[Personalised Health care]

ON

Submitted in partial fulfillment of the requirements
of the degree of

Bachelor of Engineering
(Information Technology)

By

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Under the guidance of

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Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Content

Introduction to Project

- The healthcare sector is undergoing a significant transformation with the advent of artificial intelligence (AI) and data-driven technologies.
- One of the critical areas benefiting from this transformation is dermatology, where AI-powered tools are being developed to enhance diagnostic accuracy.
- This presentation explores the use of machine learning and deep learning techniques to improve the accuracy of skin disease diagnosis.
- We will discuss the benefits and challenges of these methods, examine their performance on various datasets, and propose solutions to enhance their clinical adoption

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Lacuna in the existing system

- **Limited Access to Specialists**: Shortage of trained dermatologists delays diagnosis.
- **Subjective Assessments**: Traditional methods vary by professional experience.
- **High Error Rates**: Misdiagnoses lead to incorrect treatments.
- **Lack of Personalized Insights**: Current systems overlook patient history and genetic factors.
- **Data Fragmentation**: Health data is scattered across multiple systems, leading to incomplete insights and ineffective care management.

Problem Definition

- Reduce diagnostic errors with automated image analysis.
- Provide real-time, data-driven insights.
- Personalize healthcare using patient-specific data.
- Improve accessibility to quality dermatological diagnostics.

Literature Survey

Sr no	Name of paper	Year of publication	Author	Summary
1.	Skin Lesion Classification and Detection Using ML Techniques	2023	Taye Girma Debelee	A systematic review of ML and DL advancements in skin lesion analysis, discussing classification, segmentation, and detection methods. Highlights dataset challenges and future directions
2.	Machine Learning and Deep Learning for Medical Image Analysis	2022	Meghavi Rana & Megha Bhushan	Reviews ML and DL applications for disease detection, comparing classifiers like SVM and CNNs. Experimental evaluations on MRI datasets.
3.	A Systematic Literature Survey on Skin Disease Detection.	2024	Rashmi Yadav & Aruna Bhat	Analyzes ML and DL techniques from 2021-2023, categorizing studies by models, datasets, and performance metrics. Identifies challenges like image noise.
4.	Recent Advancements in the Diagnosis of Skin Diseases Using ML and DL	2023	Junpeng Zhang et al.	Comparative analysis of ML and DL methodologies for skin disease diagnosis, emphasizing segmentation, classification, and dataset generalizability issues.

Literature Survey

Sr no	Name of paper	Year of publication	Author	Summary
5.	Systematic Review of Deep Learning Image Analyses for Skin Disease Diagnosis	2023	Shern Ping Choy et al.	Evaluates DL's role in diagnosing and monitoring skin diseases, identifying biases in dataset representation and recommending real-world validation methods.
6.	The Role of Machine Learning and Deep Learning Approaches for the Detection of Skin Cancer	2023	Tehseen Mazhar et al.	Reviews ML and DL applications for disease detection, comparing classifiers like SVM and CNNs. Experimental evaluations on MRI datasets.
7.	Skin Lesions Diagnosis Using ML and DL Classification Models	2023	-	Examines ML and DL models for diagnosing skin lesions, comparing their accuracy and robustness across datasets. Suggests improvements for real-world applications.

Methodology Employed

1. **Data Collection & Preprocessing**
    - Large-scale dataset compilation, enhancement, and feature extraction.
2. **Model Selection & Training**
    - Comparison of ML/DL models .
    - Hyperparameter tuning and optimization.
3. **System Development**
    - AI model integration into a diagnostic platform.
    - Cloud and edge computing deployment.
4. **Validation & Testing**
    - Performance evaluation (accuracy, precision, recall, F1-score).
    - Clinical validation with dermatologists.

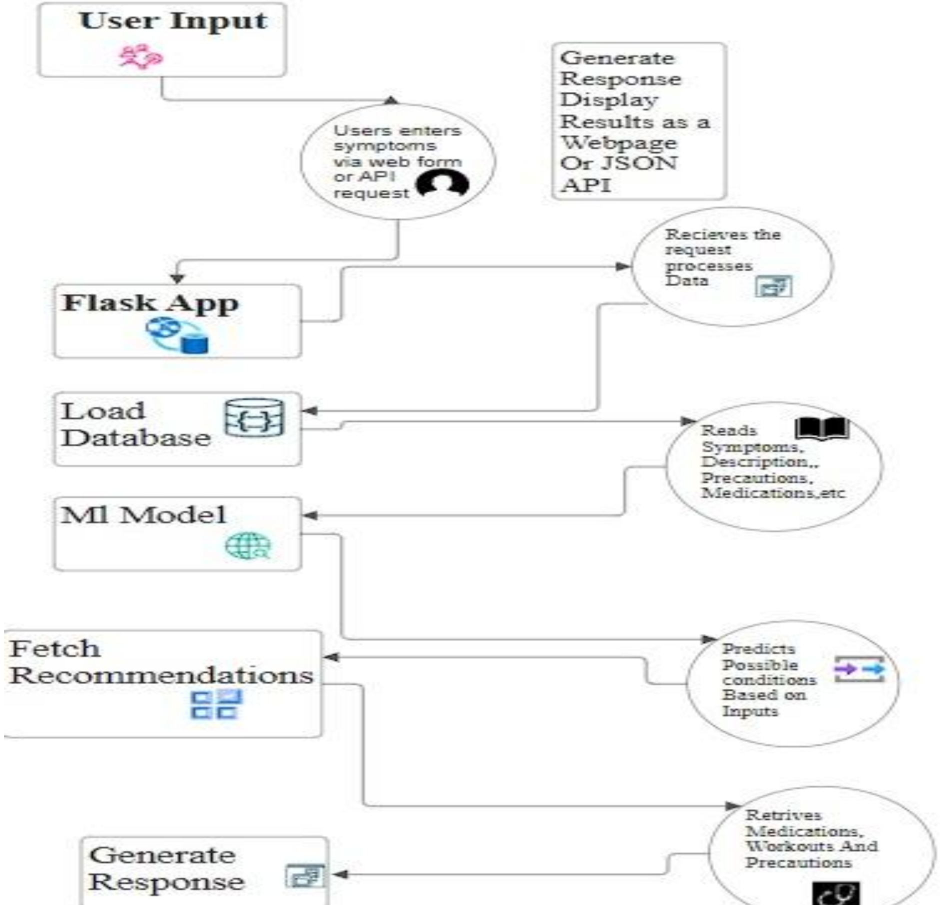
Hardware, Software, Tools and constraint

Hardware:
- Processor: I3 or higher
- RAM: Minimum 2GB
- Monitor
- Internet Connection

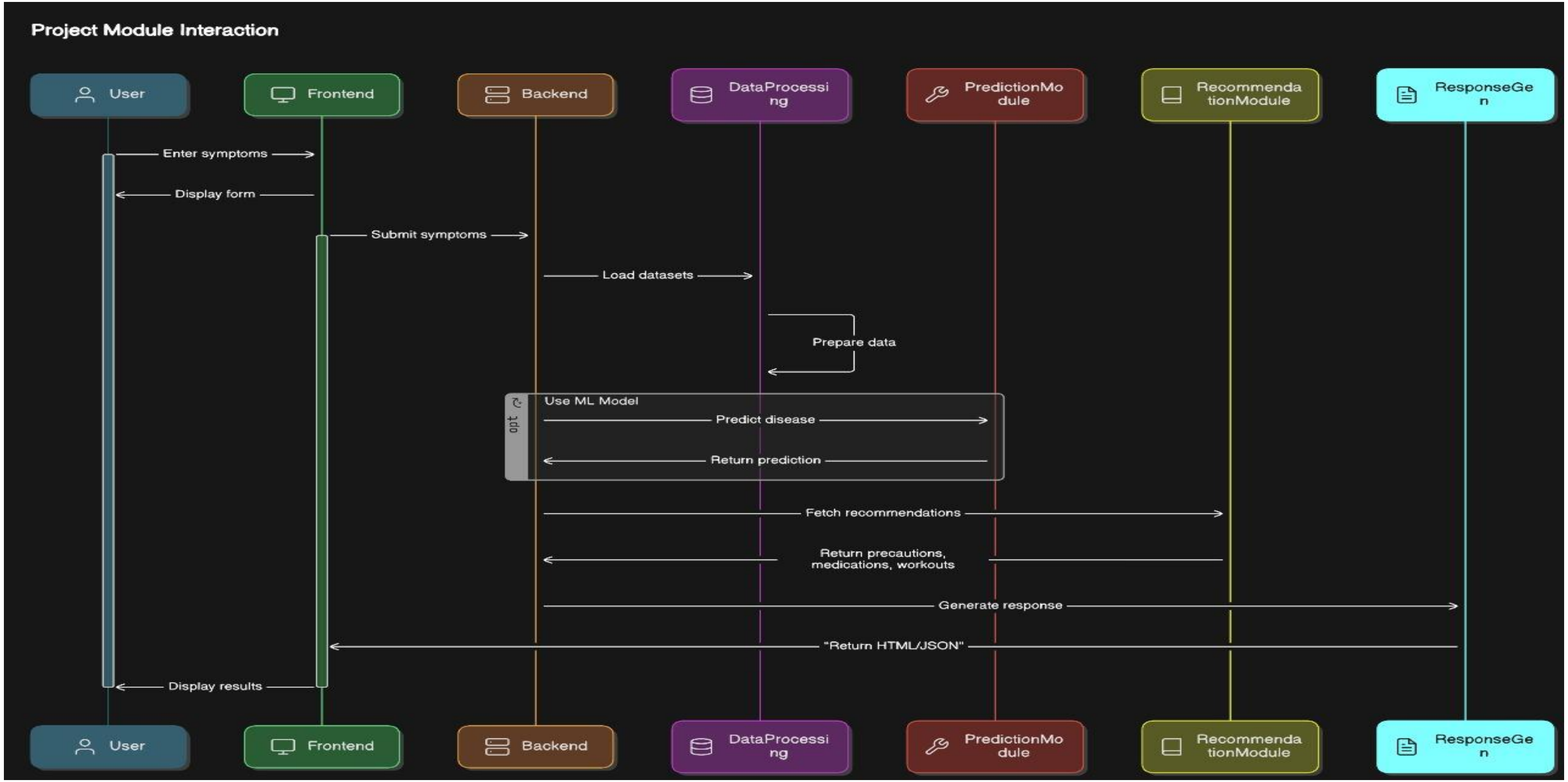
Software:
- VS Code
- Data analytics
- EHR integration platforms
- Front-end development tools

Tools:
- Cloud computing services
- Database management systems
- Version control systems

Block Diagram



Modular Diagram



Implementation Screenshots

Comparison :

Feature	With 5-Fold Cross-Validation	Without 5-Fold (Single Split)
Process	Splits data into 5 parts, trains on 4, tests on 1, repeats 5 times.	Splits data into training & testing once.
Bias & Variance	Reduces variance, provides stable results.	Higher variance, depends on the specific split.
Training Efficiency	More computationally expensive (5 runs).	Faster (only one train-test split).
Performance Accuracy	More reliable generalization performance.	Might be overfitting or underfitting due to one-time evaluation.
Use Case	When dataset is small, or a	When dataset is large, or

Implementation Screenshots

```
SVC Accuracy: 1.0
SVC Confusion Matrix:
[[40,  0,  0, ...,  0,  0,  0],
 [ 0, 43,  0, ...,  0,  0,  0],
 [ 0,  0, 28, ...,  0,  0,  0],
 ...,
 [ 0,  0,  0, ..., 34,  0,  0],
 [ 0,  0,  0, ...,  0, 41,  0],
 [ 0,  0,  0, ...,  0,  0, 31]]

========================================
```

```
RandomForest Accuracy: 1.0
RandomForest Confusion Matrix:
[[40,  0,  0, ...,  0,  0,  0],
 [ 0, 43,  0, ...,  0,  0,  0],
 [ 0,  0, 28, ...,  0,  0,  0],
 ...,
 [ 0,  0,  0, ..., 34,  0,  0],
 [ 0,  0,  0, ...,  0, 41,  0],
 [ 0,  0,  0, ...,  0,  0, 31]]

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```

```
GradientBoosting Accuracy: 1.0
GradientBoosting Confusion Matrix:
[[40,  0,  0, ...,  0,  0,  0],
 [ 0, 43,  0, ...,  0,  0,  0],
 [ 0,  0, 28, ...,  0,  0,  0],
 ...,
 [ 0,  0,  0, ..., 34,  0,  0],
 [ 0,  0,  0, ...,  0, 41,  0],
 [ 0,  0,  0, ...,  0,  0, 31]]

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```

```
KNeighbors Accuracy: 1.0
KNeighbors Confusion Matrix:
[[40,  0,  0, ...,  0,  0,  0],
 [ 0, 43,  0, ...,  0,  0,  0],
 [ 0,  0, 28, ...,  0,  0,  0],
 ...,
 [ 0,  0,  0, ..., 34,  0,  0],
 [ 0,  0,  0, ...,  0, 41,  0],
 [ 0,  0,  0, ...,  0,  0, 31]]

========================================
```

```
MultinomialNB Accuracy: 1.0
MultinomialNB Confusion Matrix:
[[40,  0,  0, ...,  0,  0,  0],
 [ 0, 43,  0, ...,  0,  0,  0],
 [ 0,  0, 28, ...,  0,  0,  0],
 ...,
 [ 0,  0,  0, ..., 34,  0,  0],
 [ 0,  0,  0, ...,  0, 41,  0],
 [ 0,  0,  0, ...,  0,  0, 31]]

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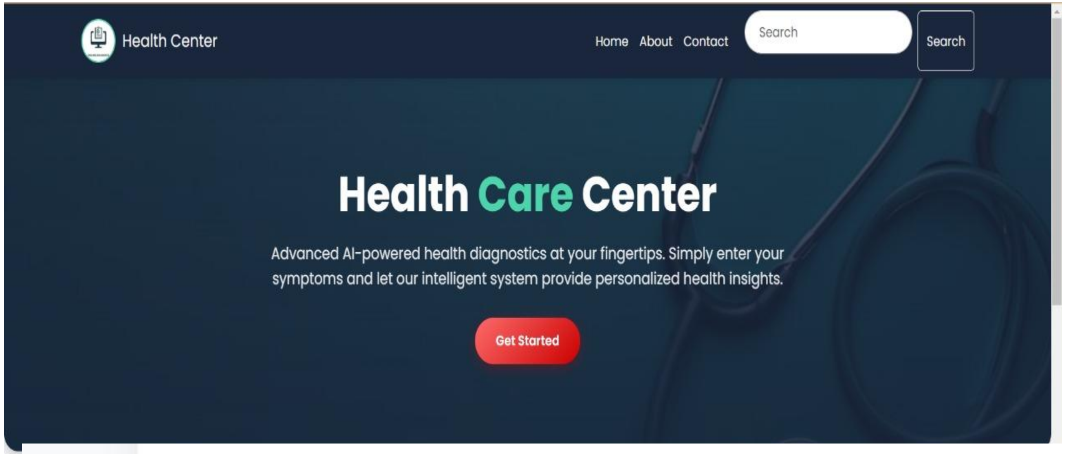
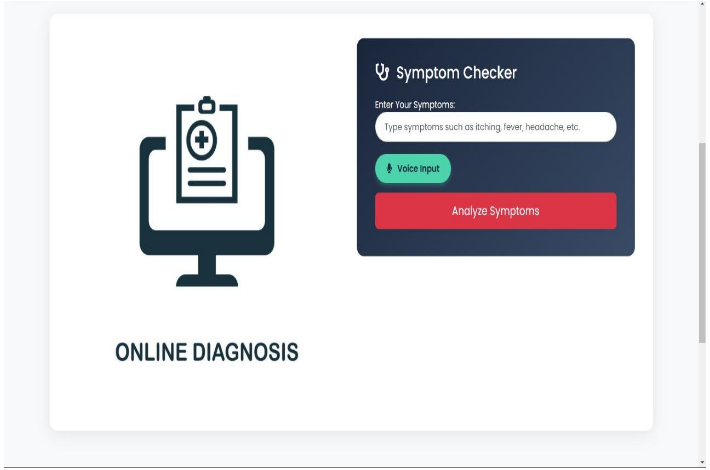
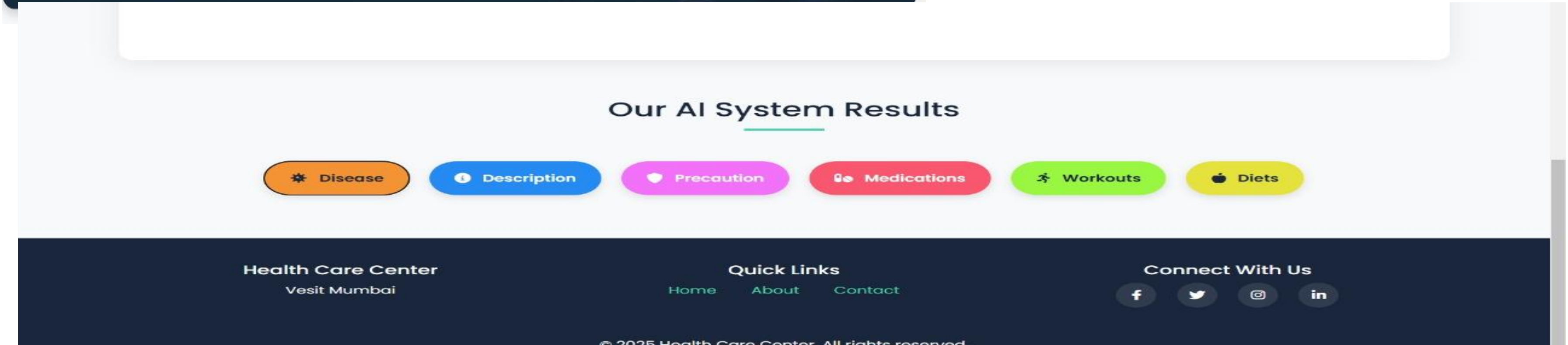
accuracy			0.97	61
macro avg	0.97	0.95	0.95	61
weighted avg	1.00	0.97	0.98	61

Implementation Screenshots







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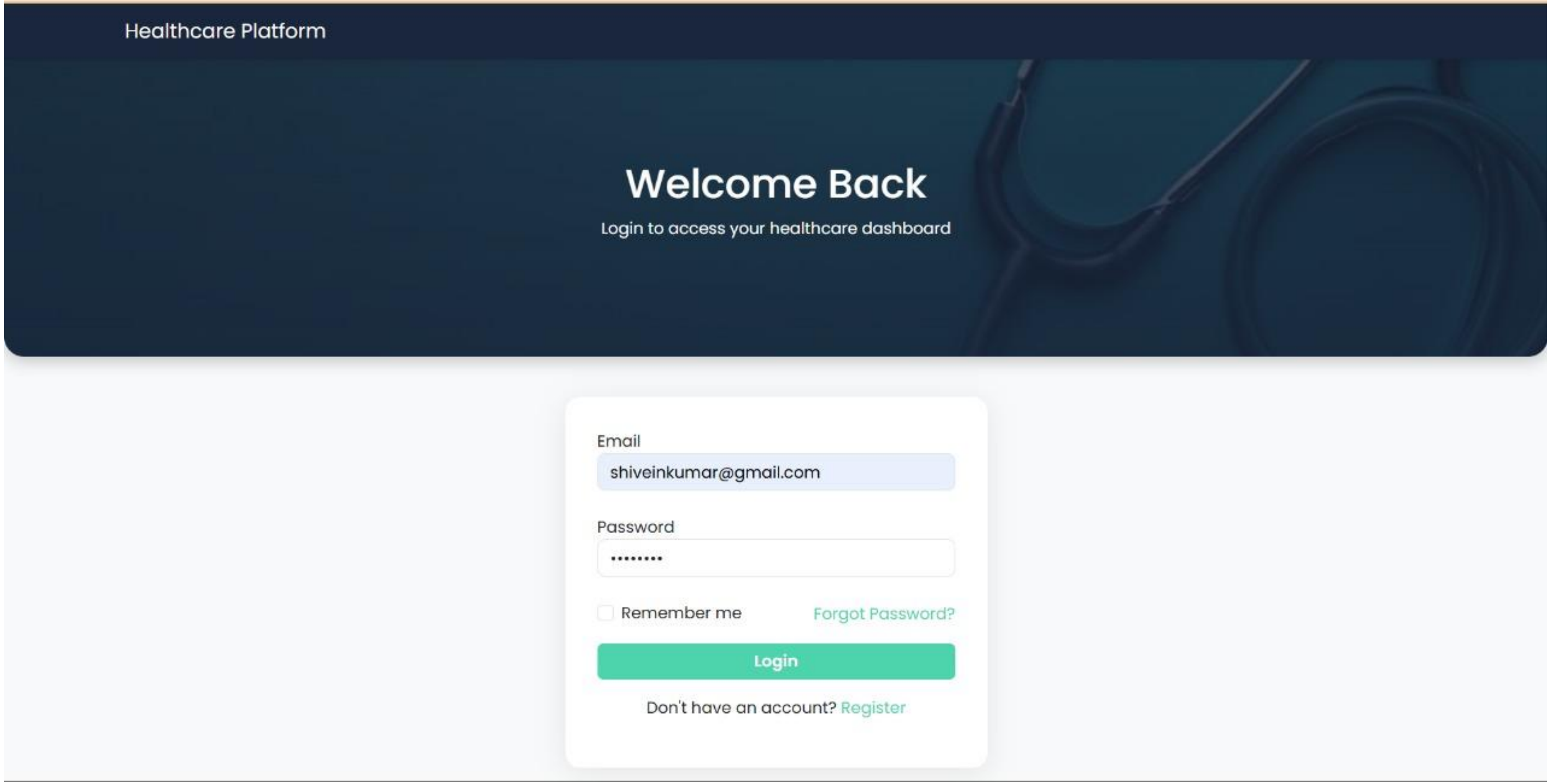

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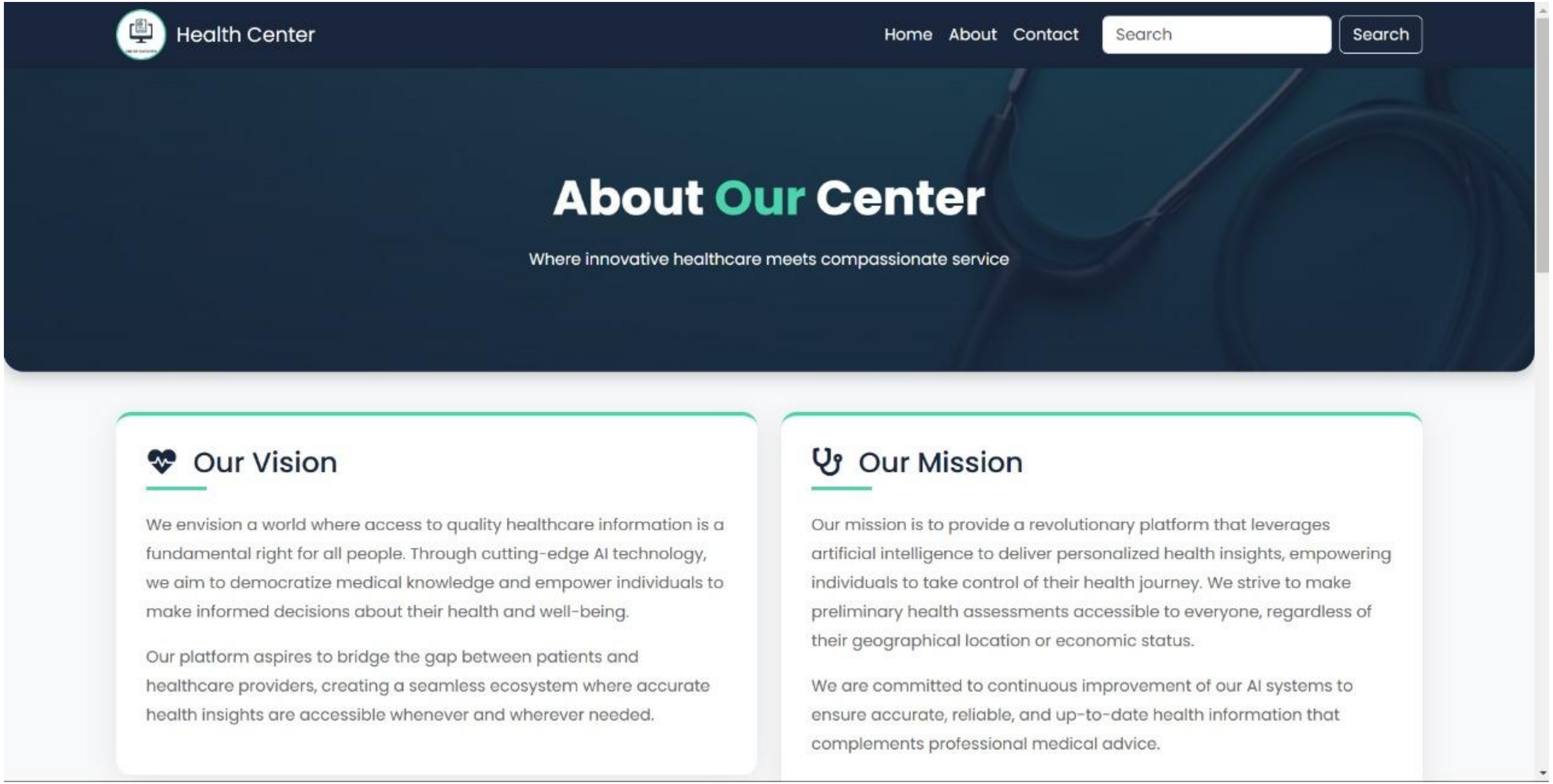

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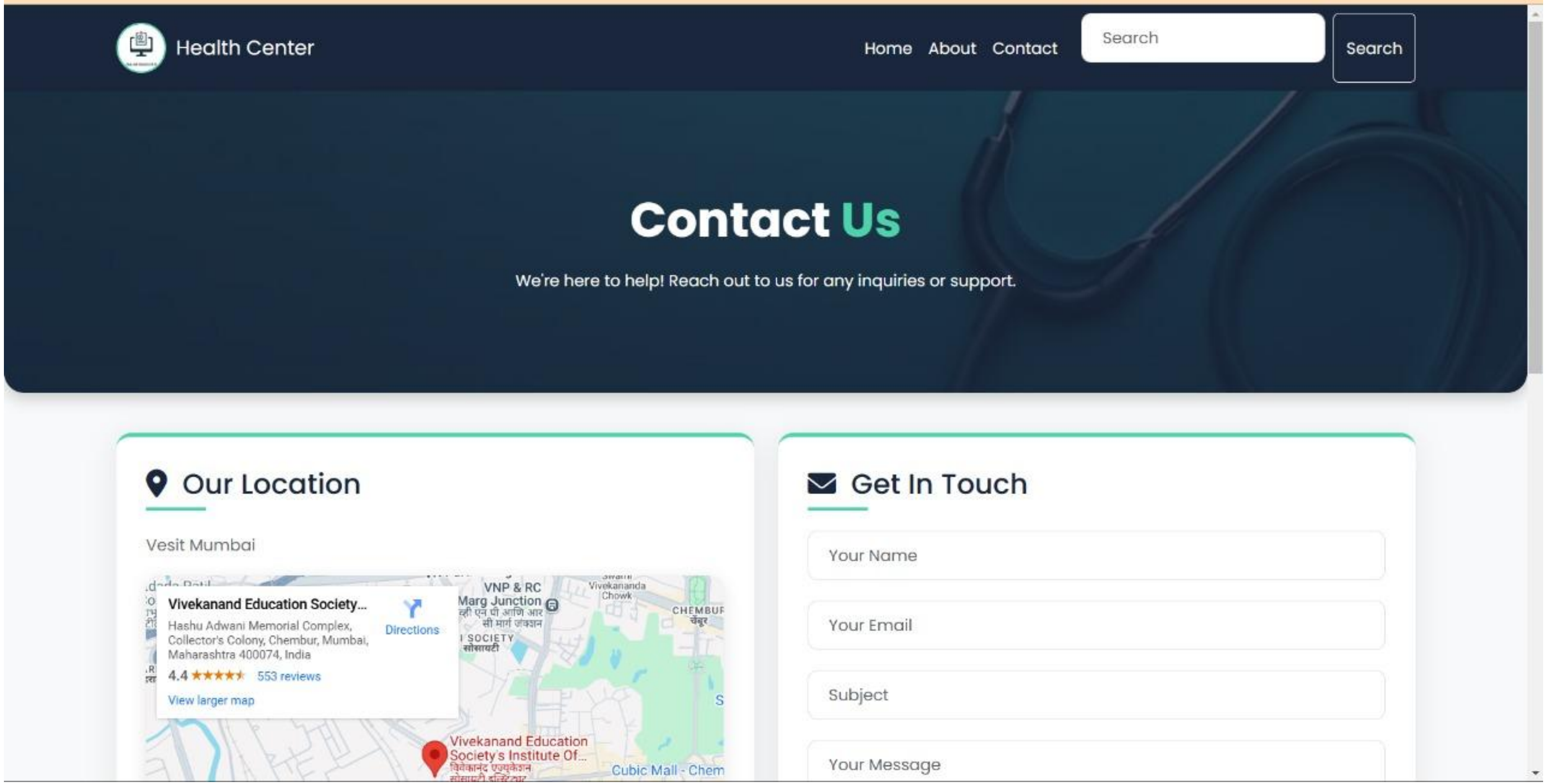

Next Work Plan

- **Enhancing Model Performance**: Improve accuracy across skin types.
- **Telemedicine Integration**: Enable remote diagnostics.
- **Image processing** : Model training with image processed prediction.
- **User Testing & Clinical Trials**: Conduct pilot studies.
- **Regulatory Approvals & Deployment**: Ensure compliance for large-scale use

Conclusion

- ML and DL in dermatology can revolutionize diagnostics, addressing gaps and improving accuracy. Our AI-driven approach enables personalized, efficient, and scalable healthcare, shaping the future of dermatological care globally.
- Continuous advancements, regulatory approvals, and clinical validation..AI-powered dermatology will be essential in modern healthcare, improving patient outcomes worldwide.
- AI-driven approaches provide real-time, data-backed insights that empower both clinicians and patients.

References

[1] Debelee, T. G. (2023). **Skin Lesion Classification and Detection Using Machine Learning Techniques**. A systematic review of ML and DL advancements in skin lesion analysis, discussing classification, segmentation, and detection methods. Highlights dataset challenges and future directions.

[2] Rana, M., & Bhushan, M. (2022). **Machine Learning and Deep Learning for Medical Image Analysis**. Reviews ML and DL applications for disease detection, comparing classifiers like SVM and CNNs. Experimental evaluations on MRI datasets.

[3] Yadav, R., & Bhat, A. (2024). **A Systematic Literature Survey on Skin Disease Detection and Classification**. Analyzes ML and DL techniques from 2021-2023, categorizing studies by models, datasets, and performance metrics. Identifies challenges like image noise.

[4] Zhang, J., et al. (2023). **Recent Advancements in the Diagnosis of Skin Diseases Using ML and DL**. Comparative analysis of ML and DL methodologies for skin disease diagnosis, emphasizing segmentation, classification, and dataset generalizability issues.

References

[5] Choy, S. P., et al. (2023). **Systematic Review of Deep Learning Image Analyses for Skin Disease Diagnosis**. Evaluates DL's role in diagnosing and monitoring skin diseases, identifying biases in dataset representation and recommending real-world validation methods.

[6] Mazhar, T., et al. (2023). **The Role of Machine Learning and Deep Learning Approaches for the Detection of Skin Cancer**. Reviews ML and DL techniques for skin cancer detection, discussing segmentation, lesion tracking, and classification challenges. Highlights applications in computer-assisted diagnosis.

[7]. (2023). **Skin Lesions Diagnosis Using ML and DL Classification Models**. Examines ML and DL models for diagnosing skin lesions, comparing their accuracy and robustness across datasets. Suggests improvements for real-world applications

[8] Esteva, A., Kuprel, B., Novoa, R. A., Ko, J., Swetter, S. M., Blau, H. M., & Thrun, S. (2017). **Dermatologist-level classification of skin cancer with deep neural networks**