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| Faculty of Computers and Information Systems  Computer Science Dept. |  | univ Mansoura University |

**Derma AI**

**Skin Diagnosis System Using AI**

**Graduation Project**

**by**

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**A project submitted in partial fulfilment of the requirements for the degree of Bachelor of Science Computer Science**

**Supervised by**

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# Abstract

While the population is always increasing, the facilities of a country's healthcare system are struggling to keep up, especially In a developing country you can easily notice the shortage in healthcare services, equipment, and even staff.

As a result, some curable diseases may go unnoticed and a situation that could be easily managed might escalate to a more serious problem.

According to recent studies, skin and subcutaneous diseases are the fourth leading cause of nonfatal disease burden globally, affecting 30–70% of individuals and prevalent in all age groups. In addition to that Diagnostic accuracy of non-specialists is only 24–70%

Our team took notice of that and we started thinking how we could integrate computer science and machine learning with the medical field to help mitigate the load on the healthcare system.

Researchers have been trying to leverage the benefits of AI technology for a few decades now and since we are passionate about solving problems, especially ones that are directly affecting human lives, we are trying to address this problem by providing a solution that can help both the patient and the professional healthcare provider.

# Acknowledgement

Thanks to everyone who helped us to carry out our project.

We would like to express our deep gratitude and respect to **Prof. Mohamed El-Rahmawy and Dr. Sara El-Sayed El-Metwally,** our supervisors, for their professional guidance and valuable support, encouragement, and useful criticism of this project.

Special thanks with much appreciation to **Eng. Nada El-Madah** for her support, help, and motivation and because she gave us positive energy to get our work done in the best way.

Finally, our thanks go to **our families** for their love, prayers, caring and sacrifices for educating and preparing us for our future.

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# List of Abbreviations

# Chapter 1: Introduction

## Introduction

The advancement of technology in our modern era has had an important role in solving many problems that are difficult to solve by ordinary methods, as technology has opened the gates wide open for innovation and creativity to solve problems and meet consumers’ needs with ease of use and high efficiency. Despite this rapid development of technology and the emergence fields such as artificial intelligence, which was developed specifically to simulate the human mind., this is not fully exploited in the medical field other than in research, though there are quite a few problems that need exactly that.

## Problem Definition

While the population is always increasing, the facilities of a country's healthcare system are struggling to keep up, especially in a developing country you can easily notice the shortage in healthcare services, equipment, and even staff.

As a result, some curable diseases may go unnoticed and a situation that could be easily managed might escalate to a more serious problem.

According to recent studies, skin and subcutaneous diseases are the fourth leading cause of nonfatal disease burden globally, affecting 30–70% of individuals and prevalent in all age groups. In addition to that Diagnostic accuracy of non-specialists is only 24–70%.

## Project Objectives

Our team took notice of that and we started thinking how we could integrate computer science and machine learning with the medical field to help mitigate the load on the healthcare system.

Researchers have been trying to leverage the benefits of AI technology for a few decades now and since we are passionate about solving problems, especially ones that are directly affecting human lives, we are trying to address this problem by providing a solution that can help both the patient and the professional healthcare provider.

The following list shows the main objectives of the project:

* To use Artificial Intelligence tools as a promising method of diagnosing commonly known diseases and to be a relatively easier and a cheaper added asset to help with the lack of healthcare services and staff.
* To develop a system that can diagnose skin diseases with high accuracy using AI models that are deployed to the cloud.
* To make use of the abundance of data to be provided by users with their permission to increase the AI models accuracy.
* To develop an easy-to-use mobile application connected to our online system to be the interface of our system, which will in turn be the entry point of metadata and images from the users to be scanned.
* To provide a follow-up with the users with information and possibly off-the-shelf medicine to help with their diagnosis.

## Project Scope

“DermaAI” is an application that can provide reliable diagnosis of 620+ skin diseases. We believe this will help mitigate the load on the healthcare system and provide the public with an alternative when there are no options left.

The process of diagnosis goes as follows:

First the patient requests a new scan which is followed by a couple of simple questions, like the affected place on the body for example.

Secondly, he is to be asked to provide an image of the area related to the diagnosis, he may also be asked to crop out only that particular area to make it easier to detect.

Finally, the patient is asked to confirm his input. The result will be the highest predicted diseases, in addition to photos of similar cases and information about the disease and what the patient can and can’t do to take care of the affected area.

## Project Timeline

* Identifying project objectives
* Diagnose skin diseases with high accuracy using Deep Learning.
* Ease of providing drugs related to dermatology through the App.
* Ease of booking an appointment with a specialist for the patient's condition.
* Project implementation is divided into 4 phases
* First Phase (15 Oct - 7 Jan)
* Brainstorm for Requirement Analysis
  + 1-Sprint
  + 15th Oct To 1st Nov
* Design Document & Prototype
  + 2-Sprints
  + 1st Nov To 1st Dec - 2 Sprints
* Development Demo with first Layer of models
  + 1-Sprint
  + 1 Dec To 15 Dec
* Quality Assurance & 1st version Deployment
  + 1-Sprint
  + 15 Dec To 30 Dec
* Risk Management 7 days.
* Second Phase (7 Jan - 30 Feb)
* Brainstorm, Design Document
  + 1-Sprint
  + 7 Jan To 23 Jan
* Development of 8 DL models in the second layer
  + 1-Sprints
  + 23 Jan To 7 Feb
* Quality Assurance for test demo for live data & Deployment for second version
  + 1-Sprint
  + 7 Feb to 23 Feb.
* Risk Management 7 days.
* Third Phase (30 Feb - 23 Apr)
* Brainstorm, Design Document
* 1-Sprints
* 30 Feb to 14 Mar
* Development Demo with of 16 DL models in the second layer
  + 1-Sprints
  + 14 Mar to 30 Mar
* Quality Assurance for test demo for live data & Deployment for third version
  + 1-Sprint
  + 1 Apr to 15 Apr.
* Risk Management 7 days.
* Fourth Phase (23 Apr - 30 Jun)
* Brainstorm, Design Document
  + 1-Sprint
  + 23 Apr to 7 May
* Development Demo with of 23 DL models in the second layer
  + 1-Sprint
  + 7 May to 23 May.
* Quality Assurance for test demo for live data & Deployment for Final version
  + 1-Sprint
  + 23 May to 7 Jun.
* Completing Full Documentation
  + 1-Sprint
  + 7 Jun to 23 Jun
* Risk Management 7 days.
* Addition Risk Management on overall plan 15 days

\*\*\* TODO\*\*\*

## Document Organization

This project consists of six chapters in addition to one appendix. These chapters are organized to reflect the scientific steps toward our main objective. A brief description about the contents of each chapter is given in the following paragraphs:

# Chapter 2: Literature Review

A project must always be put in the context of existing works relevant to the topic. Discussion of that context is referred to as a review of the literature and can either be a separate chapter or be integrated into the project as a whole. The review of the literature encompasses discussions of the prevailing theories, existing creative works, historical contexts, relevant studies, etc. The list of references should endorse that a thorough examination of similar and related existing works have taken place. The chapter should:

* provide evidence supporting the historical, theoretical, and research background of the study;
* show the relationships between the study and other research studies of similar areas;
* define how the investigation differs from other studies in the field;
* include theoretical foundations, expert opinion, and actual research findings;
* use primary sources whenever possible.

## Introduction

## Background

You should provide a brief section giving background information on the materials needed to follow your project because the information and experience of the readers with the subject and materials involved may vary.

## Review of Relevant Work

Categorize the literature into recognizable topic clusters:

* stake out the various positions that are relevant to your project,
* build on conclusions that lead to your project, or demonstrate the places where the literature is lacking.

## Relationship between the Relevant Work and Our Own Work

## Summary

# Chapter 3: System Analysis

It is necessary to study and analyze the current system to understand the shortcomings and problems of the current system and generate solutions to solve the problems.

## Introduction

## Analysis of Existing Systems

This section may contain any of the following information; document review, data collection, user interviews, questionnaires, observation or data sampling.

## System Requirements

### Functional Requirements

### Non Functional Requirements

Performance Constraints

Resources

### Design Objectives (*Optional*)

### User Requirements

## System Architecture

## Development Methodology

Either UML or DFD is recommended for this purpose. If you use the DFD, then use the corresponding diagrams (instead of use case and sequence diagram).

### Use Case Diagrams

### Use Case Description (Detailed Use Cases)

### Sequence Diagram

## Tools and Languages

## Summary

# Chapter 4: System Design

The design of the investigation explains how the study was formulated to investigate each question or hypothesis and if appropriate, it identifies all variables and how they are manipulated.

## Introduction

## Class Diagram

If you use DFD, then you should use ER diagram here.

## Data base Design or Algorithms

## 4.4 Interface Design

## 4.5 Summary

# Chapter 5: System Implementation

The students of CS491 should remove this chapter and prepare it only when they take CS492, that is during the implementation of their system.

## Introduction

## Mapping Design to Implementation

## Sample Application Codes

## System Testing

The system testing has the following objectives:

* Perform a final test of all parts of the program.
* Demonstrate that users can interact with the system successfully.
* Verify that all system components are integrated properly and that actual processing situation will be handled correctly.
* Confirm that the system can handle predicted volumes of data in a timely and efficiently manner.

## Results

The results of the investigation are presented in narrative form and may be supplemented with graphics and data could be presented using tables and figures you should well argue and proof. The discussion of the results should be presented according to each question or hypothesis. You can also include inferences, projections, and probable explanations of the results and discuss the implications of patterns and trends, including any secondary findings.

## Goals Achieved

Describe to which degree does the findings support the original objectives of the project (partially, fully achieved, or exceeded expectations). Here you will summarize the achievements and deficiencies of your project. You may also state what you would/could have done, if you had had more time or if things had worked out differently. It is important to be completely honest when it comes to the deficiencies and inadequacies of your work because part of your aim is to demonstrate your ability to recognize the remaining problems.

# Chapter 6: Conclusion and Future Work

## Conclusion

The concluding section should summarize the entire research effort. A sufficiently comprehensive overview should allow the intended audience to comprehend your study. At this point, it is appropriate to reacquaint the reader with the conceptual framework, the design of the investigation, the methodology, and the results of the study. This section should include the significance of the study and its conclusions, the limitations and weaknesses of the study, implications for future research, and recommendations.

## Future Work

This should address two domains: first, new areas of research and development instigated by achievements in this project, and the second part of the current work that were not completed due to time constraints and/or problems encountered.

# References

The purpose of a reference is to acknowledge the contributions of other authors to which you owe an intellectual debt, and also to enable readers to locate the source easily. In this section, you can use alphabetical or numerical system. For the latter we recommend IEEE system which is widely used in computer sciences and engineering. IEEE system dictates the in-text citation to appear as a number within square brackets (e.g. [1]). The full details of the reference appear in the reference list in the order of citation in the text. As for the alphabetical system(also known as author-date system), Harvard or APA system of referencing can be used. The advantage of author-date system, is that the name of the author and the year appear in the text, hence this eases reading. The reader only refers to the reference section for the details of the document since the name and the year already exist in the text.

The following is an example list of references using IEEE system. Please refer to the IEEE citation reference for details.

[1] V. J. Blue, and J. L. Adler, “Cellular automata micro-simulation of bi-directional pedestrian flows,” *J. Transportation Research*, pp. 135-141, 2000.

[2] S. Sarmady, F. Haron, and A. Z. H. Talib, “Modelling groups of pedestrians in least effort crowd movements using cellular automata,” in *Proc. 2009 2nd Asia International Conference on Modelling & Simulation*, Bali, Indonesia, 2009, pp. 520-525.

[3] F. H. Hassan,”Heuristic search methods and cellular automata modeling for layout design ,” Ph.D dissertation, Sch. of Info. Sys, Comp. and Math., Brunel Univ., UK, 2013.

[4] G. K. Still. (2010, July 15). *Crowd Disasters* [Online]. Available: <http://www.gkstill.com/CrowdDisasters.html>.

# Appendix A

For the graduation project CS492 report, you should prepare an appendix explaining file structure on the CD submitted with it. The appendix must also contain information on how the code should be run (i.e. the user guide or manual). Other appendices may include documents such as: the checklist of examiners’ comments, questionnaire, selected experimental data, schedules, testing strategy or risk management plans. Do not include the source code as an appendix (submit it on a CD). Do not include voluminous appendices (these should also be submitted on a CD, if necessary).

Students who have successfully completed their graduation project, CS492 oral examination and made all the revisions and corrections required by the examining committee, must submit one bound copy to the Project Committee.

# Appendix B

This section shows examples of figure, table and equation. We assume that the figure, table and equation appear in Chapter 2, therefore their numberings will be preceded by number 2. Whenever possible please place the figures and tables alongside with the captions, immediately following the first text that refer to it. If this is not possible, then the figure or table should appear in the following page. More than one figure or table can be placed in a single page. However, it is advisable to disperse the figures and tables throughout the report. Please ensure that the figures and tables do not run across pages.

process3.emf

Figure 2.1: Basic movement process model.

Figure 2.1 shows that before and after spacing should be equal to 12pt. The figure caption is under the figure. Figures are center justification. If you start a paragraph with the word “Figure” then use capital F, otherwise small f.

Tables are similar to the figures, but the difference is that the table caption is above the table, for example, table 2.1 shows an example of way-finding path table concept.

Table 2.1: An example of way-finding path table concept [2].

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Source** | **Destination** | **Cost** | **MidP-1** | **MidP-2** | **MidP-3** | **MidP-4** | **MidP-5** | **MidP-6** |
| Gate1 | Gate2 | 1 | - | - | - | - | - | - |
| Gate1 | Gate6 | 2 | Room1 | - |  | - | - | - |
| Room4 | Room7 | 3 | Room3 | Room5 | - | - | - | - |
| … | … | … | … | … | … | … | … | … |

References are numbered in square brackets, “[” and ”]”. We use IEEE system in our citation above, see the examples in the reference section.

Each equation in a chapter is to be numbered consecutively using a decimal system appearing flush with the right hand margin. For example:

Y = mx + b (2.1)

The numbers in parentheses are the chapter number and equation number respectively. Every new symbol used in the report text for the first time must be explained. When a large number of special symbols are used, it is permissible to collect them in a table or in a special appendix.

# Appendix C

The following describe the details of the required report format.

**Paper**

Standard A4 size; Weight: 90 Grams

Width: 8.27"; Height: 11.69"

**Fonts, Type Styles**

Font Size = 12 (Normal Text)

Font = Times New Roman

Heading 1 (Font Size) = 22 (Bold), Font = Times New Roman

Heading 2 (Font Size) = 16 (Bold), Font = Times New Roman

Heading 3 (Font Size) = 14 (Bold), Font = Times New Roman

**Margins**

Top = 1.0" Bottom = 1.0"

Left = 1.25" Right = 1.0"

**Spacing**

Line Spacing = 1.5

Paragraph Spacing = 6 pts (before) and 0 pts (after)

**Indentation**

Indent all quotations comprising 4 or more lines by 5 spaces from left.

**Page Numbers**

Except for the title page, number all pages which come before the first page of the body chapters consecutively with lower case roman numerals (i, ii, iii, iv…).

The first page with Arabic numeral (1, 2, 3, and so on) starts from the page of the introduction but it is mentioned on page 2 onwards. Mention page numbers on the bottom right of the page. The first page of each section or chapter will not carry the page number, however the page number will be counted for the proceeding page.

**Headers**

The header will comprise the title of the project report (together with the project logo if you wish). On every odd page will appear the title of the report while on the even pages the title of the chapter or section will be mentioned. The first page of every section or chapter shall not carry the header.