



MISSION WHISPER: AI- POWERED ASTRONAUT STRESS MONITORING SYSTEM

ITAI 2372 – Conceptual Design Track

Alhassane Samassekou

THE CHALLENGE: ASTRONAUT MENTAL HEALTH IN SPACE

- Long-duration missions cause psychological stress (isolation, high stakes).
- Current tools rely on self-reporting, missing subtle distress signs.
- Unchecked stress risks communication breakdowns and mission-critical errors.

Proactive stress monitoring is critical for mission safety and success.



MISSION WHISPER: AI FOR STRESS MONITORING



- AI system to monitor astronaut stress in real time.
- Analyzes voice, facial expressions, biometrics, and text logs.
- Alerts NASA flight surgeons, psychologists, and crews.
- Goal: Enhance safety and performance on long missions.

HOW IT WORKS: MULTIMODAL AI MONITORING

Types of Biometric Authentication



- Non-invasive, continuous monitoring.
- Real-time alerts for high stress levels.
- User-friendly dashboard for mission control.

TECHNICAL DESIGN: DATA AND AI

Data Sources:

- Voice: Tone, pitch, speed (audio logs).
- Video: Micro-expressions (camera feed).
- Biometrics: Heart rate, skin temp, sleep (wearables).
- Text: Sentiment in mission logs/journals.

AI Methods:

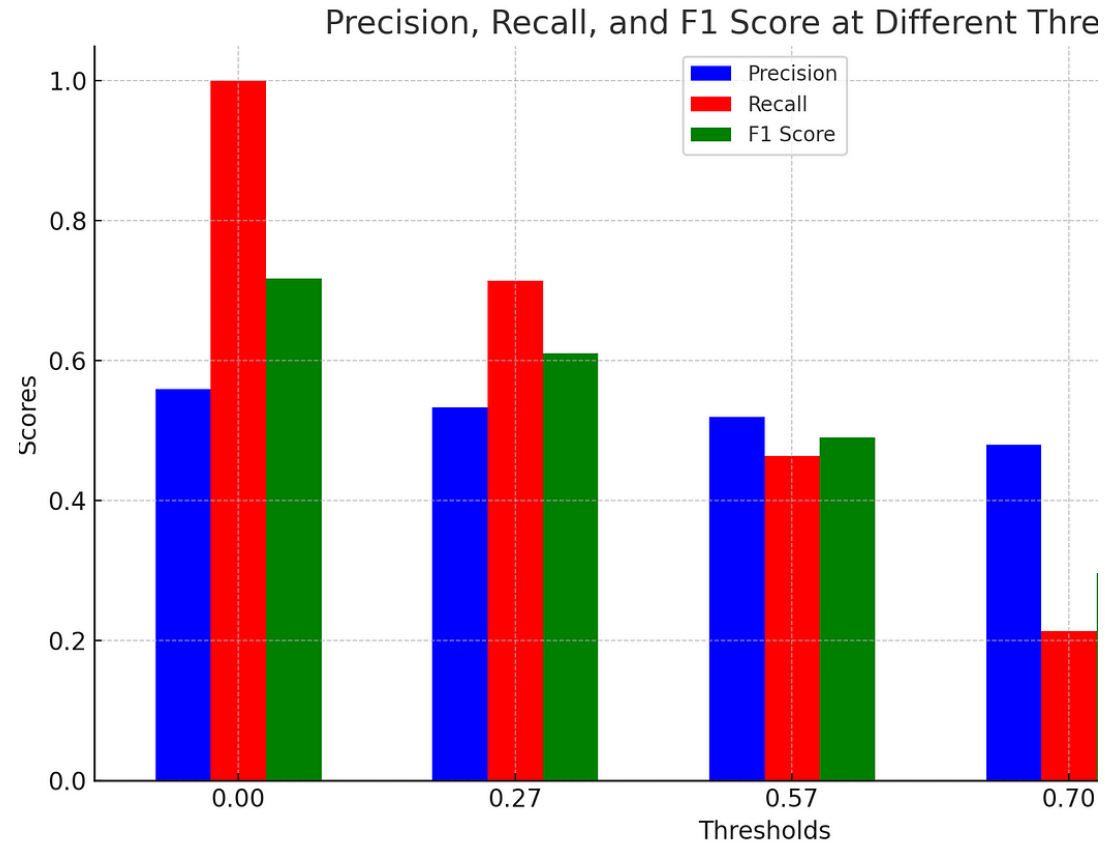
- Voice: CNNs/transformers for emotion recognition.
- Video: ResNet for facial analysis.
- Biometrics: Random Forest for stress classification.
- Text: BERT for sentiment analysis.

SYSTEM ARCHITECTURE



- Preprocessing: Cleans noisy data (e.g., audio filtering).
- Risk Score: Combines outputs for a 0–100 stress score.
 - Dashboard: Real-time visualization using Streamlit.

TESTING PLAN



- Unit Testing: Validate each AI model (voice, video, biometric, text) on labeled datasets.
- Simulation Testing: Test system with mission-like scenarios (e.g., high-stress events).
- Metrics: Accuracy (>85%), F1 score (>0.80), low false positives. Validation: Human-in-the-loop review by psychologists; threshold tuning.

WHY MISSION WHISPER MATTERS



- Enhances astronaut safety and mission success.
- Proactive mental health support for long missions (e.g., Mars, lunar outposts).
- Scalable for future space exploration.
- Empowers flight surgeons and psychologists with data-driven insights.

CONCLUSION

- Mission Whisper: A proactive AI solution for astronaut stress.
- Ready to support NASA's future.
- Comprehensive design with rigorous testing.

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THANK YOU

Alhasasne Samassekou

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