**DECLARATION**

We hereby declare that the Capstone Project Phase - 2 entitled **“SmartCart”** has been carried out by us under the guidance of Dr. Bharathi R., Professor and submitted in partial fulfilment of the course requirements for the award of degree of **Bachelor of Technology** in **Computer Science and Engineering** of **PES University, Bengaluru** during the academic semester June – Nov. 2023. The matter embodied in this report has not been submitted to any other university or institution for the award of any degree.

| **PES2UG20CS004**  **PES2UG20CS100**  **PES2UG20CS465**  **PES2UG20CS524** | **Aakarsh Jain**  **Saketh D Varma**  **Shubham Karjini**  **Nachiketha C S** |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

**ACKNOWLEDGEMENT**

I would like to express my gratitude to Dr. Bharathi R., Department of Computer Science and Engineering, PES University, for her continuous guidance, assistance, and encouragement throughout the development of this UE20CS461A -Capstone Project Phase – 2.

I am grateful to the Capstone Project Coordinator, Dr. Sarasvathi V, Professor and Dr. Sudeepa Roy Dey, Associate Professor, for organizing, managing, and helping with the entire process.

I take this opportunity to thank Dr. Sandesh B J, Chairperson, Department of Computer Science and Engineering, PES University, for all the knowledge and support I have received from the department. I would like to thank Dr. B.K. Keshavan, Dean of Faculty, PES University for his help.

I am deeply grateful to Dr. M. R. Doreswamy, Chancellor, PES University, Prof. Jawahar Doreswamy, Pro Chancellor – PES University, Dr. Suryaprasad J, Vice-Chancellor, PES University and Prof. Nagarjuna Sadineni, Pro-Vice Chancellor - PES University, for providing to me various opportunities and enlightenment every step of the way. Finally, this project could not have been completed without the continual support and encouragement I have received from my family and friends.

**ABSTRACT**

To revolutionize the online fashion retail experience, this project introduces a user-friendly web application that integrates virtual try-on technology, recommendation systems, and seamless e-commerce functionality. In the modern era of online shopping, improving the user experience and bridging the gap between virtual and physical try-on experiences are crucial.

Users see a dynamic home page with a curated selection of fashion items after logging in. Cloth recommendations are offered, allowing users to peruse personalized outfit suggestions derived from a variety of datasets. Once they select a favorite outfit from the recommendations, they are shown a virtual try-on option that makes use of augmented reality or computer vision techniques to show users how the chosen outfit will appear on them in real-time.

This integration of recommendation, virtual try-on, and e-commerce not only streamlines the shopping process but also adds a personalised and interactive dimension to online fashion retail. The outfit selected for the virtual try-on will be automatically added to the cart. The application provides a transparent and intuitive billing system, displaying the accumulated costs of chosen items.

| **TABLE OF CONTENTS**   | **Chapter No.** | **Title** | **Page No.** | | --- | --- | --- | | **1.** | **INTRODUCTION** | **01** | | **2.** | **PROBLEM STATEMENT** | **02** | | **3.** | **LITERATURE REVIEW**  3.1 A Virtual Trial Room Using Pose Estimation and  Homography  3.1.1 Objective  3.1.2 Working  3.1.3 Advantages  3.1.4 Limitations  3.2 Automatic Generation of Code Analysis Tools: The  CastQL Approach  3.2.1 Objective  3.2.2 Working  3.2.3 Advantages  3.2.4 Limitations  3.3 Implementation Of Virtual Fitting Room Using Image  Processing  3.3.1 Objective  3.3.2 Working  3.3.3 Advantages  3.3.4 Limitations  3.4 A Neural Network Approach To The Virtual dressing  room  3.4.1 Objective  3.4.2 Working  3.4.3 Advantages  3.4.4 Limitations  3.5 Towards Photo-Realistic Virtual Try-On by Adaptively  Generating⇔Preserving Image Content  3.4.1 Objective  3.4.2 Working  3.4.3 Advantages  3.4.4 Limitations | **03**  **03**  **03**  **03**  **03**  **03**  **04**  **04**  **04**  **04**  **04**  **05**  **05**  **05**  **05**  **05**  **06**  **06**  **06**  **06**  **06**  **07**  **07**  **07**  **07**  **07** | | **4.** | **PROJECT REQUIREMENTS SPECIFICATION**  4.1 Introduction  4.1.1 Project Scope  4.2 Literature Survey or Existing System  4.3 Product Perspective  4.3.1 Product Features  4.3.2 User Classes and Characteristics  4.3.3 Operating Environment  4.3.4 General Constraints, Assumptions and Dependencies  4.3.5 Risks  4.4 Functional Requirements  4.4.1 Outfit Selection  4.4.2 Cloth Recommendation  4.4.3 Virtual Try-On  4.4.4 Shopping Cart  4.5 External Interface Requirements  4.5.1 User Interfaces  4.5.2 Recommendation Button  4.5.3 Virtual Try-On Interface  4.6 Non-Functional Requirements  4.6.1 Performance  4.6.2 Scalability  4.6.3 Usability  4.6.4 Compatibility  4.6.5 Security  4.7 Other Requirements | **08**  **08**  **08**  **09**  **09**  **10**  **10**  **11**  **11**  **11**  **11**  **11**  **11**  **12**  **12**  **12**  **12**  **12**  **13**  **13**  **13**  **13**  **13**  **14**  **14**  **14** | | **5.** | **HIGH LEVEL DESIGN**  5.1 Introduction  5.2 System Architecture  5.2.1 Frontend  5.2.2 Backend  5.2.3 Database  5.3 Components  5.3.1 User Authentication and Database  5.3.2 Image Processing and Feature Extraction  5.3.3 Nearest Neighbors Recommendations  5.3.4 Web Application  5.3.5 File Handling  5.4 High Level Design  5.4.1 Sequence Diagram  5.4.2 Data Flow Diagram | **15**  **15**  **15**  **15**  **16**  **16**  **16**  **16**  **17**  **17**  **17**  **17**  **18**  **18**  **19** | | **6.** | **LOW LEVEL DESIGN**  6.1 Introduction  6.2 Purpose  6.3 Scope  6.4 Design Constraints, Assumptions and Dependencies  6.5 Design Description  6.5.1 Master Class Diagram  6.5.2 Class Diagram | **20**  **20**  **21**  **21**  **22**  **23**  **24**  **25** | | **7.** | **SYSTEM DESIGN**  7.1 Introduction  7.2 Dataflow  7.3 Modules  7.4 System Considerations  7.4.1 Master Class Diagram  7.4.2 Use Case Diagram  7.4.3 Packaging Diagram  7.4.4 Deployment Diagram | **26**  **26**  **26**  **28**  **29**  **29**  **34**  **35**  **36** | | **8.** | **PROPOSED METHODOLOGY**  8.1 Web Application Foundation  8.2 User Authentication and Database Integration  8.3 Image Handling and Recommendation System  8.4 Virtual Try-On  8.5 Openpose Estimation  8.6 Semantic Generation  8.7 User Interface Design  8.8 Price Information Display  8.9 Flask Session Usage  8.10 Library Dependencies  8.11 Error Handling | **37**  **37**  **37**  **37**  **38**  **38**  **38**  **38**  **39**  **39**  **39**  **39** | | **9.** | **IMPLEMENTATION AND PSEUDOCODE**  9.1 Recommendation Pseudocode  9.1.1 Image Upload and Save  9.1.2 Image Feature Extraction  9.1.3 Nearest Neighbors Recommendation  9.2 Virtual Try-On Pseudocode  9.2.1 Pose Estimation  9.2.2 Bilinear Filter  9.2.3 Semantic Generation  9.2.4 Correlation Layer | **40**  **40**  **40**  **41**  **42**  **42**  **42**  **43**  **43**  **44** | | **10.** | **RESULTS AND DISCUSSION**  10.1 Results  10.2 Discussion | **45**  **45**  **48** | | **11.** | **CONCLUSION AND FUTURE WORK**  11.1 Conclusion  11.2 Future Work  11.2.1 Module Refinement  11.2.2 Dataset Enrichment  11.2.3 Scalability  11.2.4 Enhanced Security  11.2.5 Performance Optimization  11.2.6 Feature expansion | **50**  **50**  **51**  **51**  **51**  **51**  **51**  **52**  **52** | | **12.** | **REFERENCES/BIBLIOGRAPHY** | **53** | | **13.** | **APPENDIX A DEFINITIONS, ACRONYMS AND ABBREVIATIONS** | **57** | | **14.** | **APPENDIX B FIGURES** | **59** | | |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**LIST OF FIGURES**

| **Figure No.** | **Title** | **Page No.** |
| --- | --- | --- |
| Figure 5.4.1  Figure 5.4.2  Figure 6.5.1  Figure 6.5.2  Figure 7.4.1  Figure 7.4.2  Figure 7.4.3  Figure 7.4.4  Figure 9.1.1    Figure 9.1.2    Figure 9.1.3    Figure 9.2.1  Figure 9.2.2  Figure 9.2.3    Figure 9.2.4  Figure 10.1 | Sequence Diagram  Dataflow Diagram  Master Class Diagram  Class Diagram  Master Class Diagram  Use Case Diagram  Packaging Diagram  Deployment Diagram  Pseudo code snapshot of Image Upload and Save  Pseudo code snapshot of Image Feature Extraction  Pseudo code snapshot of Nearest Neighbors Recommendation  Pseudo code snapshot of Pose Estimation  Pseudo code snapshot of Bilinear Filter  Pseudo code snapshot of Semantic Generation  Pseudo code snapshot of Correlation Layer  Snapshot of Cloth Recommendation | **18**  **19**  **24**  **25**  **29**  **34**  **35**  **36**  **40**  **41**  **42**  **42**  **43**  **43**  **44**  **45** |

**LIST OF TABLES**

| **Table No.** | **Title** | **Page No.** |
| --- | --- | --- |
| 7.4.1.2  7.4.1.5  7.4.1.8  7.4.1.11  7.4.1.14  7.4.2.1 | Data Members of User Module  Data Members of System Module  Data Members of Virtual Try-On Module  Data Members of Recommendation Module  Data Members of Bill Module  Use Case Description | **30**  **31**  **31**  **32**  **33**  **35** |