When you have a document that shows a lot of numbers, it’s a good idea to have a little text that explains the numbers. You can do that here.

## Debt

Of course, we would all prefer to just have profits. But if you’ve got any debt, this is the place to make notes about it.

## Going Concern

Okay, you get the idea. If you’ve got notes to add about your financials, add them here.

## Contingent Liabilities

Keep in mind that some of these headings might not apply to your business (and you might have others to add). This one, for example, is about potential liabilities that could arise if something happens in the future, such as a pending legal decision.

## Takeaways

What would you like your readers to understand? Add notes on key takeaways here.

# Independent Auditor’s Report

* 1. Unqualified Opinion
  2. Qualified Opinion Report
  3. Adverse Opinion Report
  4. Disclaimer of Opinion Report
  5. Auditor’s Report on Internal Controls of Public Companies
  6. Going Concern

# Contact Information

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# Company Information

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