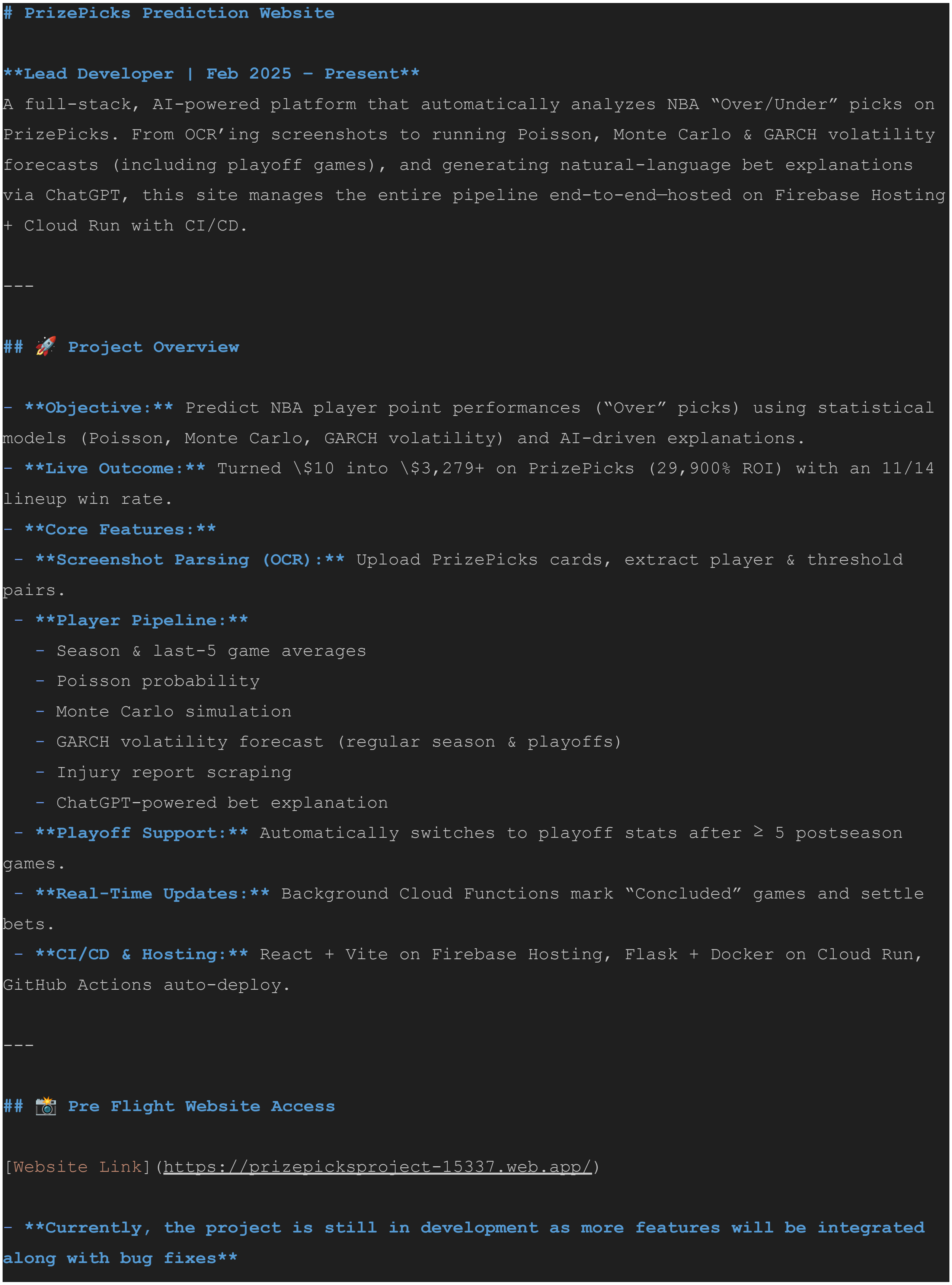

```markdown
# PrizePicks Prediction Website

**Lead Developer | Feb 2025 – Present**
A full-stack, AI-powered platform that automatically analyzes NBA “Over/Under” picks on PrizePicks. From OCR’ing screenshots to running Poisson, Monte Carlo & GARCH volatility forecasts (including playoff games), and generating natural-language bet explanations via ChatGPT, this site manages the entire pipeline end-to-end—hosted on Firebase Hosting + Cloud Run with CI/CD.

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## 🚀 Project Overview

- **Objective:** Predict NBA player point performances (“Over” picks) using statistical models (Poisson, Monte Carlo, GARCH volatility) and AI-driven explanations.
- **Live Outcome:** Turned \$10 into \$3,279+ on PrizePicks (29,900% ROI) with an 11/14 lineup win rate.
- **Core Features:**
 - **Screenshot Parsing (OCR):** Upload PrizePicks cards, extract player & threshold pairs.
 - **Player Pipeline:**
   - Season & last-5 game averages
   - Poisson probability
   - Monte Carlo simulation
   - GARCH volatility forecast (regular season & playoffs)
   - Injury report scraping
   - ChatGPT-powered bet explanation
 - **Playoff Support:** Automatically switches to playoff stats after ≥ 5 postseason games.
 - **Real-Time Updates:** Background Cloud Functions mark “Concluded” games and settle bets.
 - **CI/CD & Hosting:** React + Vite on Firebase Hosting, Flask + Docker on Cloud Run, GitHub Actions auto-deploy.

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## 📸 Pre Flight Website Access

[Website Link](https://prizepicksproject-15337.web.app/)

- **Currently, the project is still in development as more features will be integrated along with bug fixes**
```

```
 - If you would like access to the website despite it's early development phase, please feel free to reach out to bryanram2024@gmail.com

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## 📸 Demo Video

[Watch on GitHub](https://github.com/user-attachments/assets/ec796b28-824e-4374-8d9a-beedc7a0ed4e)

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## 🖼️ Screenshots

### Home Page
![](https://github.com/user-attachments/assets/39f4e1e9-add3-415b-95ca-03cb9c5b3129)
Greeted by Earnings, Active Bets & Live Picks.

### Player Analysis Panel
![](https://github.com/user-attachments/assets/8d960312-30c7-47f6-9004-ed82facc348b)
Input a player + threshold → see probability forecasts & AI explanation.

### Processed Players Dashboard
![](https://github.com/user-attachments/assets/3f9c727b-b315-4688-bd57-0a12a55820dc)
Aggregated player cards across all users.

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## 🧰 Tech Stack

### Front-End
- **React + Vite** – SPA framework
- **Tailwind CSS** – Utility-first styling
- **Lucide React** – Icon library
- **Recharts** – Charts & graphs

### Back-End
- **Python 3.9+**
- **OCaml** - Monte Carlo
- **Flask** – REST API
- **gunicorn** – WSGI server (Cloud Run)
- **firebase-admin** – Firestore & Auth
```

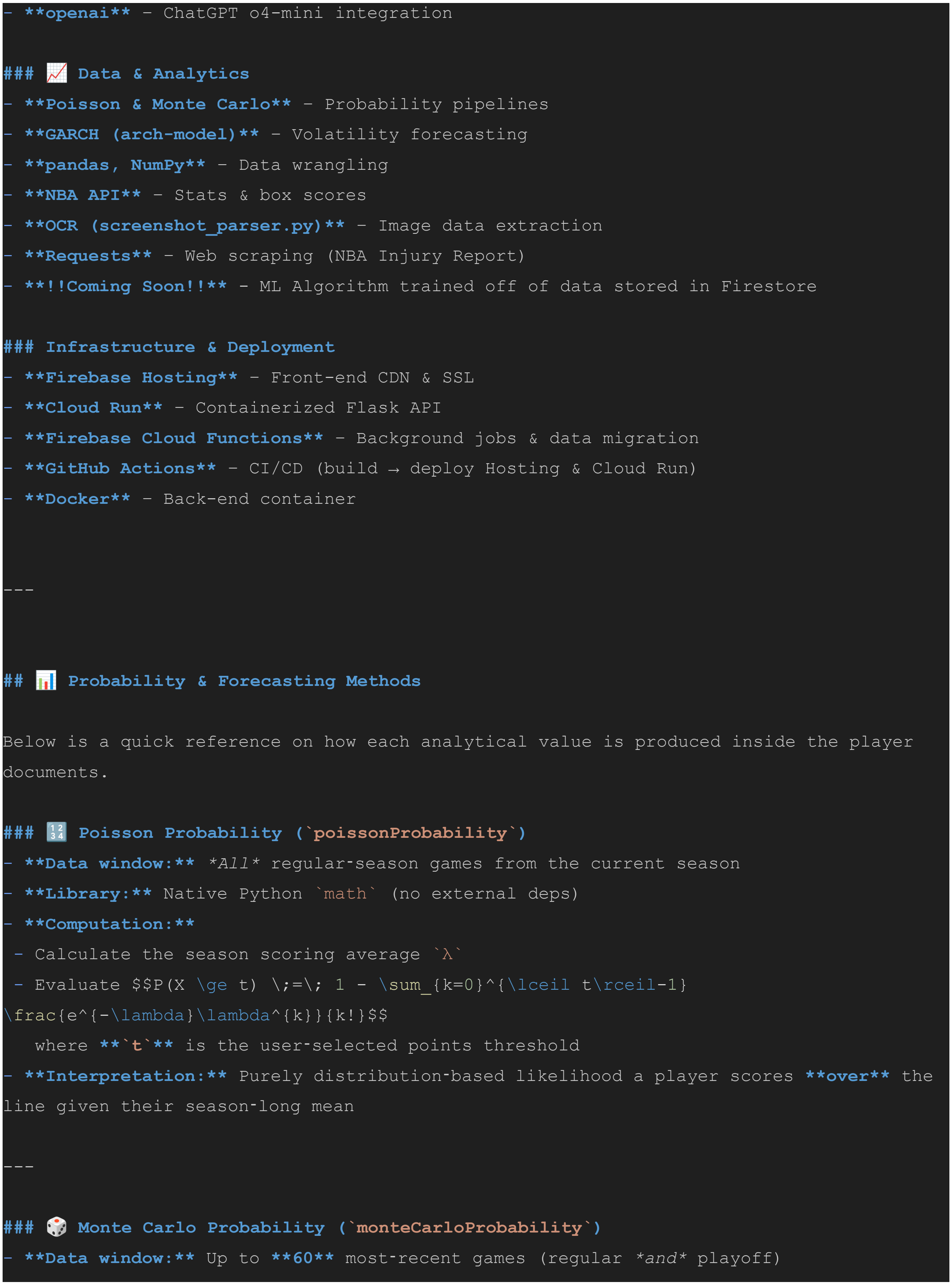

```markdown
- **openai** – ChatGPT o4-mini integration

### 📈 Data & Analytics
- **Poisson & Monte Carlo** – Probability pipelines
- **GARCH (arch-model)** – Volatility forecasting
- **pandas, NumPy** – Data wrangling
- **NBA API** – Stats & box scores
- **OCR (screenshot_parser.py)** – Image data extraction
- **Requests** – Web scraping (NBA Injury Report)
- **!!Coming Soon!!** – ML Algorithm trained off of data stored in Firestore

### Infrastructure & Deployment
- **Firebase Hosting** – Front-end CDN & SSL
- **Cloud Run** – Containerized Flask API
- **Firebase Cloud Functions** – Background jobs & data migration
- **GitHub Actions** – CI/CD (build → deploy Hosting & Cloud Run)
- **Docker** – Back-end container



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## 📊 Probability & Forecasting Methods

Below is a quick reference on how each analytical value is produced inside the player documents.

### 🔢 Poisson Probability (`poissonProbability`)
- **Data window:** *All* regular-season games from the current season
- **Library:** Native Python `math` (no external deps)
- **Computation:**
  - Calculate the season scoring average `λ`
  - Evaluate $$P(X \ge t) \;=\; 1 - \sum_{k=0}^{\lceil t\rceil-1} \frac{e^{-\lambda}\lambda^{k}}{k!}$$
   where **`t`** is the user-selected points threshold
- **Interpretation:** Purely distribution-based likelihood a player scores **over** the line given their season-long mean

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### 🎲 Monte Carlo Probability (`monteCarloProbability`)
- **Data window:** Up to **60** most-recent games (regular *and* playoff)
- **Stats used:** sample mean `μ` & standard deviation `σ`
- **Simulations:** **100 000** random seasons per query
- **Engine priority:**
 1. **OCaml** routine exposed through a C shared library (`mc_stub.c`) for speed
 2. Fallback to NumPy's `np.random.normal()` if the native lib isn't available
- **Output:** Fraction of simulations where the random score ≥ user threshold
- **Why Monte Carlo?** Captures hot/cold streaks and non-Gaussian tails better than a
single closed-form model

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### 📈 GARCH Volatility Forecast (`volatilityForecast`, `volatilityPlayOffsForecast`)
- **Data window:** **Last 50** games (or all playoff games once ≥ 5 exist)
- **Library:** [`arch`](https://github.com/bashtage/arch) – fits a **GARCH(1,1)** model
- **Pipeline:**
 1. Convert the points series to "returns" via first differences
 2. Fit GARCH(1,1) on those returns
 3. Return the 1-step-ahead forecasted **σ** (square-root of the predicted variance)
- **Interpretation:** Forward-looking volatility that reflects clustering of
high-variance performances

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Together, these three metrics give a balanced outlook:

| Metric | Scope | Strength |
| ------ | ----- | -------- |
| **Poisson** | Season-long | Fast analytical baseline |
| **Monte Carlo** | Last ≤ 60 games | Empirical tail-risk capture |
| **GARCH σ** | Last 50 games | Short-run variance / streak detection |

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### Project Scheme
PRIZEPICKS_PREDICTIONWEBSITE/
├── backEnd/
│   ├── app.py
│   ├── backtester.py
│   ├── chatgpt_bet_explainer.py
│   ├── injury_report.py
│   ├── main.py
│   ├── monte_carlo.py
│   ├── player_analyzer.py
│   ├── prediction_analyzer.py
│   ├── requirements.txt
│   ├── screenshot_parser.py
│   ├── volatility.py
│   └── Dockerfile
├── frontEnd/
│   ├── public/
│   │   │   └── mobile-viewport.html
│   ├── src/
│   │   ├── components/
│   │   │   ├── ActiveBet.jsx
│   │   │   ├── AdvancedMetricsCard.jsx
│   │   │   ├── ApiTest.jsx
│   │   │   ├── AppLayout.jsx
│   │   │   ├── BetConfirmation.jsx
│   │   │   ├── BetExplanationCard.jsx
│   │   │   ├── BetSlip.jsx
│   │   │   ├── chatgpt-thinking.css
│   │   │   ├── ChatGptThinking.jsx
│   │   │   ├── DailyPicks.jsx
│   │   │   ├── Dashboard.jsx
│   │   │   ├── EditBetModal.jsx
│   │   │   ├── FavoritePlayers.jsx
│   │   │   ├── ImageWithFallback.jsx
│   │   │   ├── InjuryStatusCard.jsx
│   │   │   ├── MobileLayout.jsx
│   │   │   ├── MobileOptimizedDashboard.jsx
│   │   │   ├── MobilePlayerCard.jsx
│   │   │   ├── MonteCarloCard.jsx
│   │   │   ├── Notifications.jsx
│   │   │   ├── PlayerAnalysisDashboard.jsx
│   │   │   ├── PlayerAnalysisModal.jsx
│   │   │   ├── PlayerAnalysisSearch.jsx
│   │   │   ├── PlayerCard.jsx
│   │   │   ├── PlayerStatsModal.jsx
│   │   │   ├── PredictionCard.jsx
│   │   │   ├── PreviousBets.jsx
│   │   │   ├── processed-players.css
│   │   │   ├── ProcessedPlayers.jsx
│   │   │   ├── RecommendationCard.jsx
│   │   │   ├── ScreenshotUploader.jsx
│   │   │   ├── StatsCard.jsx
│   │   │   ├── thinking-animation.css
│   │   │   ├── ThinkingAnimation.jsx
│   │   │   ├── TrendingPicks.jsx
│   │   │   └── admin/
│   │   │       ├── SystemOverview.jsx
│   │   │       ├── UserAnalytics.jsx
│   │   │       ├── BetPerformance.jsx
│   │   │       ├── PlayerAnalytics.jsx
│   │   │       ├── FinancialMetrics.jsx
│   │   │       └── SystemMonitoring.jsx
│   │   ├── pages/
│   │   │   ├── SignIn.jsx
│   │   │   ├── DashboardPage.jsx
│   │   │   ├── ProcessedPlayersPage.jsx
│   │   │   ├── PreviousBetsPage.jsx
│   │   │   ├── AlertsPage.jsx
│   │   │   ├── SignIn.jsx
│   │   │   ├── AdminLogin.jsx
│   │   │   └── AdminLayout.jsx
│   │   ├── scripts/
│   │   │   ├── initDatabase.js
│   │   │   ├── migrateData.js
│   │   │   ├── mobile-viewport.js
│   │   │   └── use-mobile-detector.js
│   │   ├── services/
│   │   │   ├── api.js
│   │   │   └── firebaseService.js
│   │   ├── App.css
│   │   ├── App.jsx
│   │   ├── firebase.js
│   │   ├── index.css
│   │   └── main.jsx
├── functions/
│   ├── index.js
├── injury_report_fn/
│   ├── index.css
│   └── main.jsx
├── .firebaserc
├── .github/workflows
│   └── firebase-hosting-merge.yml
├── firebase.json
└── README.md

### Firestore Database Scheme
firestore/
├ processedPlayers/ (collection)
│   ├── active/ (document)
│   │   └── {first_last_threshold_YYYYMMDD} (e.g. aaron_gordon_11.5_20250511)
│   │       ├ name: string (e.g. Aaron Wiggins)
│   │       ├ playerId: string (e.g. 1630598)
│   │       ├ team: string (e.g. Oklahoma City Thunder)
│   │       ├ position: string (e.g. G)
│   │       ├─ opponent: string (e.g. Minnesota Timberwolves)
│   │       ├─ photoUrl: string (url)
│   │       ├─ teamLogo: string (url)
│   │       ├─ opponentLogo: string (url)
│   │       ├─ gameDate: Timestamp
│   │       ├─ gameTime: string
│   │       ├─ gameType: string
│   │       ├─ teamPlayoffRank: number
│   │       ├─ opponentPlayoffRank: number
│   │       ├─ seasonAvgPoints: number
│   │       ├─ last5RegularGamesAvg: number
│   │       ├─ seasonAvgVsOpponent: number
│   │       ├─ homeAwayAvg: number
│   │       ├─ last5RegularGames: array<map>
│   │       │    └─ [{ date, points, opponent, opponentFullName, … }, …]
│   │       ├─ advancedPerformance: map
│   │       ├─ careerSeasonStats: array<map>
│   │       ├─ injuryReport: map
│   │       ├─ betExplanation: map
│   │       ├─ poissonProbability: number
│   │       ├─ monteCarloProbability: number
│   │       ├─ volatilityForecast: number
│   │       ├─ season_games_agst_opp: array<map>
│   │       ├─ num_playoff_games: number
│   │       ├─ playoffAvg: number
│   │       ├─ volatilityPlayOffsForecast: number
│   │       └─ playoff_games: array<map>
│   │            ├─ date: string
│   │            ├─ points: number
│   │            ├─ opponent, string
│   │            └─ gameType: string
│   ├── concluded/ (document)
│   │       └── {first_last_threshold_YYYYMMDD}/
│   │            │ ( same fields as active/ )
│   │            │  points: number
│   │            └─ minutes: number
│   └── injury_report/ (document)
│           └── {team_name (e.g. indiana_pacers)}/ (document)
│               ├─ lastUpdated: timestamp
│               ├─ players: array<map>
│               │   ├─ gameDate: string
│               │   ├─ gameTime: string
│               │   └─ reason: string
│               └─ team: string
├─ users/{userId}/ (collection)
│   ├─ activeBets/{YYYYMMDDTHHMMSSZ} (e.g. 20250528T221321Z)
│   │   ├─ betAmount: number
│   │   ├─ betPayOut: number
│   │   ├─ bettingPlatform: string
│   │   ├─ betType: string
│   │   ├─ betResult: string
│   │   └─ picks: array<map>
│   │       └─ {processedPlayers/players/active/first_last_threshold_YYYYMMDD} (doc ref)
│   ├─ betHistory/{YYYYMMDDTHHMMSSZ} (e.g. 20250528T221321Z)
│   │   └─ ( same fields as activeBets/ )
│   └─ profileData
│       ├─ createdAt: timestamp
│       ├─ displayName: string
│       ├─ lastLogin: timestamp
│       ├─ lossCount: number
│       ├─ password: string
│       ├─ pfp: string
│       ├─ totalBets: number
│       ├─ totalEarnings: number
│       ├─ username: string
│       └─ winCount: number
└─ admin/
    ├── profile/
    │   ├─ username: string
    │   └─ password: string
    ├── analytics/
    │   ├── daily_stats/
    │   ├── user_metrics/
    │   └── system_health/
    ├── monitoring/
    │   ├── api_performance/
    │   └── error_logs/
    └── reports/
        ├── bet_performance/
        └── player_analytics/
```

More information on every File:

backEnd/

File	Purpose in one glance	Key responsibilities / notes
`app.py`	Central Flask API gateway + admin analytics hub	• Boots Flask, enables CORS for localhost + Firebase-hosted domains, and auto-auths with the Cloud Run service account → initializes Firestore.• Utility helpers pkey() + thr_doc_ref() standardise document IDs for “player + threshold” records.• /api/player (POST) – cache-or-compute pipeline: – Checks processedPlayers/players/active/{player_threshold}; returns doc if it exists. – Otherwise runs full analysis stack: ▪ player_analyzer season + L5 stats ▪ real-time injury status (injury_report) ▪ Poisson & Monte Carlo win odds ▪ GARCH volatility (reg-season and playoffs if ≥5 PO games) ▪ ChatGPT natural-language bet explanation – Persists the result back to Firestore (pick_id field added).• /api/parse_screenshot (POST) – accepts one or more images, OCRs each with screenshot_parser, POSTs every detected player + threshold pair to /api/player, and returns a flat list of what it parsed.• /api/player/<id>/more_games (GET) – lazy-loads all extra regular-season games for infinite-scroll tables.• Admin analytics suite now pulls live counts instead of pure mocks: – /api/admin/overview totals users, active bets, processed players, winnings, plus a placeholder apiRequests counter. – /api/admin/users returns per-user engagement stats (earnings, win-rate, last login, etc.). – /api/admin/bets aggregates bet volume/performance (still mostly sample data). – /api/admin/players builds league-wide hit-rate & “most-analyzed” tables on the fly. – /api/admin/system surfaces health metrics (CPU, memory, latency, uptime).• check_games cron endpoint wired in via main.check_games_handler for scheduled status sweeps.• Runs app.run() in local debug; Cloud Run uses Gunicorn (app:app).
`backtester.py`	Historical profit-and-loss simulator	• Scans prior `processedPlayers/*` docs, applies a simple bet-settlement rule, and builds a P&L Series.• Useful for validating the model or generating performance charts in notebooks.
`chatgpt_bet_explainer.py`	Natural-language “Why this bet?” generator	• Crafts a prompt with player stats + probabilities, calls the OpenAI ChatGPT API, and returns a concise explanation.• Cached in Firestore so each pick is explained only once.

`injury_report.py`	Live injury-status scraper	• Pulls the NBA’s official daily injury feed (or a mirrored JSON).• Normalizes status (Out, Q, P) and injury details, returning a clean dict keyed by NBA player ID.• Consumed by `player_analyzer.py` to adjust probabilities.
`main.py`	Cloud-Run entry-point + cron helpers	• Exposes `app` for Gunicorn **and** contains scheduled logic that: – polls recent box scores; – moves finished picks from *active* → *concluded*; – updates user bet history.
`monte_carlo.py`	Python wrapper around native Monte-Carlo engine	• Fetches ≤ 60 recent games → computes μ, σ → runs **100 000** sims.• Prefers the ultra-fast shared lib `libmontecarlo.so` (see below) but can fall back to NumPy.
`player_analyzer.py`	Master data wrangler & feature builder	• Queries `nba_api` for season stats, last-5 logs, playoff data, opponent strength, etc.• Calls `injury_report`, `volatility.forecast_volatility`, `prediction_analyzer.poisson_over_prob`, and `monte_carlo.monte_carlo_probability`.• Bundles everything into a dict that the front-end cards expect.
`prediction_analyzer.py`	Math helpers (Poisson & misc.)	• Implements closed-form Poisson “≥ threshold” calculation.• Provides thin wrappers invoked by `player_analyzer` and feeds into `chatgpt_bet_explainer`.
`volatility.py`	GARCH(1,1) volatility forecaster	• Builds a 50-game (or playoff-only) series of point “returns”, fits `arch_model`, and returns 1-step-ahead σ.• Output stored as `volatilityForecast` / `volatilityPlayOffsForecast`.
`screenshot_parser.py`	OCR extractor	• Accepts base-64 images, calls OpenAI Vision, parses **player / threshold** pairs, and returns them to `app.py`.
`requirements.txt`	Python dependency list	• Flask, `nba_api`, `arch`, `firebase-admin`, `openai`, etc.—installed in Stage 2 of the Docker build.

`mc_stub.c` & **`montecarlo.ml`**	Native speed layer for Monte-Carlo	• `montecarlo.ml` → OCaml routine that performs the random draws.• `mc_stub.c` bridges Python ↔ OCaml via `ctypes`, producing **`libmontecarlo.so`** during the Docker build.
`Dockerfile`	Two-stage container build	**Stage 1 (OCaml):** 1. Starts from `ocaml/opam`, installs OCaml + `ctypes`. 2. Compiles `montecarlo.ml` into a PIC object, compiles `mc_stub.c`, links both into **`libmontecarlo.so`**. **Stage 2 (Python runtime):** 1. `python:3.9-slim`, installs `libffi` and Python deps from `requirements.txt`. 2. Copies the compiled `.so` and all back-end source files. 3. Launches Gunicorn (`CMD gunicorn app:app --bind 0.0.0.0:${PORT:-8080}` …).

frontEnd/

File	Purpose in one glance	Key responsibilities / notable details
`tailwind.config.js`	**Design-system config for Tailwind CSS**	**• Specifies content scan globs (`index.html`, all files under `src/`) so unused classes are purged from production builds.• Extends the default theme with custom breakpoints (`xs` 475 px to `2xl` 1536 px), extra spacing steps (18, 88, 128), a granular font-scale (`xs` → `4xl`), and utilities like `minHeight.touch` (44 px iOS tap target) and `maxWidth.mobile` (100 vw).• Adds reusable animations & keyframes – slide-in/out, fade-in/out, spin, pulse – referenced by class names such as `animate-slide-in-right`.• No additional plugins loaded; relies solely on Tailwind core.**

frontEnd/public/

File	Purpose in one glance	Key details
`mobile-viewport.html`	Mini HTML shim that forces mobile-friendly scaling and blocks pinch/double-tap zoom	• Declares a restrictive **`<meta name="viewport" …>`** so the SPA renders at 100 % width on phones.• Inline IIFE listens for **`touchstart`** (multi-touch) and **`touchend`** events to `preventDefault()`—stopping iOS pinch-zoom and the 300 ms double-tap zoom gesture.• Contains no UI markup; it simply injects these behaviors before the React bundle mounts.

frontEnd/src/

File	Purpose in one glance	Key responsibilities / notable details
`App.css`	Global styling + mobile-first overrides	• Sets the global shell: `#root` max-width 1280 px, centered with zero padding, left-aligned text.• Keeps Vite starter styles: logo hover/ spin animation, `.card` padding, `.read-the-docs` gray text.• Removes the previously bloated mobile overrides—Tailwind utility classes in the new components now handle responsiveness.• Adds a slim mobile-only block (`max-width: 768px`) that just enforces 44 px minimum touch targets and `font-size: 16px` on form controls to prevent iOS zoom.
`App.jsx`	Top-level React router	• Uses React Router v6 to declare the full routing map: `/` → `SignIn`, `/dashboard` → `DashboardPage`, `/processed-players` → `ProcessedPlayersPage`, `/previous-bets` → `PreviousBetsPage`, `/alerts` → `AlertsPage`.• Includes a legacy redirect by pointing `/HomePage` to `DashboardPage`, preserving old bookmarks.• Stateless functional wrapper; exported as default so `main.jsx` can mount it at the root.
`firebase.js`	Front-end Firebase initializer	• Reads API keys & IDs from Vite env variables and calls `initializeApp()`.• Exports Firestore instance `db` and, in browser environments only, `analytics`—guarded so SSR or Node tests don't break.
`index.css`	Tailwind layer injection	• Simply imports `@tailwind base`, `components`, and `utilities`; actual custom styles live in individual component `.css` files.
`main.jsx`	React entry point rendered by Vite	• Boots the app via `createRoot().render(<StrictMode><App /></StrictMode>)`.• Pulls in `index.css` so Tailwind styles apply globally before any component mounts.

frontEnd/src/pages

File	Purpose in one glance	Key responsibilities / notable elements

`DashboardPage.jsx`	Main dashboard SPA (picks + search + upload)	• Still wrapped in AppLayout so header/nav/banners stay global.• Data boot‑strap: on mount it ① fetches profile, picks, active‑bets & history, ② auto‑migrates completed bets to history, ③ hydrates state in one async flow with granular error handling.• Picks workflow – Lists saved picks in a responsive card grid (photo, team logos, OVER/UNDER chip, progress bar). – Adds picks from PlayerAnalysisDashboard or the Processed Players page via addUserPick(); de‑dupes and enforces ≤ 6 picks. – Removes with Trash icon (removeUserPick()), shows loading skeleton while first fetch resolves.• Search & analysis: embeds PlayerAnalysisSearch ➜ /api/player ➜ PlayerAnalysisDashboard for instant deep‑dive + Add to Picks CTA.• Screenshot pipeline: ScreenshotUploader parses PrizePicks cards then routes to Processed Players on success.• Betting flow – Lock In Picks button enabled when ≥ 2 picks → opens BetSlip. – On confirm it validates, normalises pick objects, calls createBet(), clears picks (clearUserPicks()), refreshes active bets, then shows BetConfirmation.• Active bets panel: formats live wagers for the ActiveBet accordion; supports Edit (→ EditBetModal), Cancel (with confirm dialog), and player click (opens PlayerStatsModal).• Modals stack handled declaratively: BetSlip, BetConfirmation, PlayerStatsModal, EditBetModal all mount/unmount via local state.• Robust error / empty states, progress indicators, and safe fallbacks (placeholder images, TBD labels) make the page resilient across legacy and new Firestore schemas.
`ProcessedPlayersPage.jsx`	Dedicated gallery of server‑processed players	• Uses `AppLayout`.• Renders `ProcessedPlayers`, passes `onAddToPicks`; enforces 6‑pick cap; de‑dupes legacy picks.• Route: `/processed-players`.
`PreviousBetsPage.jsx`	Bet history & active wagers center	• Uses `AppLayout`.• Shows `ActiveBet` list (editable/cancellable) + `PreviousBets` accordion from Firestore history.• On mount migrates completed bets; supplies `EditBetModal`, `PlayerStatsModal`.• Route: `/previous-bets`.

`AlertsPage.jsx`	Notifications / alerts hub	• Uses `AppLayout`.• Thin wrapper that mounts `Notifications`; future iterations will hydrate from user-specific subs.• Route: `/alerts`.
`SignIn.jsx`	Simple username + password login screen	• Stylized form with show-password toggle.• Verifies credentials via `getUserByUsername`; seeds new users; stores `currentUser` in `sessionStorage`.• Redirects to `/dashboard` on success.
`AdminLogin.jsx`	Admin portal login page	• Gradient “Admin Portal” screen with Lucide icons; username + password fields with show/hide toggle.• Calls `getAdminCredentials` & `verifyAdminPassword` (from `firebaseService`) to authenticate.• On success sets `sessionStorage.isAdmin = true` & `adminUser`, then `navigate("/admin/dashboard")`.• Shows red error banner on failure & loading spinner while verifying.• Route: `/admin`.
`AdminDashboard.jsx`	Auth-protected admin SPA (analytics + monitoring)	• Wrapped in `AdminLayout` (admin header/sidebar).• On mount checks `sessionStorage.isAdmin`; if missing, redirects to `/admin`.• Tab navigation: System Overview, User Analytics, Bet Performance, Player Analytics, Financial Metrics, System Monitoring.• Dynamically renders the active tab component; polls Firestore via service helpers.• Route: `/admin/dashboard`.

frontEnd/src/components/

File	Purpose in one glance	Key responsibilities / notable UI behavior

PredictionCard.jsx	Mini card that surfaces the model's score prediction for one player	• Shows threshold, computed probability and Poisson probability.• Colors the Recommendation banner green / yellow / red based on `prediction.category` ("Almost guaranteed", "Neutral", "Riskey").
PreviousBets.jsx	Accordion list of a user's completed and in-flight wagers	• Combines Active Bets and Completed Bets into one history panel with coloured section badges. • Each bet header shows wager date, stake, win/loss chip and toggles an expandable results pane.• Expanded view renders platform/bet-type meta plus a pick grid that colour-codes HIT vs MISS and shows actual points.• Uses local `expandedBets` state to remember which cards are open.
processed-players.css *(updated)*	Hover, touch & animation helpers for ProcessedPlayers grid	• Scales card to 1.02 × on hover, 0.98 × on touch-press; adds deeper shadow.• Re-usable `.pulse` key-frame (green glow) for "Added to Picks"-style confirmations.• Mobile tweaks: bigger touch targets (`min-height: 400 px`), tighter grid gaps, larger font, and button sizing.• Utility spin & fade-in key-frames used by loading spinners / card entrance.
ProcessedPlayers.jsx *(updated)*	Searchable / filterable gallery of players already analyzed server-side	• Fetches docs via `getProcessedPlayers()` → builds team and AI-recommendation drop-downs (100 % YES / 90–100 % YES / 80–90 % possible).• Mobile-first card redesign with gradient headers, team/opponent logos, and threshold/probability panels.• "Add to Picks" confirmation ✅ now pulses for 3 s; per-player added state stored in `addedPlayers` map.• Handles loading spinner, graceful error banner, empty-state, and responsive grid (1 × → 3 ×).• Clicking a card opens PlayerAnalysisModal.

RecommendationCard.jsx	Lightweight “quick verdict” box used inside the analysis modal	• Derives OVER/UNDER & confidence (High / Medium) from basic averages vs threshold.• Shows Poisson probability and icon-based sentiment (□ green / □ red).
ScreenshotUploader.jsx	Drag-and-drop widget that parses PrizePicks images, then chains player analysis	• Supports multi-file drag-and-drop and click-to-browse; shows image previews with type & size badges and per-file remove/X.• Simulates progress to 95 %, calls `/api/parse_screenshot`, then sequentially POSTs each parsed {player, threshold} to `/api/player` while updating row-status chips (spinner → ✅/❌).• Handles error banners, success banners, Clear All, and clears previews after processing.
StatsCard.jsx	Detailed stat panel inside the analysis modal	• Displays season avg, last-5 avg, vs-opponent avg, home/away avg.• Inline table of last-5 games, color-coded vs threshold.• “See More” opens paginated modal of up to 15 games.
thinking-animation.css	Re-usable pulse animation for ChatGPT “thinking” loader	• `.thinking-dot` staggered dot pulse and `.thinking-ring` breathing ring key-frames.
ThinkingAnimation.jsx	Centered loader component while awaiting AI response	• Uses the above CSS to render a gradient ring, three pulsing dots, and explanatory blurb (“Gathering player statistics…”).
TrendingPicks.jsx	Static demo card of “most popular picks”	• Currently hard-codes an array of three players with popularity %, threshold and recommendation; renders with icons & team info.
FavoritePlayers.jsx	Empty-state panel for future “starred” players	• Renders a grid of favorite-player tiles once data exists; for now shows a big prompt and “Add Players” CTA button.
ImageWithFallback.jsx	Re-usable `<img>` wrapper that never breaks	• Attempts primary `src`; on `onError` swaps to `fallbackSrc` (or `/placeholder.svg`) so broken images don’t wreck the layout.

InjuryStatusCard.jsx	Rich card that visualizes a player’s latest injury report	• Three states: no data, found on report, healthy.• Maps status → color (red = Out, yellow = Questionable, green = Probable/Available).• Shows reason, game date/time, and matchup when available.
MonteCarloCard.jsx	Explains the Monte-Carlo simulation result for a threshold	• Displays probability (green / yellow / red), distribution type, and an info blurb with a chart icon.• Parses string or numeric inputs and formats to ##.## %.
Notifications.jsx	Placeholder settings panel for future alerts	• Static copy describing upcoming features (game-start, performance, result alerts).• Disabled toggle switches communicate “coming soon.”
PlayerAnalysisDashboard.jsx	In-page deep-dive dashboard shown after a search	• Hero banner with photo, logos, matchup info, AI recommendation chip, threshold, Poisson & Monte-Carlo % s.• Key-stats tiles, volatility tiles, playoff tiles.• Expandable sections for all-season encounters, recent games, playoff log; “Load more games” fetches via `/api/player/{id}/more_games`.
PlayerAnalysisModal.jsx *(updated)*	Full-screen modal deep-dive (mobile-first)	• Gradient hero with photo, dual-logo overlay, threshold & AI recommendation chip.• Key-stats grid, volatility tiles (regular & playoffs), and mobile-optimized expandable sections (all-season encounters, more-games fetch).• Displays Poisson & Monte-Carlo % s, advanced metrics, injury report snippet, plus free-text AI bet explanation.• “Add to Picks” button closes modal and returns enriched pick object with deterministic `id`.
PlayerAnalysisSearch.jsx	Smart search bar that drives the analysis flow	• Autocomplete form with recent-search drop-down (localStorage), search-tips panel, and live validation.• Saves top 5 searches; emits `onSearch(player, threshold)`; parent supplies loading / error props.

PlayerCard.jsx	Simple summary card for list views	• Shows photo, team/opponent logos, ranks, next-game info—used in processed players & search suggestions.
PlayerStatsModal.jsx	Lightweight modal for viewing bet details from Previous Bets	• Hydrates from Firestore when possible for richer stats; falls back to passed prop.• Presents threshold, recommendation, timings, season / last-5 / vs-opponent averages and actual result.
AdvancedMetricsCard.jsx	Shows eFG %, 3-pt share, FT-rate & splits	• Renders advanced-metrics grid plus career-season table.• Includes an info call-out explaining each stat.
ApiTest.jsx	Connectivity checker for the Flask API	• Calls `testAPI()` on mount, shows ChatGptThinking loader until response, then prints success or error with a Retry button.
BetConfirmation.jsx	Post-submission modal summarizing a locked bet	• Gradient header with ✅ icon; lists platform (logo-aware), bet amount, potential winnings and computed Total Payout.• Scrollable pick list shows threshold & recommendation chips, plus success tick.• Done button dismisses modal.
BetExplanationCard.jsx	AI narrative block (“Why this bet?”)	• Chooses up/down/warning icon & colors from recommendation, shows ChatGPT text plus Poisson & Monte-Carlo % s, with fallback No Recommendation state.
BetSlip.jsx	Full-screen wizard to assemble & confirm a wager	• Inputs for Bet Amount and Potential Winnings; live validation disables Confirm until both > 0. • Platform selector supports PrizePicks, Underdog or custom “Other” with conditional bet-type buttons.• Tap a pick card to toggle inclusion; selected picks highlighted.• On confirm → passes amount, winnings, selected IDs, platform & bet-type to parent.
chatgpt-thinking.css	Dot-pulse & logo-glow animation for loaders	• Defines `.chatgpt-thinking-dot` key-frames and `.logo-pulse` halo.
ChatGptThinking.jsx	Loader component that uses the above CSS	• Shows ChatGPT logo + three pulsing dots and optional status text.

DailyPicks.jsx	**“Today’s picks” & performance-tracker panel**	**• Empty-state call-out if no picks. • Otherwise renders player row with date/time icons, threshold + recommendation chip and “Locked In” badge.• Footer Performance Tracker summarises pick count, hard-coded winnings & stake placeholders.**
EditBetModal.jsx	**Modal to tweak an existing bet before settlement**	**• Lets user change amount, platform, bet type & which picks are included; recalculates winnings; validates at least one pick selected.**
AppLayout.jsx	**Shared top-level layout wrapping all main pages**	**• Desktop header with nav links; mobile header + slide-in menu using Lucide icons and `mobileMenuOpen` state.• Highlights active route via `useLocation()`, displays “Play at your own risk” banner + cumulative-earnings banner.• Fetches user profile (avatar, display name, earnings) on mount; handles sign-out and auth-guard redirection.**
MobileLayout.jsx *(updated)*	**Responsive shell that swaps between a desktop sidebar and a collapsible mobile drawer**	**• Navigation buttons now use React Router’s `navigate()` instead of local state.• Sticky mobile header with hamburger/close icon toggles drawer; desktop sidebar fixed 64 px wide.• Wraps `{children}` so any page can inherit the layout—and delegates global banners & auth guard to AppLayout.**
MobileOptimizedDashboard.jsx	**All-in-one mobile dashboard workflow (pick list → search → stats)**	**• Shows Your Picks panel with lock-in, remove and live count (picks.length / 6).• Responsive analysis form and “Analyze” button.• Renders PlayerCard, StatsCard, RecommendationCard, last-5 games table, and Add to Picks CTA after a search.**
MobilePlayerCard.jsx	**Compact player-info tile for small screens**	**• Displays photo (with fallback), name, team, position, team/opponent playoff ranks, and next-game info.• Fully responsive flex layout that stacks on narrow widths.**

ActiveBet.jsx	Expandable card summarizing an in-progress wager	• Trophy icon with pulsing alert dot; Edit / Cancel action buttons.• Expanded panel splits Bet Details and Your Picks; pick rows are clickable and status-coloured (Final / Live / Scheduled).

frontEnd/src/components/admin/

File	Purpose in one glance	Key responsibilities / notable UI behavior
`SystemOverview.jsx`	Snapshot of overall platform health	• Fetches system KPIs via `getSystemOverview()` every 30 s.• Stats grid (users, bets, processed players, winnings, uptime, API, error-rate, response time).• Recent activity feed & quick-action buttons (manage users, DB backup, alerts).
`UserAnalytics.jsx`	Insights into user engagement & behavior	• Time-range selector (24h, 7d, 30d, 90d) → `getUserAnalytics()`.• Metrics tiles (active users, avg session, top performer, new sign-ups).• Recent-activity table & engagement bar chart.
`BetPerformance.jsx`	Platform-wide bet outcome analytics	• Time-range selector; fetches via `getBetPerformance()`.• Metrics tiles (total bets, win-rate, winnings, ROI), win/loss distro bars, most-profitable picks list, 30-day performance trend chart.
`PlayerAnalytics.jsx`	Aggregate view of player-level stats	• Fetches via `getPlayerAnalytics()`; sort dropdown (hit-rate, analyzed, profit, popularity).• Metrics tiles, sortable ranking table, threshold distribution & team-frequency charts.
`FinancialMetrics.jsx`	Revenue and financial health dashboard	• Time-range selector; fetches via `getFinancialMetrics()`.• Metrics tiles (revenue, user winnings, platform ROI, avg bet size), revenue breakdown bars, top-earning users list, revenue trend chart.

`SystemMonitoring.jsx`	Live operational monitoring panel	• Polls `getSystemHealth()` every 10 s.• Metrics grid (API response, DB perf, CPU/memory, latency, error rate) colored by status.• System alerts feed, 24 h charts for response time & error rate, service-status grid with uptime dots.

frontEnd/src/scripts/

File	Purpose in one glance	Key responsibilities / notable elements
`mobile-viewport.js`	Forces proper mobile scaling when the main app is loaded from `/public/mobile-viewport.html`	• Immediately-invoked function checks whether a `<meta name="viewport">` already exists; if not, it injects one with `initial-scale=1`, `maximum-scale=1`, and `user-scalable=no` to lock the zoom level.
`use-mobile-detector.js`	Lightweight React hook to tell components “are we on a phone?”	• Keeps an `isMobile` state that is `true` when `window.innerWidth < 768 px`.• Listens for `resize` events so the flag updates dynamically if the user rotates or resizes the window.
`initDatabase.js`	One-time Firestore seeder for local/dev demos	• When executed, creates a demo user `bryanram` (with a basic profile), admin site-wide stats, and an admin user list document if they don’t already exist.• Uses `serverTimestamp()` so created/last-login times are server-authoritative.
`migrateData.js`	Script to reorganize legacy user docs into the new schema	• Reads the old flat user document, rolls username/password/email into a nested `profile` object, and writes it back via `updateDoc`.• Splits historic `bets` array into `activeBets` and month-bucketed `betHistory` sub-collections, transforming each bet to the new field names along the way.

frontEnd/src/services/

File	Purpose in one glance	Key responsibilities / notable elements

`api.js`	**Thin wrapper around your *Flask* back-end**	**• Single exported helper `analyzePlayer(playerName, threshold)` that POSTs to `/api/player`. • Cleans / type-casts the threshold, maps legacy field names (`nba_player_id → playerId`, etc.) and inserts fall-back images so the UI never breaks. • Ensures dates are ISO-formatted and provides default “Unknown Team/Opponent” strings when the back-end response is incomplete.**
`firebaseService.js`	**Firestore data-access layer**	• **One unified Firestore gateway** – every read/write to *users, picks, bets, processedPlayers,* and *admin* collections goes through this file, so the rest of the React app never touches the raw Firestore SDK.• **Document-reference first design** - `createPlayerDocumentReference`, `resolveDocumentReference`, and the new **batch** helper `resolveDocumentReferences` let the UI store a lightweight pointer (`DocumentReference`) in *users.picks* or *activeBets* and expand it to a full object only when rendering. - Two-way helpers automatically fall back to legacy “full-object” arrays so nothing breaks for older users. • **Robust data normalisation** - `transformPicksData` converts whatever shape comes back (legacy, reference, mixed) into a consistent card object with sensible defaults (placeholder images, TBD times, etc.). - All bet helpers (`getActiveBets`, `getBetHistory`, etc.) pipe their pick arrays through the same normaliser so every component can assume the same keys. • **Full CRUD for user picks & bets – with path-safe updates** - `addUserPick`, `removeUserPick`, `createBet`, `updateActiveBet`, `cancelActiveBet` now compare **document paths** to avoid duplicate refs and guarantee that cancelling a bet never creates history records. - Migrations (`migrateUserPicksToReferences`, `migrateActiveBetsToReferences`, `migrateBetHistoryToReferences`, `migrateUserToReferences`) batch-convert whole accounts to the reference model in one call. • **User bootstrap + profile management** - `initializeUser` / `initializeDatabase` seed **profile** objects and daily-picks docs on first sign-in, or silently migrate flat-field users. - `verifyUserPassword`, `updateUserProfile`, `updateUserStats` work with both the new nested profile schema and the old top-level fields. • **Admin analytics & health endpoints** - Credential utilities (`getAdminCredentials`, `verifyAdminPassword`) plus Firestore aggregators (`getSystemOverview`, `getUserAnalytics`, `getBetPerformance`, `getPlayerAnalytics`, `getFinancialMetrics`, `getSystemHealth`) feed the React admin dashboard; most metrics are live counts, with a handful of placeholders flagged for future monitoring hooks. • **Safety & migration helpers everywhere** – extensive console logging, try/catch guards, and ID fallbacks mean bad data can’t crash the UI, while batch writes (`writeBatch`) keep large migrations atomic.

functions/index.js – Firebase Cloud Functions triggers

Export	Fires when…	What it does
`onPlayerStatusChange`	A document under `processedPlayers/players/active/{docId}` is updated	• Still moves a player doc from players/active → players/concluded when gameStatus flips to “Concluded”, but now also rewires every document-reference that pointed to the old path.• Internal helper updatePlayerReferences() walks every user → every activeBets doc and swaps refs like …/active/{id} → …/concluded/{id} so live bets don’t break.
`onActiveBetWrite`	A user’s bet is written at `users/{userId}/activeBets/{betId}` (create / update / delete)	• “Critical fix” – archives a bet only if its status becomes a terminal state or a deleted doc already had a terminal status (Concluded/Completed/Won/Lost).• When archiving, it converts each pick reference from the active collection to the matching doc in concluded before writing to betHistory and then deletes the active copy.• Logs and skips manual cancellations (deletes with non-terminal status).
`onUserPicksUpdate`	The top-level user doc `users/{userId}` is updated	• Cleans a user’s picks[] array, but now understands both legacy full objects and DocumentReferences: – For refs, it fetches the doc and keeps it only if gameStatus !== "Concluded". – For legacy objects it performs the same check locally.• Runs only when the picks array actually changes, then writes the filtered list back.
`migrateToDocumentReferences`		HTTPS endpoint that bulk-migrates existing data to the new reference model:1. Converts each user’s legacy picks array to DocumentReferences into players/active.2. Converts any legacy full-object pick arrays inside activeBets the same way.3. Streams progress to logs and returns a JSON summary (Successfully migrated N users).

injury_report_fn/

File	Purpose in one glance	Key responsibilities / notable elements

`full_injury_report.py`	*Deep* PDF scraper that converts the NBA's official daily-injury PDF into clean JSON	• Re-creates the NBA's PDF URL based on the most recent "eastern-time" release window (reports drop 12 p.m./5 p.m./8 p.m. ET). • Downloads the PDF, opens it with `pdfplumber`, and uses explicit x-coordinates to pull a column-perfect table. • Normalizes team names, splits camel-cased headings, swaps "Lastname, Firstname" → "Firstname Lastname," and strips line-breaks from the *Reason* column. • Exposes two helpers: • `get_full_injury_report()` → list ⊂ {gameDate, gameTime, team, player, status, reason} for every entry. • `get_player_status(name)` → quick lookup returning `{status, reason}` (or `"NOT YET SUBMITTED"` if a team hasn't filed).
`main.py`	Cloud-Function handler that keeps Firestore documents in sync with real-time game status	• Utility `fetch_game_status()` hits `nba_api`'s `ScoreboardV2` & `BoxScoreTraditionalV2` to see whether a game has started, is live, or has finished—and, if finished, grabs the player's final points. • `check_active_players()` walks the `processedPlayers/players/active` collection; if `fetch_game_status()` returns new info, it calls `update_doc()` to patch the Firestore doc (e.g., set `"gameStatus": "Concluded"` and `"finalPoints": n`). • Stubs for `check_user_picks()` and `check_active_bets()` illustrate the same pattern for user bet docs. • `check_games_handler(request)` is the HTTP entry-point wired to Cloud Scheduler (runs every hour); it invokes `check_active_players()` and responds 200 OK or 500 on error.