## **HedgeDog Project Documentation**

### **1. Introduction**

**HedgeDog** is an innovative **AI-powered sports betting assistant** designed to revolutionize the way users approach risk and decision-making. The platform leverages real-time data, advanced hedging strategies, and predictive AI to empower users with informed choices, proving that **luck can also be overturned if data is made use of the right way**.

By combining sports analytics, real-time odds monitoring, and AI-driven insights, HedgeDog aims to create a future where technology levels the playing field for bettors.

### **2. Backend Progress**

The backend is the core of HedgeDog, providing scalable APIs and implementing complex hedging logic.

#### **Completed:**

* **Tech Stack**: Spring Boot with PostgreSQL as the database.
* **Core Features**:
  + User registration, login, and session management.
  + API integration with external odds providers for real-time data.
  + Hedging logic for H2H, totals, and spread markets.
  + Dynamic odds monitoring with configurable intervals.
  + Safety percentage calculations using AI-driven insights.
  + Dockerized backend deployed on AWS EC2 with ECR.

#### **Remaining:**

* Full integration of **anomaly detection** for odds discrepancies.
* Enhanced **security features** for API access.
* Scalability optimizations for high traffic during peak events.
* Extended support for additional sports and bookmakers.

### **3. Frontend Progress**

The frontend is built for seamless user interaction, designed with accessibility and real-time updates in mind.

#### **Completed:**

* **Tech Stack**: React Native with Expo for cross-platform compatibility (iOS and Android).
* **Core Features**:
  + User-friendly odds selection and bet placement.
  + Adjustable odds and amount inputs for dynamic hedging.
  + Real-time updates from the backend.
  + Integration of a **Safety Percentage Bar** for intuitive risk analysis.
  + Multi-market support (H2H, totals, spreads).

#### **Remaining:**

* Enhanced **UI/UX design** for a polished look and feel.
* Support for **push notifications** to alert users of key events.
* Offline mode for viewing previously fetched data.

### **4. AI Progress**

The AI component is designed to provide predictive insights and anomaly detection.

#### **Completed:**

* **Tech Stack**: Python with Flask for AI model integration.
* **Core Features**:
  + Linear regression model for calculating safety percentages.
  + AI-driven analysis of initial vs. current odds for hedging suggestions.
  + Real-time updates integrated into the backend.

#### **Remaining:**

* Advanced **machine learning models** for game-context prediction.
* Training models with **historical betting data** for enhanced accuracy.
* Development of anomaly detection for suspicious odds and glitches.

### **5. Cloud Progress**

HedgeDog is designed for a scalable, reliable, and secure cloud-based infrastructure.

#### **Completed:**

* **Backend Hosting**: Dockerized backend running on AWS EC2.
* **Frontend Hosting**: Dockerized frontend integrated with backend.
* **Database**: PostgreSQL hosted on EC2 with proper configuration.
* **DevOps**: Docker Compose used for managing multi-service setups.

#### **Remaining:**

* Transition to **ECS with Fargate** for container orchestration.
* Deployment of **CI/CD pipelines** using GitHub Actions.
* Implementing **cloud monitoring** for performance and reliability.

### **6. Flow of the Application**

1. **Login and Region Selection**:
   * Users log in and select their preferred region (e.g., US, EU).
2. **Odds Selection**:
   * Users select a sport, bookmaker, and market (H2H, totals, spreads).
3. **Bet Details**:
   * Users input initial odds, adjust amounts, and start monitoring.
4. **Real-Time Odds Monitoring**:
   * Backend fetches updated odds every 25 seconds.
5. **Hedging Suggestions**:
   * AI analyzes the odds and provides hedging recommendations.
6. **Safety Insights**:
   * Users see the safety percentage of their bets in real-time.

### **7. Future Enhancements**

**Stock Market Integration**:  
The principles of HedgeDog extend beyond sports. We aim to adapt its core logic to the **stock market**, allowing users to hedge their financial investments. Key enhancements include:

* **Dynamic Stock Hedging**:
  + AI-powered hedging strategies for high-volatility stocks.
* **Portfolio Risk Analysis**:
  + A “Safety Percentage Bar” for diversified portfolios.
* **Real-Time Market Monitoring**:
  + Continuous updates on stock performance and risk mitigation.