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Web Tech Aug-Dec 2025 Final Exams



A white line drawing of a satellite in orbit around Earth, shown from a side-on perspective. The Earth is depicted as a large circle with concentric lines representing its rotation. The satellite is a small circle with a trail, moving along an elliptical path.

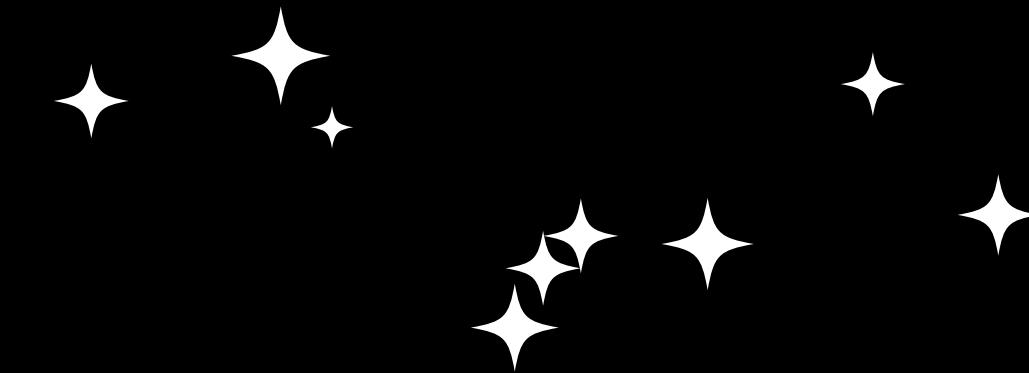
POV

Inez Agbenu is developing a data-powered website to help space enthusiasts, amateur astronomers, and satellite observers solve the challenge of tracking satellites overhead and predicting when they'll be visible from their specific location.

A black background with white star-like sparkles of varying sizes. In the bottom right corner, there is a white line drawing of a satellite in space, oriented diagonally. The satellite has a cylindrical body with various equipment and solar panels extending from it.



USER/CUSTOMER

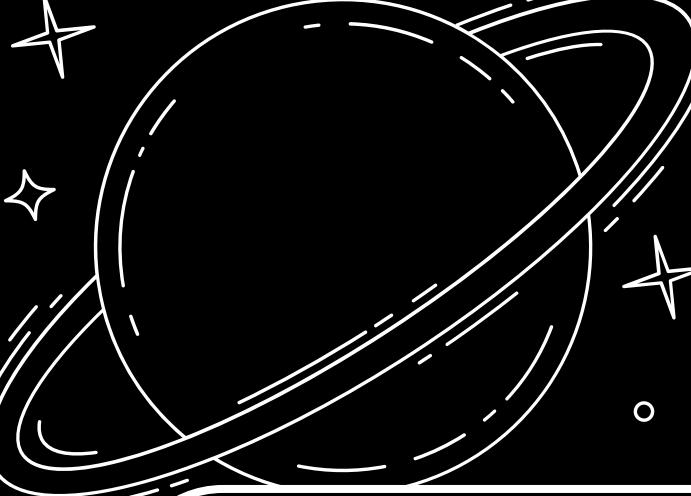


- **USERS**

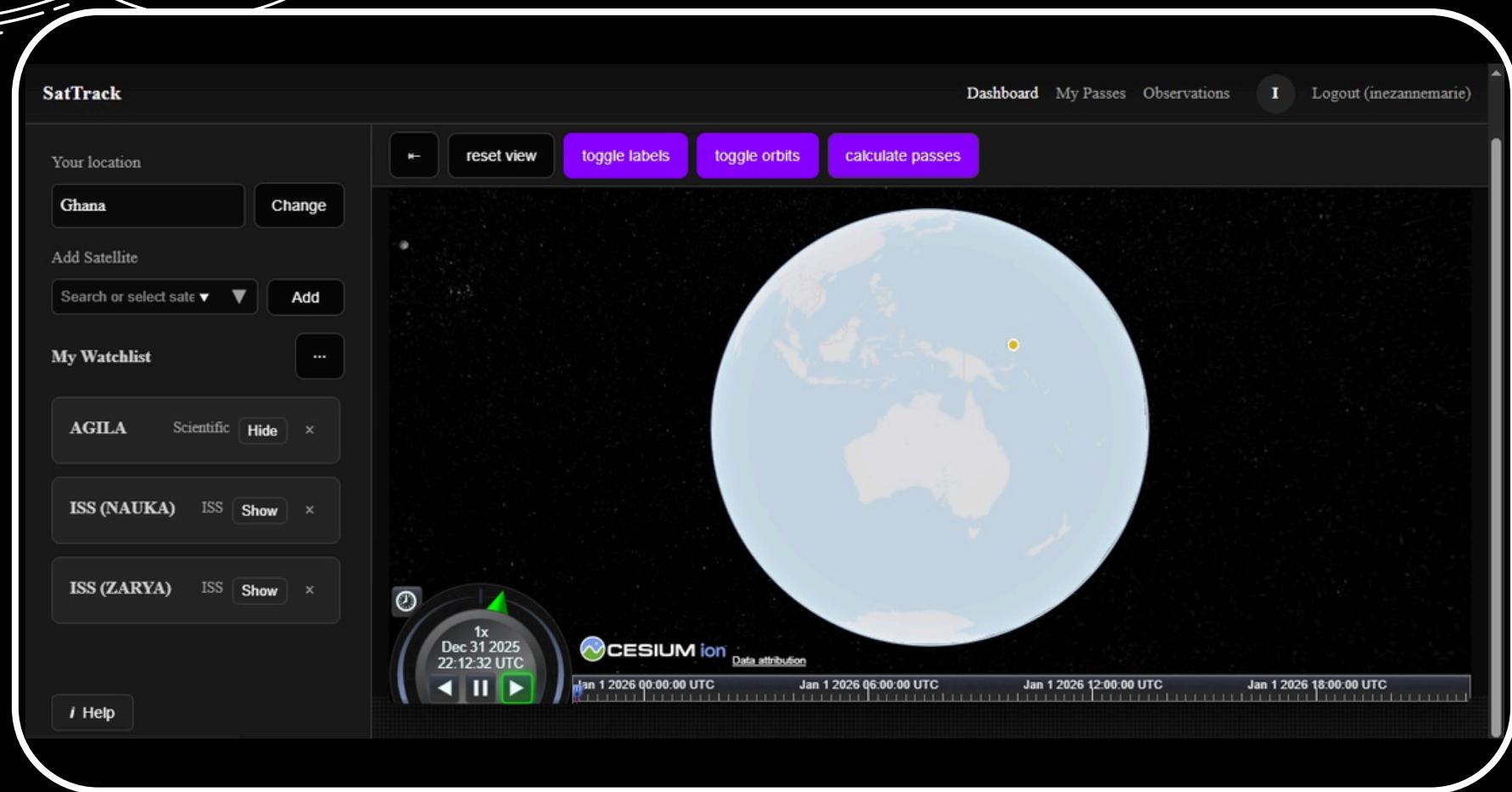
1. Space enthusiasts and amateur astronomers interested in satellite observation
2. Casual observers curious about satellites passing overhead
3. Stargazers who want location-specific predictions
4. People wanting to understand what's above them

- **USER PROBLEMS & WHAT SITE WILL SOLVE**

1. Difficulty tracking satellites overhead in real time
2. Lack of personalized, location-based pass predictions
3. Hard to visualize satellite orbits in 3D
4. No centralized way to manage a satellite watchlist
5. Missing community features to share observations and experiences



PAYOUT/FINISH

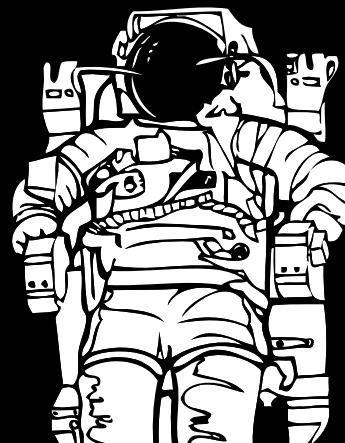


PAYOUT: WHAT IS A SIMPLE DRAWN SCREEN THAT IS ILLUSTRATIVE OF SOMETHING THE WEBSITE SHOWS THAT HELPS SOLVE THE PROBLEM. IT IS LIKELY A REPORT OR SOME RESULTS OF DATA ENTERED BY THE PARTICIPANTS. **THIS IS THE MOST IMPORTANT SQUARE**

Users would be significantly better off using SatTrack because:

1. Location-specific predictions
2. Real-time 3D visualization makes orbital mechanics intuitive and engaging
3. Personalized watchlists eliminate the need to track everything manually
4. Free and accessible - no expensive astronomy software required

FINISH: WHY ARE THE USERS BETTER OFF WITH THE WEBSITE THAN BEFORE?





MAIN FUNCTIONS OF SATTRACK

Real-Time 3D Satellite Tracking

- Interactive Cesium.js globe showing satellites orbiting Earth in real-time
- Visual representation of satellite positions updated every 5 seconds
- Color-coded by type (ISS = yellow, Starlink = blue, etc.)

Personalized Pass Predictions

- Calculates when watchlist satellites will be visible from user's exact location
- Shows pass time, duration, maximum elevation, and compass direction
- Cached predictions for next 7-30 days for instant access

Searchable Satellite Database & Watchlist

- Search 1000+ satellites by name or type
- Add favorites to personalized watchlist

Community Observation Logs (Social feature)

- Users can log sightings with visibility ratings and notes
- Like and comment on other users' observations
- Share experiences and build a community of satellite watchers

3-TIER ARCHITECTURE

1. Presentation Tier (Frontend)

- **Technologies:** HTML5, CSS3, Vanilla JavaScript, Tailwind CSS (CDN), CesiumJS, Three.js, satellite.js
- **Why:**
 - HTML/CSS/JS for flexibility and direct control
 - CesiumJS for interactive 3D globe and satellite visualization
 - Three.js for animated Earth visualization on the landing page
 - satellite.js for client-side TLE parsing and orbital calculations
 - Tailwind CSS for responsive styling without a build step
 - No heavy frameworks for faster loading

2. Application Tier (Backend)

- **Technologies:** PHP (procedural), mysqli extension, RESTful API endpoints
- **Why:**
 - PHP for server-side processing and database integration
 - mysqli for secure prepared statements and connection management
 - RESTful API endpoints (/api/*.php) for AJAX operations
 - Server-side SGP4 calculations for pass predictions
 - Session management and CSRF protection
 - Geocoding integration (Nominatim) for location resolution

3-TIER ARCHITECTURE

3. Data Tier (Database)

- **Technologies:** MySQL relational database
- **Why:**
 - Stores user accounts, watchlists, satellite data, TLE data, pass predictions, observations, comments, and likes
 - Relational design for efficient joins and queries
 - Migrations for schema versioning
 - Indexed fields for performance

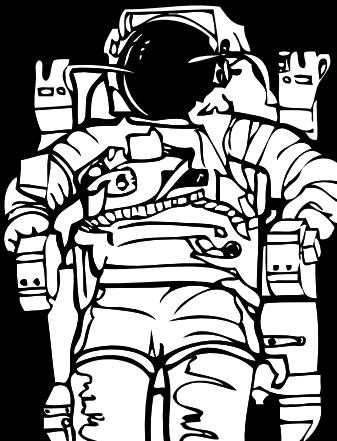
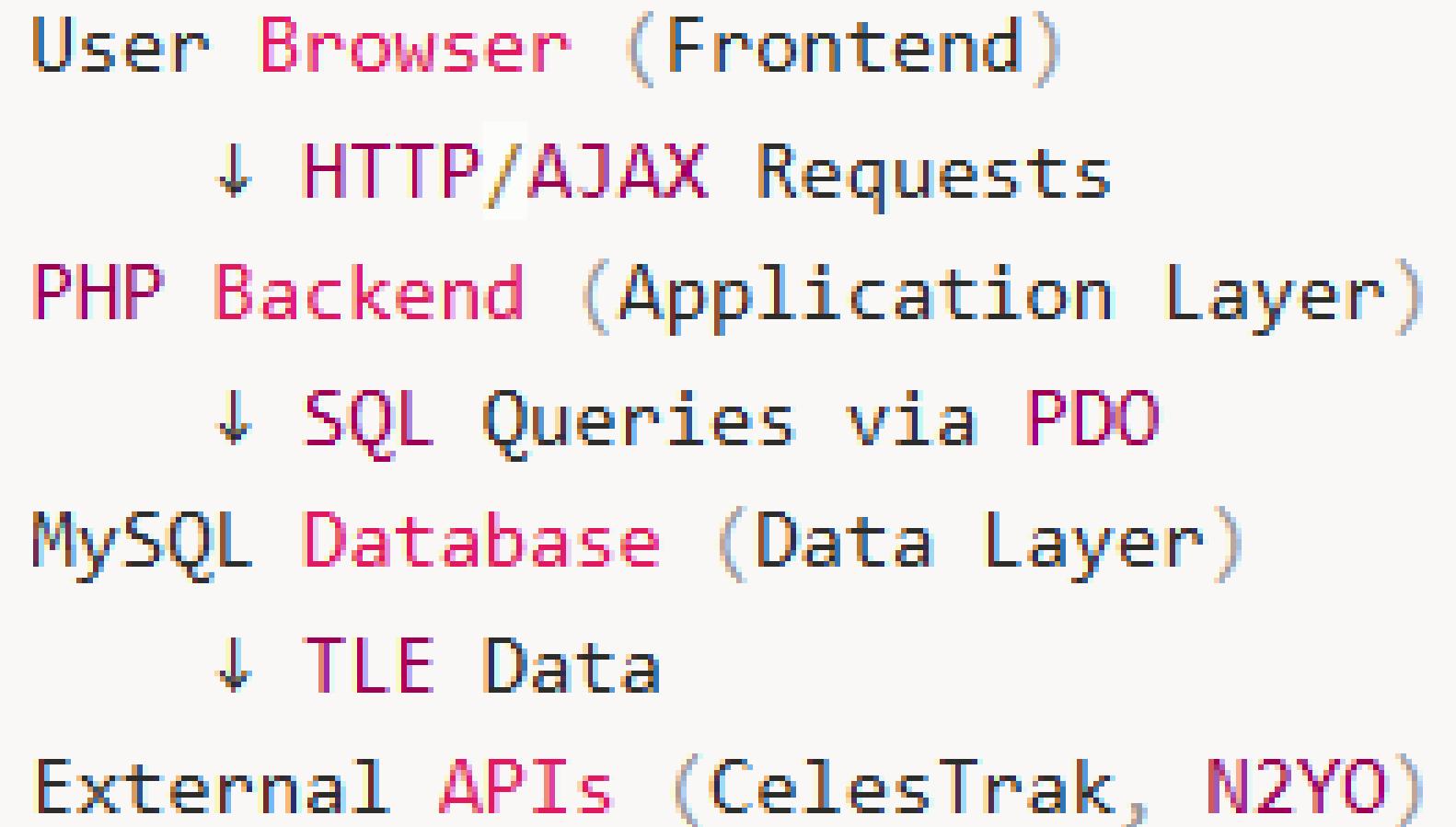
Additional Technologies & Services:

- Cesium Ion: 3D terrain and imagery provider
- OpenStreetMap/Nominatim: Geocoding for location resolution
- N2YO/CelesTrak: TLE data sources for satellite information
- Session Management: PHP sessions with secure cookie settings (HttpOnly, SameSite, Secure)
- CSRF Protection: Token-based system stored in database with session fallback

3-TIER ARCHITECTURE

How They Connect:

1. Frontend → Backend: AJAX/fetch requests to PHP API endpoints (/api/*.php)
2. Backend → Database: PHP mysqli with prepared statements for queries
3. Data Flow: JSON between frontend/backend; SQL queries between backend/database
4. Real-time Updates: Frontend polls for updates; backend calculates and serves fresh data





THANK YOU

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