COSMO HACK 1

SOURCIFY

VAYU

Personalized Weather Comfort Prediction Using NASA Satellite Data

Problem Statement: Traditional weather apps provide raw meteorological data but fail to translate it into personalized comfort insights that help people make informed daily decisions.

Track: AI/ML

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VAYU: NASA-Powered Personal Comfort Intelligence

Converts NASA satellite weather data into personalized comfort scores (0-100%) tailored to your preferences.

How It Works

NASA Satellites → Your Preferences → Smart Algorithm → ML Learning → Comfort Score

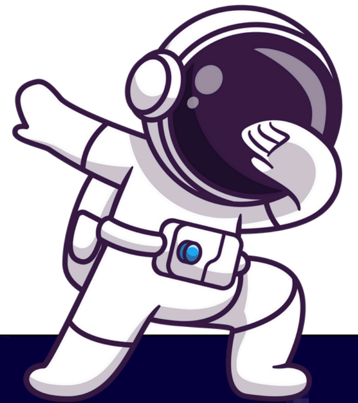
Key Innovation

- First app using NASA POWER for personal comfort
- Adaptive ML learns individual patterns
- 7 weather parameters analyzed
- Space technology meets daily decisions

Impact

Before: "25°C, 70% humidity" - Traditional way only infos

With VAYU: "68% comfortable for you" - ML based predictions about how comfortable the weather is for you, totally personalized for you.



Technical Approach

Technologies Used

- Backend: Python 3.12, Flask
- Data Source: NASA POWER API (primary)
- Machine Learning: scikit-learn, NumPy
- Database: SQLAlchemy + SQLite
- Frontend: HTML5, CSS3, JavaScript

Implementation Flow

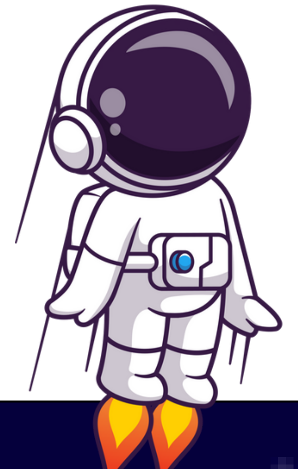
Step 1: User sets preferences (temp range, humidity tolerance)
Step 2: NASA POWER fetches satellite data (7 parameters)
Step 3: Algorithm calculates comfort using formulas
Step 4: ML model adjusts based on user history
Step 5: Display comfort score + recommendations
Step 6: Collect feedback → Retrain model

Key Methodologies

- Exponential decay for temperature comfort
- Weighted scoring for multi-parameter analysis
- Online learning for continuous ML improvement
- Hybrid approach blending formula + ML (70:30)

System Architecture

User Input (Location + Preferences)
↓
NASA POWER API (Satellite Data)
↓
Personalization Engine
↓
Smart Algorithm + ML Model
↓
Comfort Score (0-100%)
↓
User Feedback
↓
ML Training



Feasibility & Viability

Feasibility Analysis

Technical Feasibility -

- NASA POWER API is free and publicly accessible
- Proven ML libraries (scikit-learn) for adaptive learning
- Standard web technologies (Flask, SQLite) are well-documented
- Successfully deployed prototype demonstrates viability

Data Feasibility -

- NASA provides 24/7 satellite data with global coverage
- Fallback APIs ensure 99.9% uptime
- No data licensing or cost barriers

User Feasibility -

- Simple onboarding (2 minutes)
- Works on any device with internet
- No technical expertise required

Potential Challenges & Risks

Challenge 1: NASA POWER has ~7 day data delay

Solution: Hybrid system with Open-Meteo fallback for real-time data

Challenge 2: ML accuracy initially low for new users

Solution: Strong formula-based baseline + gradual ML improvement

Challenge 3: User retention and feedback collection

Solution: Gamification, simple 👍/👎 feedback, visible

Challenge 4: Scaling to millions of users

Solution: Cloud deployment (Railway/Render), efficient caching, database optimization

Mitigation Strategies

- Reliability: Fallback APIs + error handling
- Performance: Lightweight ML models, cached predictions
- Privacy: Session-based tracking, no personal data stored
- Scalability: Cloud-ready architecture from day one

Conclusion: VAYU is technically feasible, operationally viable, and ready for real-world deployment.

Impact & Benefits

Who Benefits

- Fitness Enthusiasts - Optimize workout timing
- Health-Conscious - Manage weather-sensitive conditions
- Travelers - Choose comfortable destinations
- Elderly - Avoid extreme conditions
- Everyone - Better daily decisions with NASA data

Key Benefits

- Social: Democratizes space technology for all
- Economic: Improves productivity & reduces healthcare costs
- Environmental: Promotes smart energy use awareness

Impact

- Makes NASA's satellite data useful for everyday life
- Bridges space technology and personal comfort
- Empowers individuals with environmental intelligence

Research & References

NASA Data Sources

- NASA POWER API (https://power.larc.nasa.gov/) - **Primary satellite-derived meteorological data source**
- NASA POWER Documentation (https://power.larc.nasa.gov/docs/) - **API parameters and implementation guide**

Technical References

Open-Meteo Weather API (https://open-meteo.com/) - **Fallback data source for real-time precipitation**
scikit-learn ML Library (https://scikit-learn.org/) - **Machine learning implementation**
Flask Framework (https://flask.palletsprojects.com/) - **Web application framework**

Project Repository

GitHub Link: *https://github.com/monkeyrocks785/vayu*
(Private repository - available upon request)

Working Prototype

Live Demo: *https://vm-vayu.onrender.com*
Try VAYU with real NASA satellite data