

# **Project Title: CognitiveSense AI – Multi-Modal Cognitive State Prediction System**

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## **★ 1. What this Project Does (Simple Summary)**

CognitiveSense AI ek advanced system hai jo **human stress, distraction, aur thought-shift** (attention drift) ko detect karta hai.

Ye system **4 behavioral signals** ko observe karta hai:

- 1. Keystroke Behavior** – typing speed, pressure, errors
- 2. Mouse Dynamics** – movement smoothness, acceleration, hesitation

3. **Screen Activity** – tab switching, application changes
4. **Facial Micro-Expressions** – blink rate, eye focus, micro-gestures

AI model in sab signals ko analyze karke batata hai:

- . User focused hai ya distracted
- . Stress level kya hai
- . Attention shift hone wala hai ya nahi

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## ★ 2. Why This Project Is Needed (Problem Statement)

Aaj ke digital world me hum computer use karte waqt:

- ✓ Stress me aa jate hain
- ✓ Attention break hota hai

- ✓ Mind drift hota hai
- ✓ Distraction badh jati hai

But **computers ko ye kabhi pata nahi chalta.**

Jab tak user ka behavior bigad jaye, tab tak koi alert nahi hota.

Existing solutions:

- ✗ Sirf emotion detection
- ✗ Sirf keystroke analysis
- ✗ Sirf productivity timers

**But koi bhi multi-modal cognitive prediction system exist nahi karta.**

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### ★ 3. What Makes Our Project Unique (Novelty)

Yeh project itna unique hai ki:

- ✓ 4 behavioral inputs ek saath analyze karta hai
  - ✓ Real-time cognitive state prediction deta hai
  - ✓ Thought-shift (mind drift) detect karta hai → *rare research topic*
  - ✓ Fully software-based hai, **koi sensor nahi chahiye**
  - ✓ Multi-modal fusion model (keystroke + mouse + screen + face)
  - ✓ Research publication ready
- Is combination ka koi open-source ya existing research model nahi hai.

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## ★ 4. System Architecture (Process Flow)

### ◆ Data Collection

Background me ek agent user ke behavior ko record karta hai:

- keystrokes.csv
- mouse.csv
- screen.csv
- face.json

## ◆ **Feature Extraction**

Raw data → features:

- Typing rhythm
- Mouse trajectory stats
- Screen switching entropy
- Blink frequency

## ◆ **ML Models**

- RandomForest → baseline
- LSTM → sequence learning

- TCN → cognitive drift prediction
  - GRU → efficient time-series
- ◆ **Real-time Prediction Engine**

FastAPI live server:

- Every few seconds data process
- Cognitive state calculate
- Dashboard ko live update

◆ **Dashboard**

Streamlit UI:

- Stress meter
- Distraction probability
- Focus timeline
- Thought drift graph



## **5. Expected Outputs**

Our system end-user ko ye provide karega:

- **Stress Level** (Low / Medium / High)
- **Distraction Probability (%)**
- **Thought-Shift Index**
- Real-time alerts
- Weekly cognitive pattern graphs

Accuracy expectation:

- **Stress Prediction:** 70–85%
- **Drift Detection:** High sequence accuracy
- **Dashboard Latency:** <300 ms



## 6. Real-World Applications

- Students → study focus improvement

- IT companies → employee well-being monitoring
  - Online learning platforms
  - Safety-critical jobs (pilots, drivers)
  - ADHD support tools
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## ★ 7. Why This Project Is Perfect for Major Project

- ML + Deep Learning + HCI combination
- Real-time system
- Multi-modal behavioral analysis (rare topic)
- Research paper-ready
- Practical + impactful
- Demo-friendly with dashboard

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## 8. Final One-Line Summary (Best for Presentation)

**“CognitiveSense AI is a real-time multi-modal system that predicts a user’s stress, distraction, and thought-shift using behavioral biometrics — creating a futuristic human-computer interaction model.”**