# 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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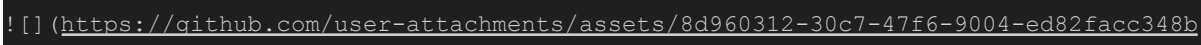
## 🖼️ Screenshots

### Home Page

Greeted by Earnings, Active Bets & Live Picks.

### Player Analysis Panel

Input a player + threshold → see probability forecasts & AI explanation.

### Processed Players Dashboard

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

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- **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
│   ├── 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
├── injury_report_fn/
|   ├── full_injury_report.py
|   └── main.py
├── .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)
```

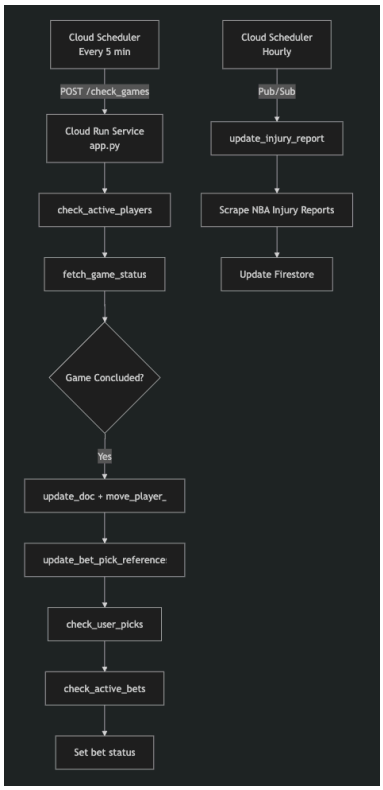
```
|   ├─ activeBets/{YYYYMMDDTHHMMSSZ} (e.g. 20250528T221321Z)
|   |   ├─ betAmount: number
|   |   ├─ betPayOut: number
|   |   ├─ bettingPlatform: string
|   |   ├─ betType: string
|   |   ├─ betResult: string
|   |   └─ picks: array<map>
|   |       └─ {processedPlayers/players/active/first_last_threshold_YYYYMMDD} (doc ref)
|   ├─ betHistory/{YYYYMMDDTHHMMSSZ} (e.g. 20250528T221321Z)
|   |   └─ ( same fields as activeBets/, except the document references in the picks
array<map> are changed to:
processedPlayers/players/concluded/first_last_threshold_YYYYMMDD} (doc ref) )
|   └─ 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/
```

## migration-flow.mermaid:

graph TD

A[Cloud Scheduler<br>Every 5 min] -->|POST /check_games| B[Cloud Run Service<br>app.py]
B --> C[check_active_players]
C --> D[fetch_game_status]
D --> E{Game Concluded?}
E -- Yes --> F[update_doc + move_player_to_concluded]
F --> G[update_bet_pick_references]
G --> H[check_user_picks]
H --> I[check_active_bets]
I --> J[Set bet status]

K[Cloud Scheduler<br>Hourly] -->|Pub/Sub| L[update_injury_report]
L --> M[Scrape NBA Injury Reports]
M --> N[Update Firestore]




## Commands on Bash Terminal

bryanramirez-gonzalez@mac functions % firebase functions:list

| Function | Version | Trigger | Location | Memory | Runtime |
|---|---|---|---|---|---|
| update_injury_report | v2 | google.cloud.pubsub.topic.v1.messagePublished | us-west2 | 244.140625 | python311 |

bryanramirez-gonzalez@mac functions % gcloud scheduler jobs list --location us-west2 --project prizepicksproject-15337

**ID** **LOCATION** **SCHEDULE (TZ)** **TARGET_TYPE** **STATE**
check-games-job us-west2 */5 * * * * (America/Los_Angeles) HTTP ENABLED
injury-report-hourly us-west2 0 * * * * (America/Los_Angeles) Pub/Sub ENABLED

bryanramirez-gonzalez@mac functions % gcloud scheduler jobs describe check-games-job \
--location us-west2 --project prizepicksproject-15337 \
--format="value(httpTarget.uri)"
https://prizepicks-backend-788584934715.us-west2.run.app/check_games

bryanramirez-gonzalez@mac prizePicks_predictionWebsite % gcloud run services list --region us-west2 --project prizepicksproject-15337
**SERVICE** **REGION** **URL** **LAST DEPLOYED BY** **LAST DEPLOYED AT**
✔ prizepicks-backend us-west2 https://prizepicks-backend-788584934715.us-west2.run.app bryanram2024@gmail.com 2025-05-30T08:24:04.584911Z
✔ update-injury-report us-west2 https://update-injury-report-788584934715.us-west2.run.app service-788584934715@gcf-admin-robot.iam.gserviceaccount.com 2025-05-20T14:55:47.616265Z

## Commands to deploy Functions:

# Run ESLint with the fix flag
npx eslint index.js --fix

# Deploy Functions only
firebase deploy --only functions

# Deploy Backend only
gcloud run deploy prizepicks-backend \
--source backEnd \
--region us-west2 \
--platform managed

# Deploy everything
git push origin main # Triggers full CI/CD

# Deployment command for the injury report function remains:
firebase deploy --only functions:update_injury_report

## 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:<br>– Checks processedPlayers/players/active/{player_threshold}; returns |

| | | |
|---|---|---|
| | | doc if it exists.<br>– Otherwise runs full analysis stack:<br>▪ player_analyzer season + L5 stats<br>▪ real-time injury status (injury_report)<br>▪ Poisson & Monte Carlo win odds<br>▪ GARCH volatility (reg-season and playoffs if ≥5 PO games)<br>▪ ChatGPT natural-language bet explanation<br>– 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:<br>– /api/admin/overview totals users, active bets, processed players, winnings, plus a placeholder apiRequests counter.<br>– /api/admin/users returns per-user engagement stats (earnings, win-rate, last login, etc.).<br>– /api/admin/bets aggregates bet volume/performance (still mostly sample data).<br>– /api/admin/players builds league-wide hit-rate & "most-analyzed" tables on the fly.<br>– /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`.<br>**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. |

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| `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.<br>• 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 |

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| | | `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. |

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| 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." |

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| **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.** |

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| **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.** |

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| 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 |
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| `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. |

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| `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**<br>- `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.<br>- Two-way helpers automatically fall back to legacy "full-object" arrays so nothing breaks for older users.<br>• **Robust data normalisation**<br>- `transformPicksData` converts whatever shape comes back (legacy, reference, mixed) into a consistent card object with sensible defaults (placeholder images, TBD times, etc.).<br>- 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.

**injury_report_fn/**

| File | Purpose in one glance | Key responsibilities / notable elements |
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| `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).** |

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| `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. |