

StressSense Masterplan

1. App Overview & Objectives

StressSense is a cross-platform mobile application (built in Flutter) designed for early detection of student stress through digital phenotyping. By combining passive sensor signals and active self-reports, StressSense aims to:

- Continuously monitor indicators of stress and well-being in high-school and undergraduate students.
 - Provide personalized insights, quick tips, and study suggestions to help students manage stress.
 - Enable researchers to validate digital phenotyping against standardized questionnaires in a controlled study.
 - Offer a secure, consent-driven data pipeline for research, including a web-based admin dashboard for analytics and export.
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2. Target Audience

- **Primary Users:** High-school and undergraduate students aged ~14–24.
 - **Research Context:** Pilot cohort recruited via academic institutions, with optional control group for active-only vs. passive+active comparison.
 - **Stakeholders:** Students, research team (PI, co-researchers), institutional review boards (IRB).
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3. Core Features & Functionality

3.1 Passive Data Collection

- **Activity & Sleep:** Accelerometer/gyroscope, screen-on/off patterns.
- **Usage Metrics:** App usage categories, unlock frequency.
- **Location Rhythms:** Geofences for 'class', 'home', 'social'.
- **Communication Counts:** Call/text frequency (no content).

3.2 Active Data Collection

- **Daily Check-In:** Chatbot-driven flow capturing mood rating (1–5) and free text.
- **Extended Surveys:** Baseline (PSS or DASS-21) and weekly follow-ups for ground-truth validation.
- **Feedback Prompts:** Thumbs-up/down on previous tips/journaling entries.

3.3 Engagement & Gamification

- **Streak Counter:** Tracks consecutive check-in days.
- **Badges & Levels:** Awards for milestones (7-day streak, first new tip).
- **Push Notifications:** One gentle daily reminder (customizable time, quiet hours).

3.4 In-App Chatbot

- **Dedicated Chat Tab:** On-demand mood check-ins and tip requests.
- **Embedded Flow:** Chatbot as the primary interface for daily check-ins.
- **Modes:** Friendly coach vs. clinical screening.

3.5 Admin Dashboard & Data Export

- **Web Dashboard:** Aggregate heatmaps, trend charts, cohort analytics.
 - **Data Exports:** CSV of sensor logs, check-ins, survey responses, chat transcripts (anonymized).
 - **Control Group Management:** Tag and compare cohorts.
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4. High-Level Technical Stack

- **Mobile Frontend:** Flutter (Dart) for iOS & Android.
 - **Backend & APIs:** Node.js (Express) or Python (FastAPI) with REST endpoints.
 - **Database:** Firebase Firestore (or PostgreSQL) for user state, check-ins, metadata; time-series DB (e.g., InfluxDB) for high-frequency sensor logs.
 - **Authentication:** Firebase Auth (email/password, OIDC SSO for institutions).
 - **Admin Dashboard:** React (with Tailwind) or Next.js, integrated with backend APIs.
 - **LLM Chatbot:** OpenAI GPT API or local transformer via Azure/AWS.
 - **Hosting & Storage:** Firebase Hosting / Vercel for frontend; Google Cloud / AWS for backend, sensor data files in Cloud Storage.
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5. Conceptual Data Model

- **User:** {id, name, cohort, preferences, consentStatus}
 - **CheckIn:** {userId, timestamp, moodRating, textResponse, passiveSnapshotId}
 - **PassiveSnapshot:** {id, userId, timestamp, activityMetrics, usageMetrics, locationMetrics, commMetrics}
 - **Survey:** {userId, surveyType, timestamp, responses}
 - **Badge:** {userId, badgeType, awardedAt}
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6. UI Design Principles

- **Clarity & Simplicity:** Minimal screens; clear prompts.
- **Personalization:** Use student's name, customizable reminders.

- **Progress Visualization:** Heatmaps, streak counters, badges.
- **Accessibility:** Large tappable areas, dark/light mode support.
- **Privacy-first:** Transparent permission toggles, data controls in Settings.

6.1 Design System & Style Guide

To ensure consistency and efficiency, adopt a unified design system:

Color Palette

- **Primary:** Calming blue (#4A90E2) for main actions and headers.
- **Secondary:** Soft teal (#50E3C2) for success states and highlights.
- **Accent:** Warm orange (#F5A623) for notifications and badges.
- **Neutral:** Grays for backgrounds, dividers, and text (from #F7F7F7 to #4A4A4A).

Typography

- **Font Family:** Inter or Roboto for readability.
- **Headings:** Bold, 20–24 pt for screen titles; 16–18 pt for section headers.
- **Body:** Regular, 14 pt for primary text; 12 pt for captions.

Components & Spacing

- **Buttons:** 2xl rounded corners, 16 px padding, soft shadow.
- **Cards:** Unified card component for Quick Tips, Study Suggestions—rounded corners, 8 px internal padding.
- **Charts:** Use concise labels, gridlines off by default; heatmap cells sized uniformly.
- **Navigation:** Bottom nav bar with 5 icons; active icon colored primary, others neutral.
- **Spacing:** 16 px base spacing; multiples (8 px, 32 px) for margins/padding.

Interaction & Feedback

- **Animations:** Subtle transitions (e.g., fade-in for cards, spring effect for badges).
- **Touch Feedback:** Ripple effect on Android, opacity change on iOS.
- **Error States:** Inline error messages in red (#D0021B); gentle shake animation when missing input.

Design Tools & Handoff

- **Wireframing:** Low-fi in Balsamiq or Figma.
- **High-fidelity:** Figma library for components; maintain shared styles.
- **Handoff:** Zeplin or Figma Inspect for dev specs (colors, spacing, asset export).

7. Security & Ethics Considerations Security & Ethics Considerations

- **Consent Workflow:** Explicit IRB-approved consent form covering all passive signals.
- **Data Anonymization:** Strip PII before analysis; use pseudonymized IDs.
- **Encryption-at-Rest & In-Transit:** TLS for all API calls; encrypted storage buckets.

- **User Controls:** Toggle opt-in/out, export data, and delete account.
 - **Compliance:** GDPR/FERPA alignment where applicable.
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8. Development Phases & Milestones

Phase	Timeline	Milestones
Phase 1: Planning	Weeks 1–2	Finalize research protocol, UI mocks, stack choices
Phase 2: MVP Frontend	Weeks 3–6	Flutter check-in, home screen, wireframes → test
Phase 3: Backend	Weeks 7–10	APIs for sensor data ingestion, check-ins, auth
Phase 4: Dashboard	Weeks 11–14	Admin web UI, data export, cohort management
Phase 5: Integration	Weeks 15–18	Chatbot integration, gamification, notifications
Phase 6: Pilot Test	Weeks 19–22	Pilot with small cohort, collect baseline & usage
Phase 7: Analysis	Weeks 23–26	Data cleaning, statistical analysis, write paper

9. Potential Challenges & Solutions

- **Battery & Performance:** Limit sampling frequency; batch data uploads.
 - **User Engagement Drop-off:** Gamification, chatbot prompts, customizable reminders.
 - **Permission Fatigue:** Gradual onboarding, clear explanations.
 - **Data Quality Variability:** Control group baseline; outlier detection in analytics.
 - **Ethical Approval Delays:** Start IRB process early; prepare clear protocols.
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10. Future Expansion Possibilities

- **Cross-Institutional Studies:** Scale to multiple universities/schools.
 - **Predictive Interventions:** Trigger real-time interventions (peer support, tele-counseling).
 - **Multilingual Support:** Extend beyond English.
 - **Wearable Integration:** Fitbit/Apple Watch for higher-fidelity signals.
 - **Community & Social Features:** Peer comparison (anonymous), group challenges.
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Appendix: Wireframes

Home Screen

```
| Good afternoon, [Name] |
|
| Last Check-in:
|   • "Moderate" on Jun 6, 2025 at 10:15
|
| Weekly Stress Heatmap
| Mon Tue Wed Thu Fri Sat Sun
| [■] [■] [■] [■] [■] [ ] [ ]
|
| Quick Tips (scroll →)
| [ ] [ ] [ ] ...
|
| Study Suggestions (scroll →)
| [Pomodoro] [Time-Block] [Review-Plan] ...
|
```

Check-In Screen (Conversation Flow)

```
| ← Home    Check-In Screen |
|
| Bot: Hi [Name]! How are you feeling
| today?
| [User types response...]
| Bot: On a scale of 1 (low) to 5 (high),
| how stressed do you feel right now?
| [1] [2] [3] [4] [5] [Submit]
|
| • Streak:    5 days in a row
| • Last badge: 7-day streak earned
|
```

Chatbot Screen (Dedicated Tab)

```
| ← Home  Check-In  Chat  History  ⚙ |
|
| Bot: Hey there! What would you like to
```

```
| talk about today? |
| [Chat history scroll...] |
| [User types message...] [Send] |
```

Onboarding & Permissions Screen

```
| Welcome to StressSense! [Get Started] |
|
| Permission: Activity & Sleep Data |
| [Allow] [Skip] |
| Permission: App Usage Stats |
| [Allow] [Skip] |
| Permission: Location Rhythms |
| [Allow] [Skip] |
| Permission: Notifications |
| [Allow] [Skip] |
```

History Screen

```
| ← Chat    History Screen |
|
| Weekly Heatmap (tap for detail) |
| Recent Check-Ins: |
| • Jun 6: Moderate (3), Tip: 👍 |
| • Jun 5: High (4), Tip: 🧘 |
```

Settings & Data Permissions Screen

```
| ← History  Settings Screen |
|
| Profile & Preferences |
| • Name, Avatar |
| • Check-In Time, Quiet Hours |
|
| Data & Privacy |
| [x] Activity & Sleep Data |
| [x] App Usage Stats |
```

	[x]	Location Rhythms	
	[]	Communication Patterns	
	•	Export My Data	
	•	Delete My Account	
	Gamification		
	•	View Badges & Streaks	
	•	Reset	

End of Masterplan