SmartSpend

The Emotion-Aware Cash-Flow Coach

TEAM FOXTROT

Team members

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Objective

- Build an ML-powered personal finance platform.
- Predict burn rate, runway & detect emotional spending.
- Provide personalized insights to support mindful financial habits.

WHY SMARTSPEND?

Emotional triggers cause unexpected overspending

- Students often spend due to stress, moods, or late-night impulses not rational planning.

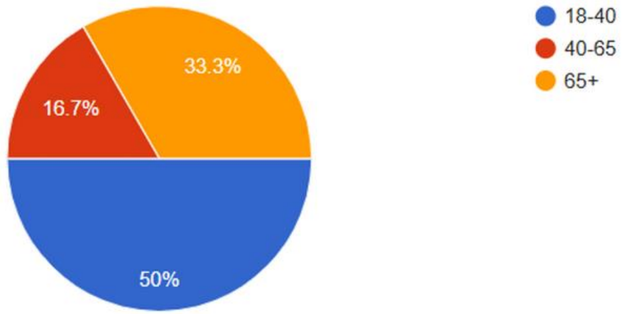
Existing apps only track numbers, not behaviors

- They show what you spent but never explain why you spent or what pattern caused it.

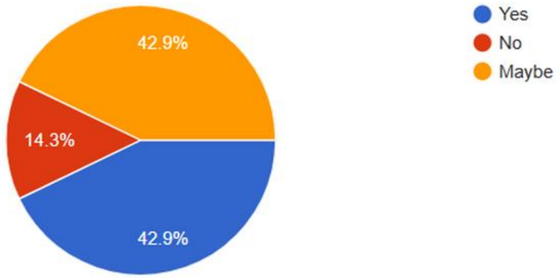
No ML-based runway prediction in budgeting tools

- Popular apps can't forecast how long your money will last or warn you before you're at risk.

Survey



Age Group



Stakeholder

Key Features

- JWT-Based Secure Login & Signup - Ensures safe authentication and seamless user onboarding.
- Dashboard with Burn Rate & Days Left Prediction - Provides a real-time financial overview with spending velocity and runway forecasting.
- NWG Classification + Mood Tagging - Categorizes every expense as Need / Want / Guilt and captures user mood to analyze emotional spending patterns.
- Bills Manager & Financial Goals Module - Helps users track recurring bills, set goals, and monitor progress in one unified place.
- ML-Driven Insights - Delivers personalized recommendations, anomaly alerts, and emotional-spending detection using machine learning.
- Tier-1 / Tier-2 / Tier-3 Predictions - Multi-level future forecasting that highlights low-, medium-, and high-risk spending scenarios.

Requirements

Functional

- User authentication through Login/Signup with secure validation.
- Dashboard visualization showing Daily Burn, Days Left, and Guilt-based spending insights.
- Expense Scheduler for recurring and fixed bills.
- Runway Goal Slider to set and track financial targets.
- Smart Notifications for pattern detection and overspending alerts.
- Achievements & Insights Feed for motivating financial discipline.
- Required libraries for training Machine learning: Numpy, Skikitlearn

Non- Functional

- Security: Encrypted passwords, secure token-based sessions.
- Performance: Fast load times and optimized API response.
- Scalability: Capable of handling multiple user wallets and large transaction data
- Reliability: Data backups and minimal downtime.
- Usability: Responsive design, intuitive UI, and simple navigation.
- Maintainability: Modular code structure for easy updates.
- Accuracy: Reliable ML predictions with low error rate.

Core Technologies Used

1.Frontend:	React, Vite, Chart.js, TypeScript
2.Backend:	Python Flask
3.Database:	MySQL
4.Machine Learning:	NumPy, Pandas,Scikit-learn.
5.Deployment:	GitHub Pages

Vision Statement

SmartSpend envisions a future where money management is not about restriction but understanding where people feel truly in control of how they spend money through awareness, not anxiousness. Our mission is to help people turn financial stress into clarity, confidence, and peace by making money management seem effortless and empowering. According to SmartSpend, we can transform every purchasing choice into a chance for self-awareness and personal development by establishing a connection between emotional and financial wellbeing.

Timeline

August-
Finalized concept
Project scope + core modules decided
SQL setup + sample dataset
Login/Signup frontend

September-
Dashboard design
Goals & Bills pages
300+ CSV dataset created
Tier-1 ML (MA7, LR)
ER Diagram finalized

October-
Transactions, Insights, Profile pages
Improved UI/UX + popups
Deep-learning features (Mood Index, NWG history)
Backend schema + architecture

November-
Full frontend–backend integration
Tier-1, Tier-2, Tier-3 ML models completed
ML backend integration finished
Final testing

December-
Deployed project
Documentation(Report and architecture)

Literature Survey

ML-driven expense forecasting (Kim, 2021) offers improvements but fails to address:

- Daily behavior changes
- Mood-based spending
- Real-time guidance

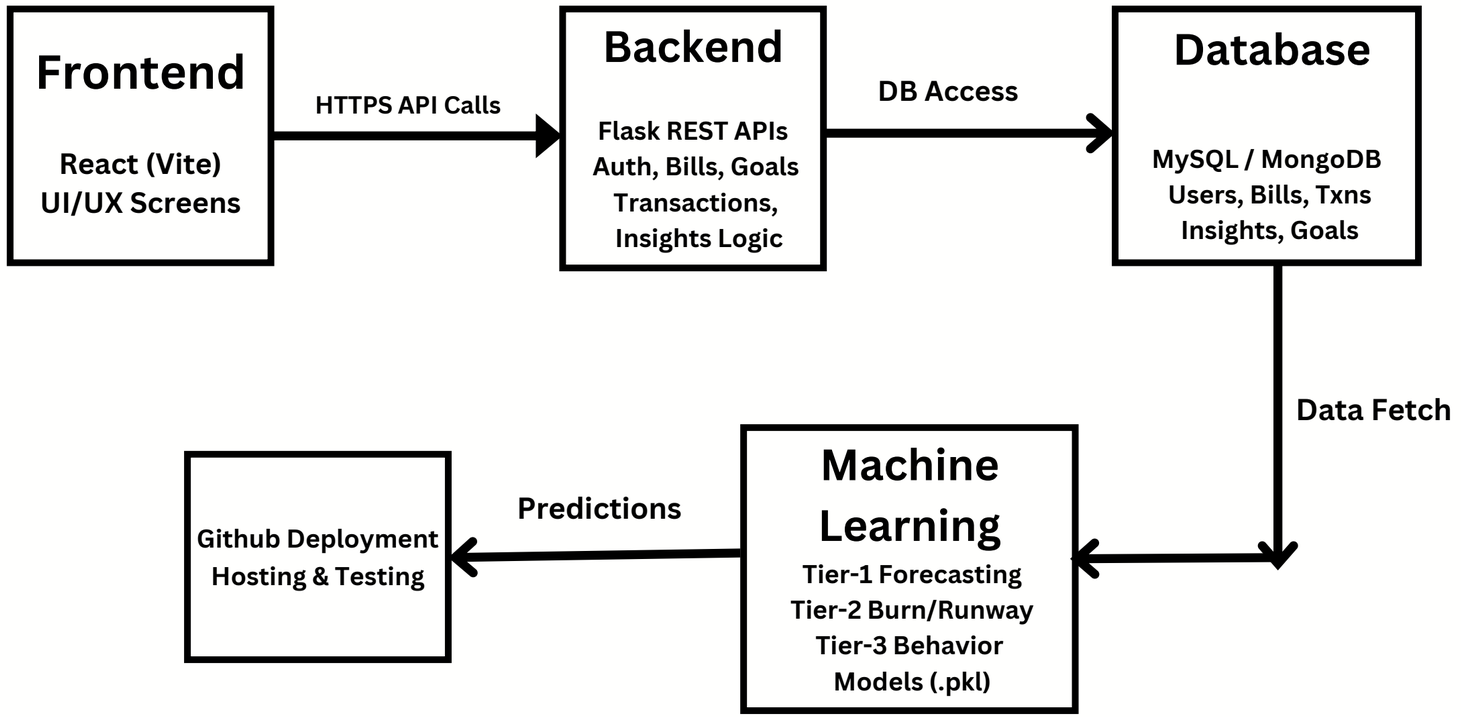
Financial behavior research highlights:

- Users underestimate their daily burn rate
- Awareness of runway improves decision-making
- NWG (Need–Want–Guilt) frameworks help users differentiate mandatory vs. emotional spending.

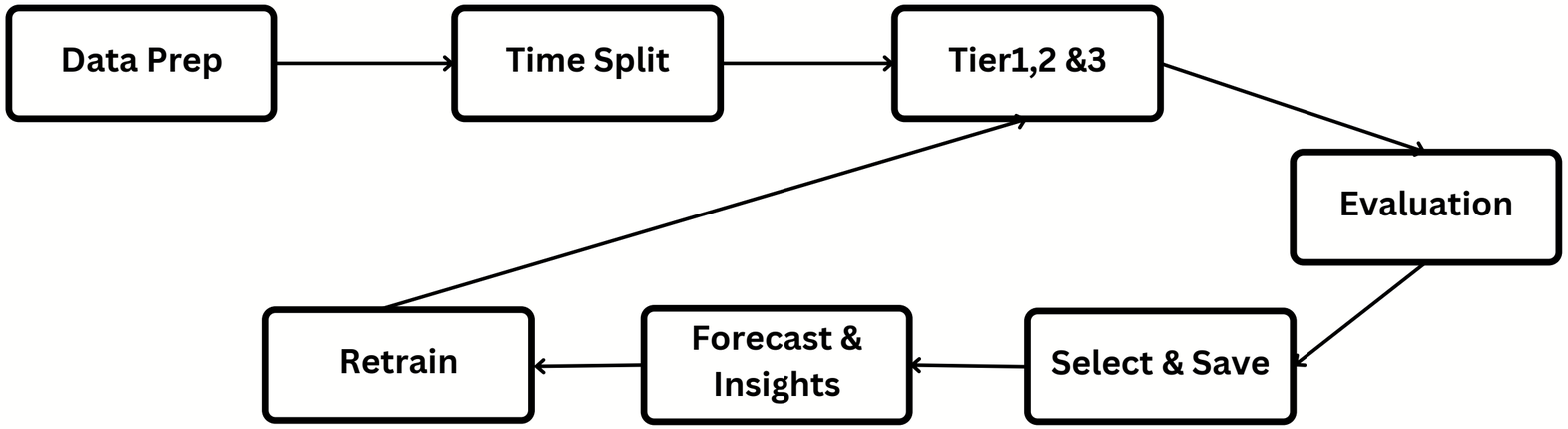
SmartSpend fills the gap by:

- Combining ML burn-rate prediction + runway calculation
- Merging behavioral insights, NWG analysis, and mood-aware analytics
- Giving actionable recommendations, not just numbers

System Architecture



Machine Learning Architecture



TIER-1 — Baseline Financial Forecasting

- Built simple statistical models (Moving Average & Linear Regression) to predict next-day balance trends.
- Used cleaned and aggregated daily wallet + transaction data as inputs.
- Generated baseline predictions that act as the foundation for Tier-2 and Tier-3 risk insights.

Machine Learning Architecture

TIER-2 — Insight Engine (Trend & Pattern Detection)

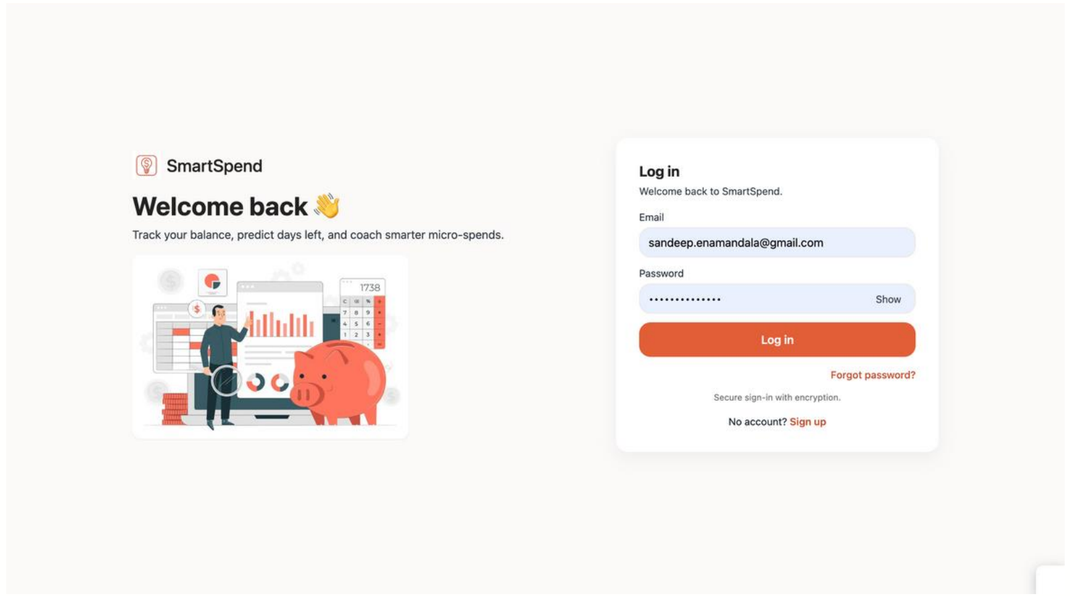
- Applied rule-based and data-driven analytics to detect overspending spikes, unusual activity and savings derif .
- Calculated features like weekly averages, category-wise spending, deltas, and trend direction.
- Produced Tier-2 insights e.g., “spending faster than usual,” “pattern deviating”.

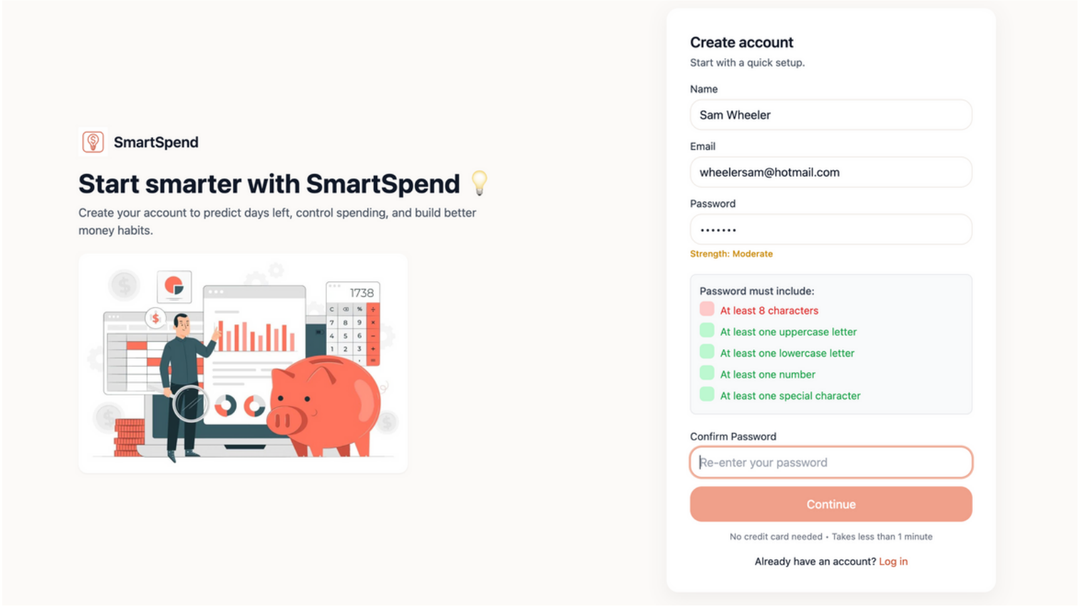
TIER-3 — Risk Classification Models

- Trained three ML models (Late-Night Spending, Overspend Risk, Guilt-Based Spending) using Random Forest and XGBoost .
- Used user-behavior features engineered from historical spending patterns.
- Output binary risk predictions that the frontend displays as risk levels.

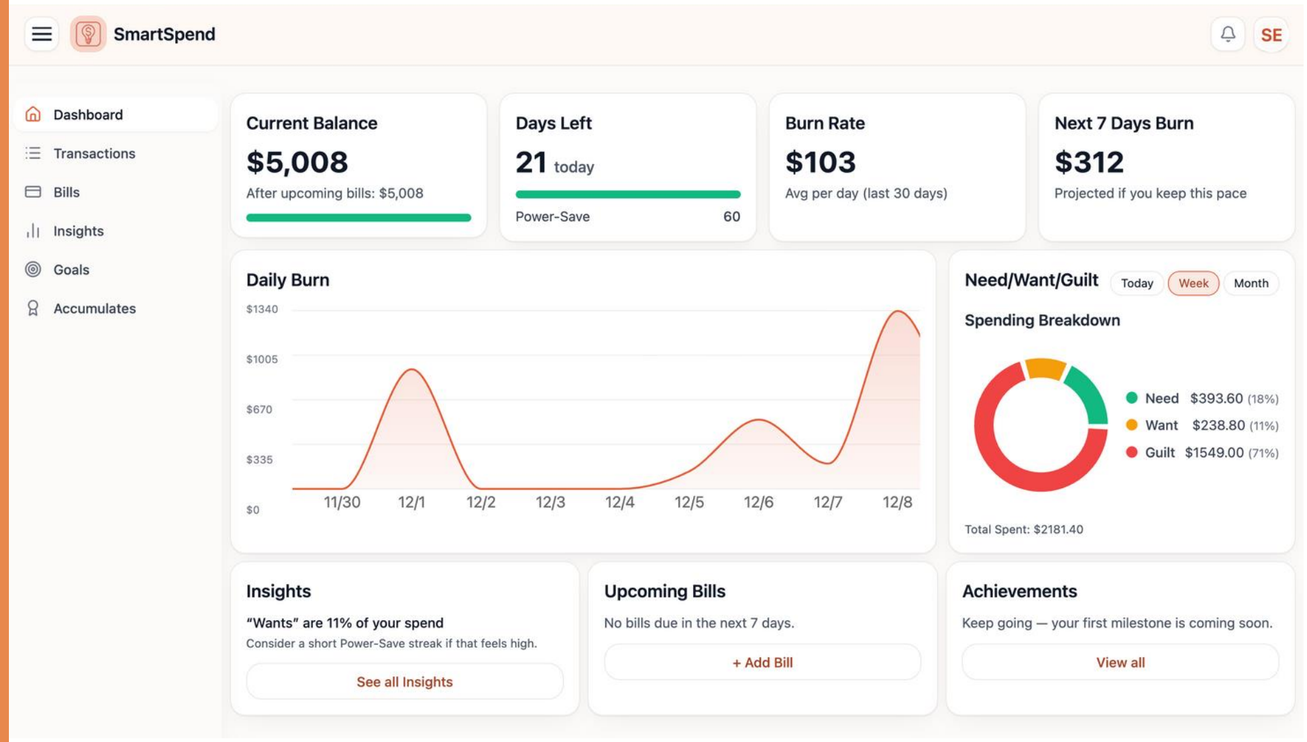
Signup & Login Flow

- Secure onboarding
- Strong password rules
- JWT-based session handling





Dashboard



Real-time Burn, Runway & Smart Insights

- Live updates on your spending pace, remaining days, and ML-driven financial cues.

Clear Visuals for Fast Decision-Making

- Charts, and trends to help users instantly understand their financial health.

Daily Burn + NWG Breakdown + Achievements

- Shows daily burn, Needs-Wants-Guilt split, and earned milestones to motivate better habits.

All-in-One Financial Snapshot

- Your balance, bills, goals, and predictions - everything in one seamless view.

Transactions Module

Add, Edit & Delete Expenses Easily

- Complete control over every transaction - modify amounts, dates, and categories anytime.

Automatic NWG Classification + Mood Tagging

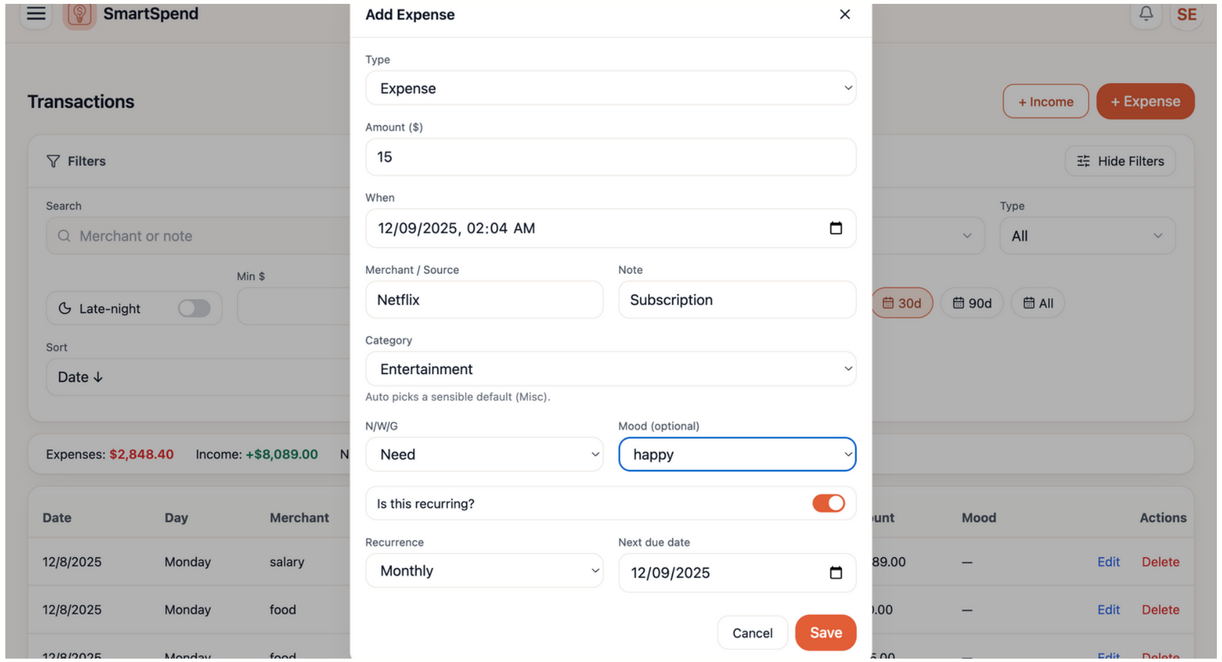
- Each expense is labeled as Need / Want / Guilt, with optional mood tagging for emotional-spend tracking.

Powerful Filters for Fast Search

- Filter by merchant, category, timestamp, NWG class, mood, or amount to instantly find any transaction.

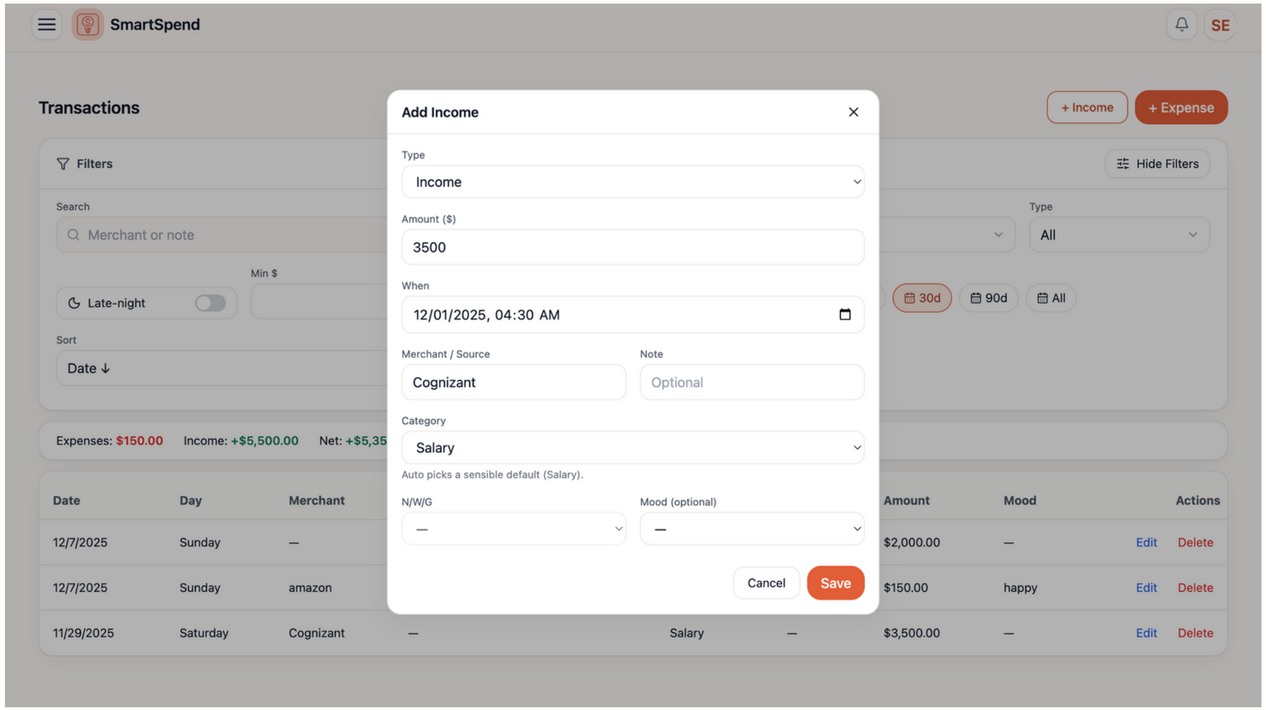
Visual Patterns & Insights

- Spot spikes, late-night spending, or category trends to improve financial awareness.



Add Transaction Modal

- Clean UI for income/expenses
- Mood tag + NWG tag for behavior modeling



Bills & Recurring Payments

Automatic Monthly Cadence Recognition

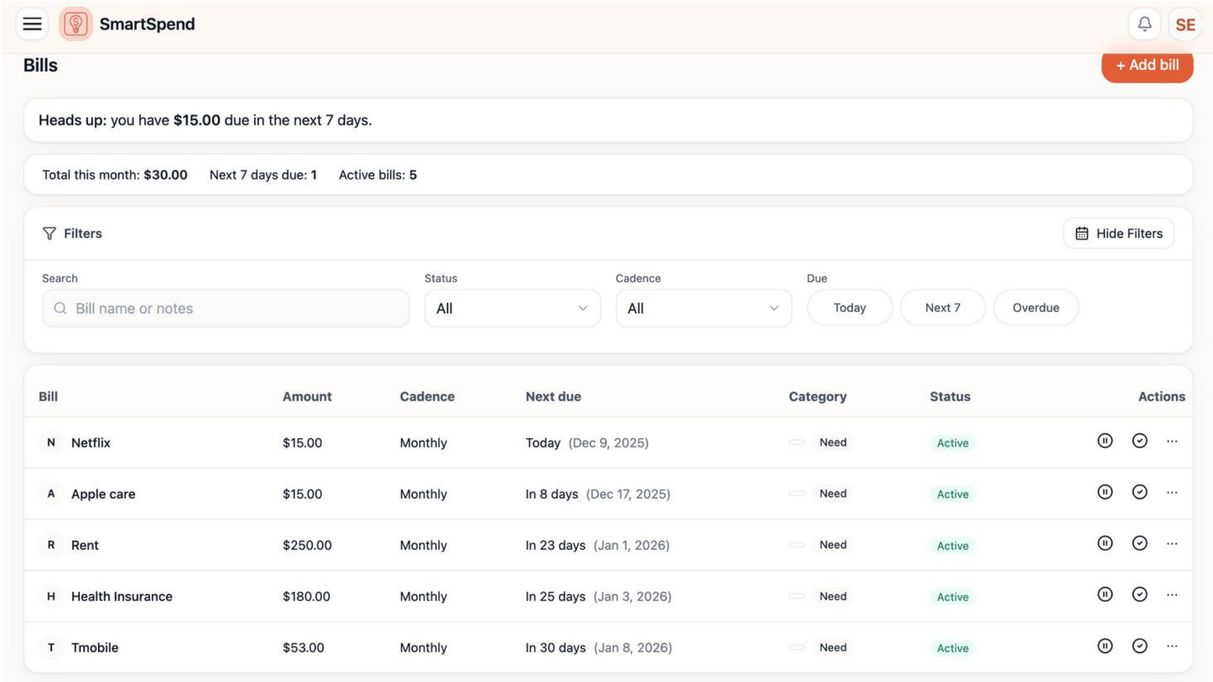
- Smart detection of recurring bills- monthly, weekly, or custom frequency.

Next-Due Date Tracking

- Every bill shows its upcoming due date, helping users stay ahead of payments.

Alerts for Upcoming Payments

- Timely reminders when a bill is approaching, reducing missed or late payments.



Goals & Runway Tracking

Personalized Runway Goals

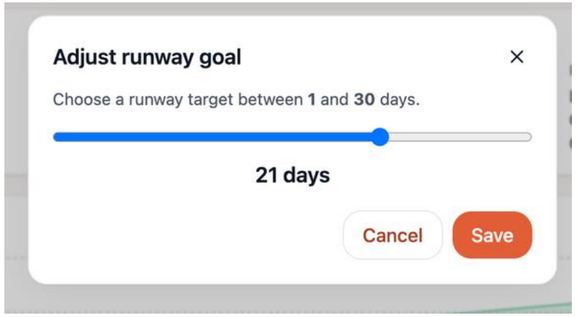
- Users set a daily-spend runway goal (up to 30 days) for smarter financial planning.

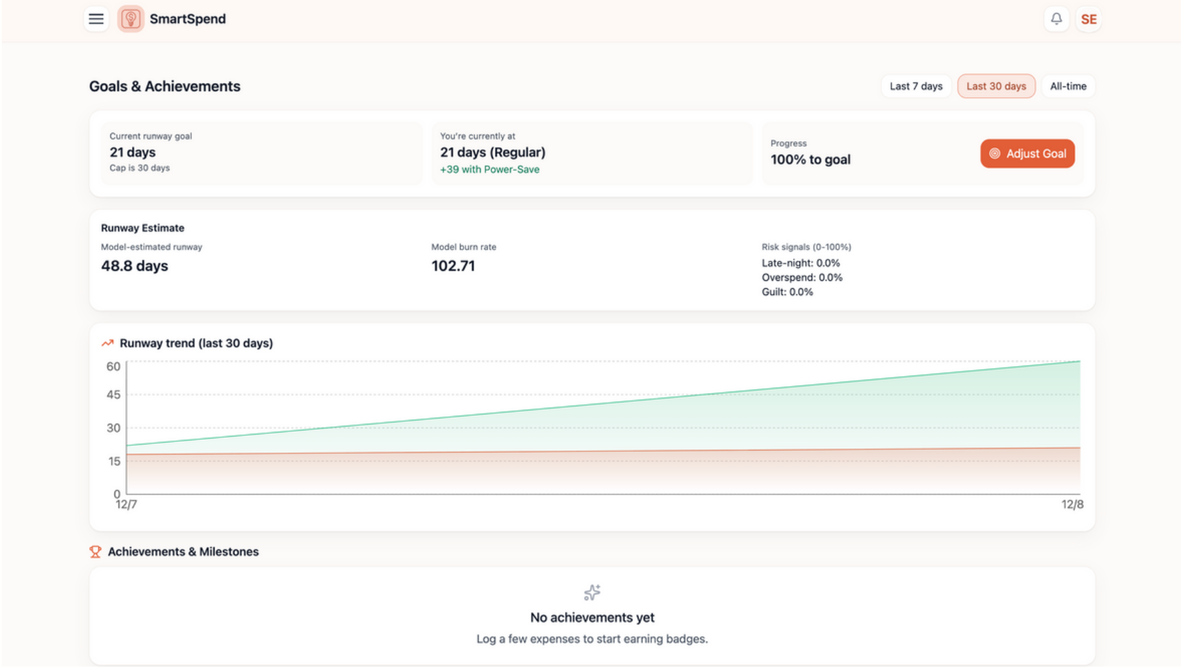
Real-Time Days-Left Estimation

- Dynamic runway calculation based on balance and burn rate—updated instantly.

Power-Save Mode Insights

- Shows how spending adjustments can extend runway with clear before–after comparisons.





Demo

Scan this QR code to explore our application.

Testing & Automation

- Unit testing for API routes
- UI testing for forms & dashboards
- ML model validation (MAE, variance checks)
- Full integration testing before deployment

```
===== TEST: SIGNUP =====
Signup status: 409
Signup response: {
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Conclusion

- SmartSpend unifies finance + behavior + ML
- Provides practical, emotional, and predictive insights.
- Built end-to-end: Frontend → Backend → ML → Deployment

Thank You

Any Questions?