

iAccelerate Women's Hackathon

Submission

Theme :

Women's Health and Wellness

Problem Statement:

Women have diverse health needs that are often not adequately addressed by generic healthcare approaches. This lack of personalization can lead to suboptimal health outcomes and limited access to relevant services.

Challenge:

Develop a data-driven solution using Hierarchical Clustering and Gaussian Mixture Models to segment women based on their health needs and preferences, aiming to create personalized healthcare recommendations

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/divyapancholi/menstrual-dataset/



"From Data to Diagnosis: Automating Women's Health Patterns"

Automating Cluster Labeling for Women's Health Insights

Proposed Solution :

We apply unsupervised learning (Hierarchical Clustering & GMM) to segment women based on menstrual cycle patterns, ovulation trends, fertility metrics, and age. An automated labeling system assigns medically relevant tags to each cluster using statistical analysis and domain knowledge.

How It Addresses the Problem:

Personalized Health Insights ~ Women receive tailored insights about their reproductive health.

Medical Awareness ~ Identifies irregular patterns (e.g., PCOS risk, menopause) for early intervention.


Scalability & Automation ~ Eliminates manual analysis, making real-time health insights accessible.

Innovation & Uniqueness:

Automated Labeling ~ No manual interpretation needed.

Hybrid Approach ~ Combines Hierarchical Clustering & GMM for improved accuracy.

Actionable Insights ~ Enables integration with health-tracking apps & telemedicine platforms for real-world impact.

 This solution bridges AI and healthcare, empowering women with data-driven insights for better reproductive health manageme

Technologies Used :

Programming Languages: Python (Pandas, NumPy, Scikit-learn, Seaborn, Matplotlib)

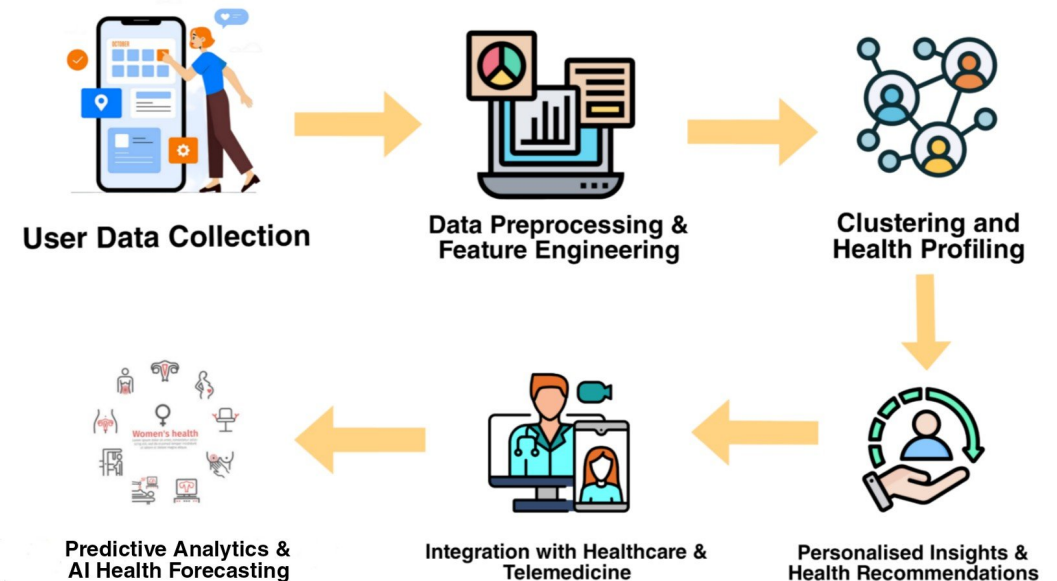
Machine Learning Frameworks: Scikit-learn, Gaussian Mixture Model (GMM), Hierarchical Clustering

Data Processing: Feature Engineering, Standardization (using StandardScaler), PCA for visualization

Visualization Tools: Matplotlib, Seaborn (for cluster interpretation and validation)

Deployment (Optional): Flask/FastAPI for API integration, Streamlit for interactive dashboards

Prototype Flowchart



Feasibility Analysis

Data Availability: Menstrual health data can be collected from apps, devices, or public sources.

Data Quality: Missing or incorrect data needs cleaning and standardization.

Labeling & Interpretation: Clusters should be meaningful and verified by experts.

Challenges & Risks

Privacy Issues: Health data is sensitive and must follow legal protections.

Data Imbalance: Some health conditions may be underrepresented.

Cluster Accuracy: The groups formed should reflect real health patterns.

Handling Large Data: Processing big datasets efficiently can be difficult.

Solutions

Data Security: Use encryption and strict access rules.

Fixing Imbalance: Add more data or use synthetic data techniques.

Expert Involvement: Work with doctors to ensure meaningful results.

Better Models: Improve clustering with feedback and retraining.

Efficient Processing: Use advanced computing methods for large data.



Potential Impact on the Target Audience

Women's Health Awareness: Helps users understand their menstrual patterns and potential health risks.

Personalized Insights: Provides tailored health recommendations based on data-driven analysis.

Early Health Detection: Identifies irregularities that may signal health issues like PCOS or endometriosis.

Better Doctor Consultations: Users can share detailed cycle insights with healthcare providers for better diagnoses.

Benefits of the Solution

Social Impact: Improves women's health education, reduces stigma, and encourages proactive care.

Economic Impact: Lowers healthcare costs by detecting risks early and reducing hospital visits.

Technological Impact: Advances AI-driven health monitoring and data-driven decision-making.

Psychological Impact: Empowers women with better control over their reproductive health, reducing anxiety.

REFERENCES

- **Dataset:**

Source: Menstrual Cycle Data

Author: Richard J. Fehring, Marquette University

Publication Date: 2012

https://epublications.marquette.edu/data_nfp/7/

- **YouTube Educational Channels:**

Menstrual Cycle Basics | 3D Animation

https://youtu.be/zcvo9VLVHWc?si=ICfPbX5QzZ_ioxmw

Hypothalamic Pituitary Ovarian Axis | Female Reproductive System

<https://youtu.be/AWyJw69OZt4?si=dNt5PByAQoYzZdxj>

Female Reproductive Disorders

<https://youtu.be/qluz-2rTKE4?si=Cjl77wcwaKfgNZzX>