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DEPT:ECE

PHASE 4:PERFORMANCE OF THE PROJECT

TITLE:AI AFFORDABLE HOUSE FINDER Objective:

To utilize artificial intelligence technologies in **Phase 4** to efficiently identify, analyze, and recommend affordable housing options based on user-specific criteria (e.g., budget, location, amenities), thereby reducing search time, increasing access to low-cost housing, and aiding decision-making for renters or buyers.

1.AI MODEL PERFORMANCE ENHANCEMENT Overview:

To ensure the **AI Affordable House Finder** delivers accurate, timely, and relevant housing recommendations, continuous **enhancement of the AI model's performance** is essential. This involves optimizing data quality, refining algorithms, and improving the system's responsiveness to user needs.

- **Data Quality & Integration**

  Collect diverse, high-quality real estate datasets (e.g., listings, pricing, demographics, amenities).

  Integrate real-time data feeds to ensure up-to-date listings.

  Clean and normalize data to reduce noise and inconsistencies.

- **Model Accuracy & Relevance**

  Fine-tune recommendation algorithms (e.g., collaborative filtering, decision trees, neural networks).

  Use supervised learning with labeled data for better affordability predictions.

  Incorporate geographic and economic factors for contextual relevance.

Outcome:

The AI-driven system was deployed with an operational user interface, enabling users to search for affordable housing based on customized parameters such as income level, family size, location preference, and proximity to amenities.

2. Search Optimization & User Experience

Overview:

The platform's search function and user interface will be optimized for faster performance and better usability.

Key Enhancements:

- **Search Speed:** Search and filtering algorithms will be optimized to return results in under 2 seconds even under high traffic.

- **UX Design:** UI will be simplified to guide users with limited tech experience through the search and application process.

- **Map & Geo Tools:** Enhanced mapping features to show price heatmaps, commute times, and neighborhood safety ratings.

Outcome:

The interface will be intuitive and fast, with personalized and accessible tools that simplify the house-hunting process for all users.

3. Third-Party Integration Performance

Overview:

Phase 4 will improve data integration with public housing databases, private listing services, and mortgage assistance programs.

Key Enhancements:

- **Real-Time Data Sync:** APIs will be optimized to fetch and update listings without lag or duplication.

- **Eligibility Matching:** Automatic screening of listings based on user eligibility for local subsidies or assistance programs.

- **Partner Portals:** Development of partner interfaces for agents and NGOs to submit and manage listings.

Outcome:

The platform will maintain current, accurate listings and offer more targeted options aligned with user qualifications.

4. Data Security and Privacy Performance

Overview:

Stronger data protection mechanisms will be implemented to protect sensitive financial and location-based information.

Key Enhancements:

- **Data Encryption:** Use of AES-256 encryption for storage and TLS 1.3 for all communications.

- **User Consent Framework:** Transparent opt-in/opt-out flows for data usage.

- **Compliance:** Alignment with GDPR, CCPA, and local housing data protection laws.

Outcome:

The system will ensure that user data is secure, with privacy features that inspire trust and meet regulatory standards.

5. Performance Testing and Metrics

Collection Overview:

System stress testing and feedback-driven refinement will ensure readiness for public launch.

Implementation:

- **Load Testing:** Simulate up to 10,000 concurrent users in urban metros.
- **Analytics Dashboard:** Real-time monitoring of latency, bounce rates, and conversion to applications.
- **User Feedback Loop:** Beta test with low-income housing applicants, NGOs, and municipal housing officers.

Outcome:

A robust, data-informed platform capable of handling peak demand and providing smooth service under varying conditions.

Key Challenges in Phase 4

1. **Scalability Across Regions:**

   - o **Challenge:** Adapting the model for diverse housing markets.

   - o **Solution:** Region-specific tuning and dynamic data pipelines.

2. **Integration with Fragmented Databases:**

   - o **Challenge:** Disparate listing formats and update schedules.

   - o **Solution:** Standardized schema and refresh intervals with error reconciliation.

3. **Digital Accessibility:**

   - o **Challenge:** Serving users with limited digital literacy or access.

   - o **Solution:** Multilingual support, mobile-first design, and offline modes.

Outcomes of Phase 4

1. **Improved AI Matching:** Accurate, fair housing suggestions that reflect both budget and lifestyle needs.

2. **Enhanced Search & UX:** Streamlined, low-latency navigation and search features.

3. **Real-Time, Integrated Listings:** Updated, verified housing options from multiple sources.

4. **Trusted Security Framework:** Full compliance and user-centered data controls.

5. **Next Steps for Finalization**
   In the next and final phase, the platform will be fully deployed in selected pilot cities. Continuous feedback will be gathered from live users, and final tuning will be performed on model parameters and platform stability.

```python
 1  import pandas as pd
 2
 3  # Step 1: Sample housing data
 4  data = {
 5      'id': [1, 2, 3, 4, 5, 6],
 6      'location': ['Phase 4', 'Phase 3', 'Phase 4', 'Phase 1', 'Phase
          4', 'Phase 5'],
 7      'price': [85000, 120000, 95000, 99000, 105000, 87000],
 8      'bedrooms': [2, 3, 2, 1, 3, 2],
 9      'bathrooms': [1, 2, 1, 1, 2, 1],
10      'area_sqft': [900, 1200, 850, 700, 1100, 950],
11      'house_type': ['Apartment', 'House', 'Apartment', 'Studio',
          'House', 'Apartment']
12  }
13
14  # Step 2: Convert to DataFrame
15  df = pd.DataFrame(data)
16
17  print("🏠 Full Housing Dataset:")
18  print(df)
19
20  # Step 3: Filter affordable houses in Phase 4 under $100,000
21  max_price = 100000
22  location_filter = 'Phase 4'
23
24  affordable_houses = df[
```

Output

```
🏠 Full Housing Dataset:
   id location   price  bedrooms  bathrooms  area_sqft house_type
0   1  Phase 4   85000         2          1        900  Apartment
1   2  Phase 3  120000         3          2       1200      House
2   3  Phase 4   95000         2          1        850  Apartment
3   4  Phase 1   99000         1          1        700     Studio
4   5  Phase 4  105000         3          2       1100      House
5   6  Phase 5   87000         2          1        950  Apartment

✅ Affordable Houses in Phase 4 under $100,000:
   id location  price  bedrooms  bathrooms  area_sqft house_type
0   1  Phase 4  85000         2          1        900  Apartment
2   3  Phase 4  95000         2          1        850  Apartment

=== Code Execution Successful ===
```