



Sickle Cell Disease (SCD) Patient/Provider Match Tool

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Objectives & Requirements

Problems:

- SCD patients are struggling to find a suitable provider based on their needs due to the disease's rarity and other complexities

Objective:

- Develop an iOS mobile application that recommends and matches SCD patients to high-value providers based on care scores
- Understand the exact clinical and behavioral situation of SCD patients

Requirements:

- Analysis of local hospitals to determine the care data related to SCD treatment
- Apply data model capable of scraping and ingesting treatment data from hospitals and providers to empower patients to understand care details

Patient Persona

2 Representative patient models [1]:

Jasmine Brown



- Student & Support by families
- Frequent pain crises and hospitalizations
- Educational interruptions, Social isolation
- Goal: Dream university

Michael Thompson



- Employee & live alone
- Frequent pain crises and hospitalizations
- Educational interruptions, Social isolation
- Goal: Long-term job

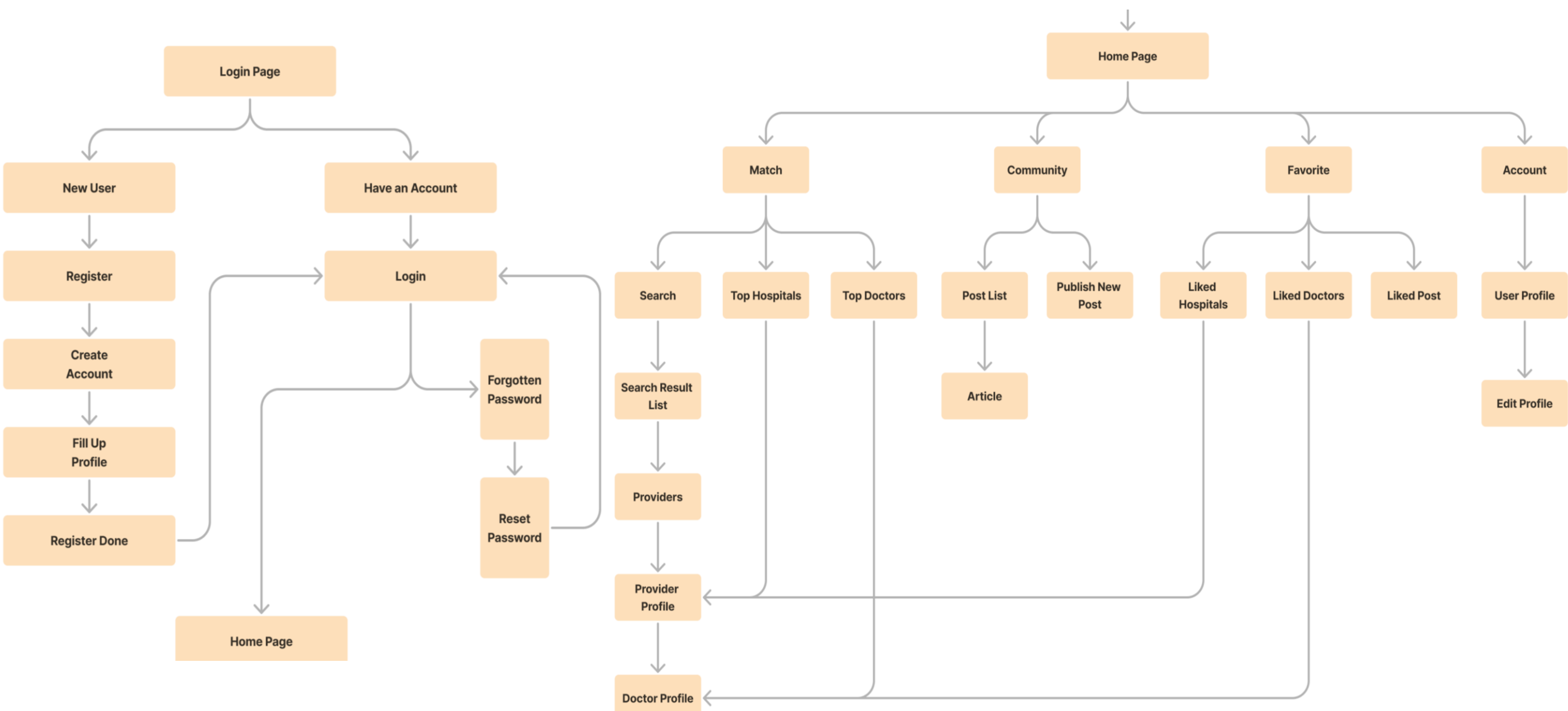
User Flow

UX/UI: Figma

Frontend: React Native & Firebase

Backend: Flask & MongoDB

Functions/Pages: Signup/Login, Match, Community, Favorite, Account



Signup/Login & Favorite & Account

Creating Account:

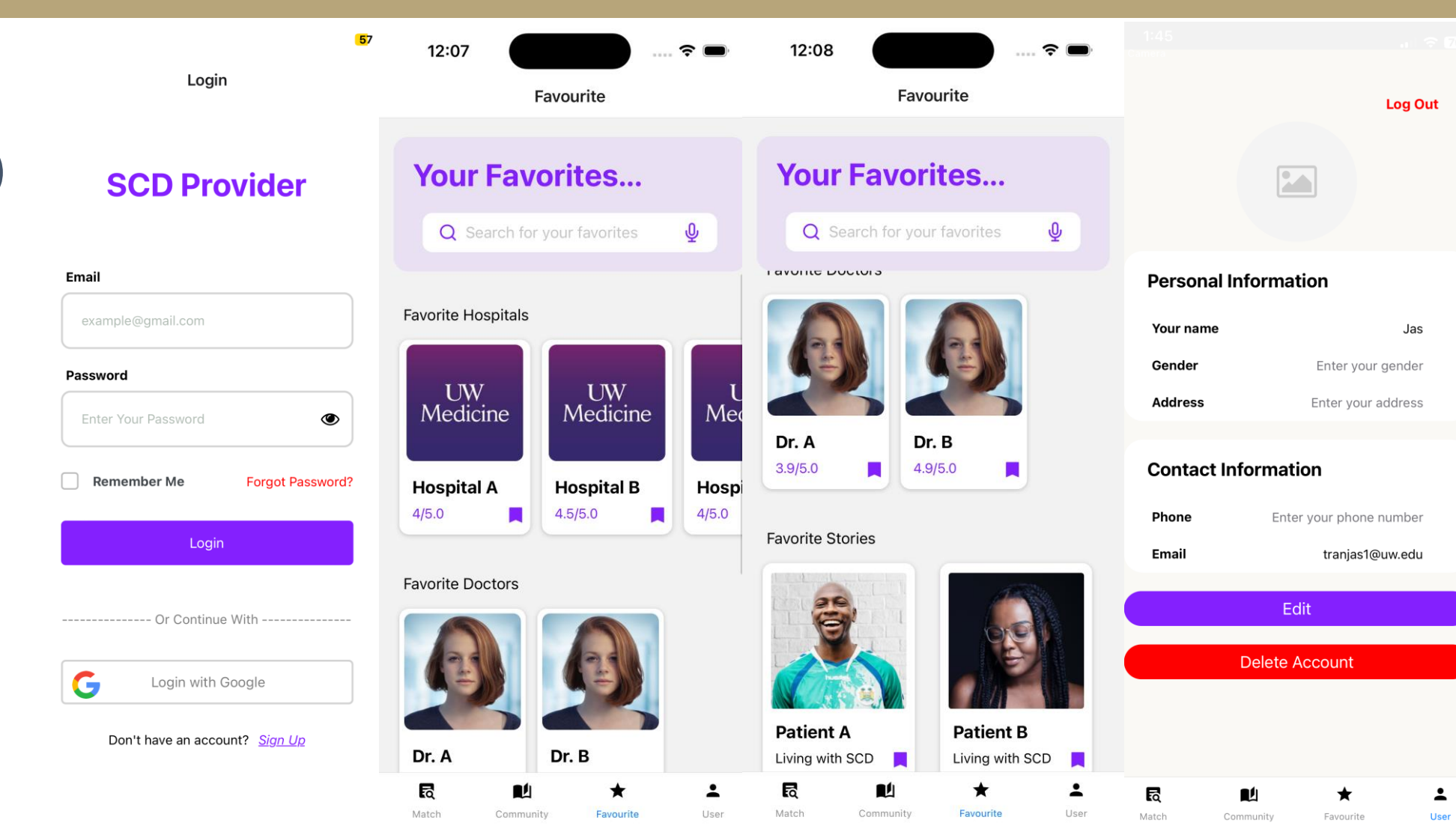
- Basic info (name, gender, age)
- Contact info (email/phone)
- Personality (MBTI)
- Symptoms
- Pain level

Favorite:

- Store interested doctors, hospitals and posts

Manage Account:

- Manage users' profile (above)



Match

Search:

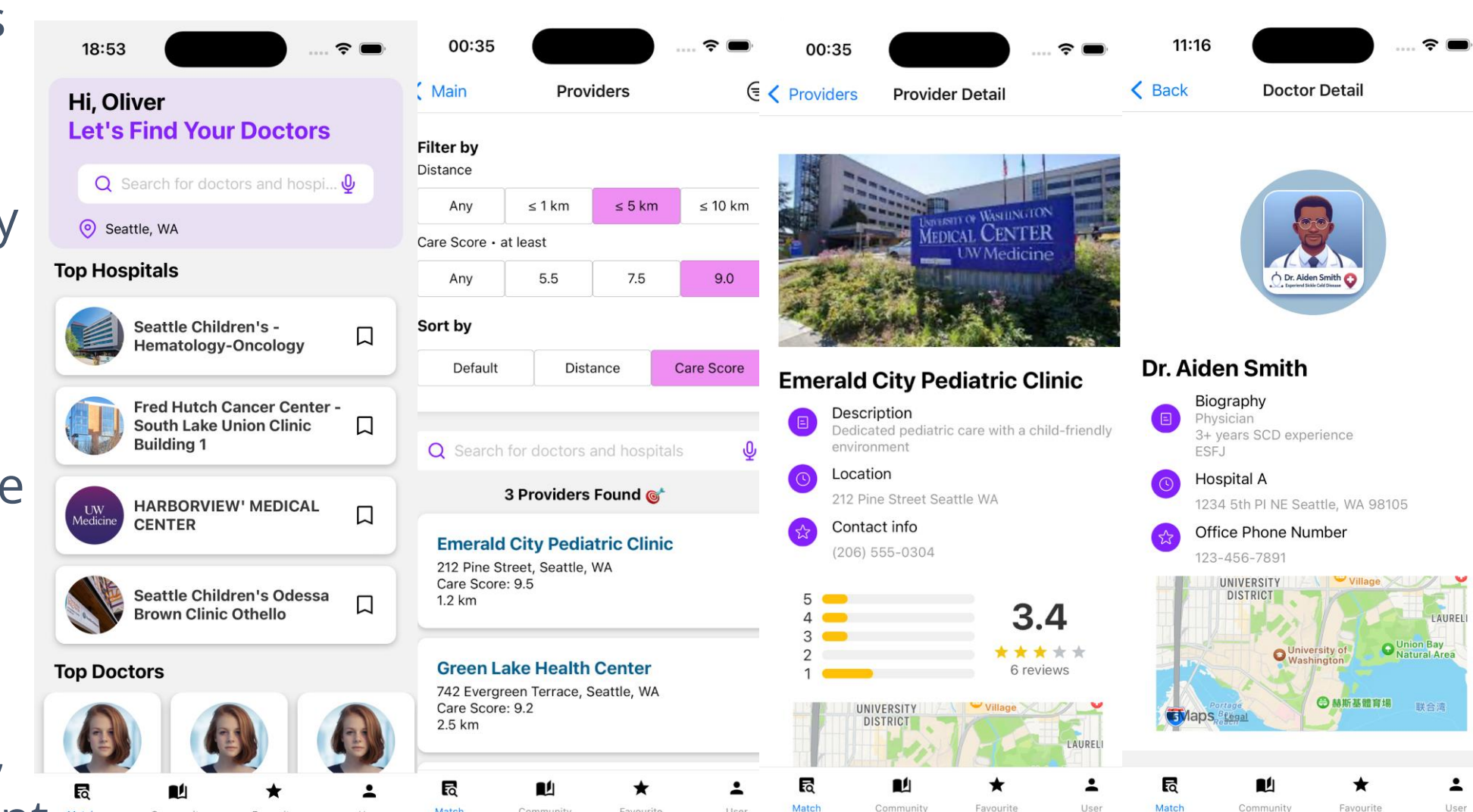
- A search bar permitting users to input keywords, provider names, or city names.
- Enhances the ability to quickly locate specific hospital providers.

Filtering:

- Filter results based on distance to provider, and care scores.

Sorting:

- Sort results by relevant parameters such as proximity, care scores, and other pertinent attributes.

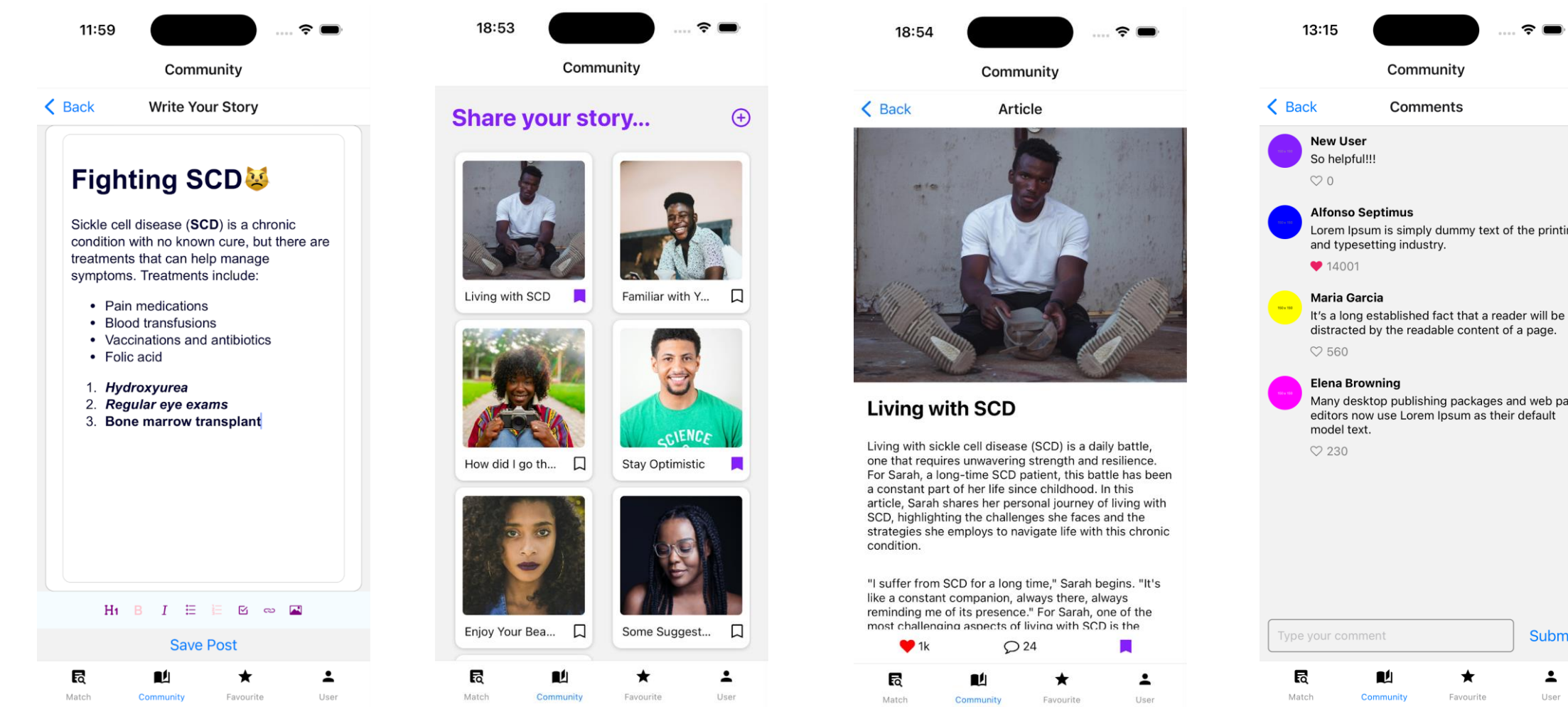


Community

Post Publishing and Browsing:

- Freely publish posts about their experiences with SCD, treatment insights, or other relevant information,
- Browse the latest posts from other community members, ensuring timely interaction and engagement.

Interactive Functions: Like, Save, & Comment



Synthetic Data Creation: in Machine Learning

- Incorporate critical attributes such as personality and pain level to enhance the relevance and accuracy of the synthetic profiles.

```
{0: {'doctor_name': 'Allison Hill',
    'gender': 'Male',
    'email': 'jillrhodes@example.net',
    'phone_number': '296-580-1338',
    'address': 'Fred Hutch Cancer Center - South Lake Union Clinic Building 1',
    'experience': 'Senior',
    'website': 'https://blake.biz/',
    'rating': '2',
    'personality': 'ISTJ',
    'Description': 'Dr. Allison Hill is a highly experienced and accomplished physician.',
    'care_score_distance': 0,
    'care_score_personality': 0,
    'care_score_pain': 0,
    'care_score': 0},
  2: {'patient_name': 'Thomas Lester',
    'age': 41,
    'gender': 'Male',
    'email': 'edwin66@example.com',
    'phone_number': '784.822.7364',
    'address': (47.611755800059655, -122.19808855817733),
    'pain_level': 4,
    'symptoms': 'Stroke',
    'personality': 'ESTP'}}
```

Recommender System Model in Machine Learning

Model Development through XGBoost [2]

Care Score Generation:

- Assign weights to Personality, Distance, and Pain level.
- Implement weighted sums to generate final care scores.

4-state Matching Algorithm based on Care Score

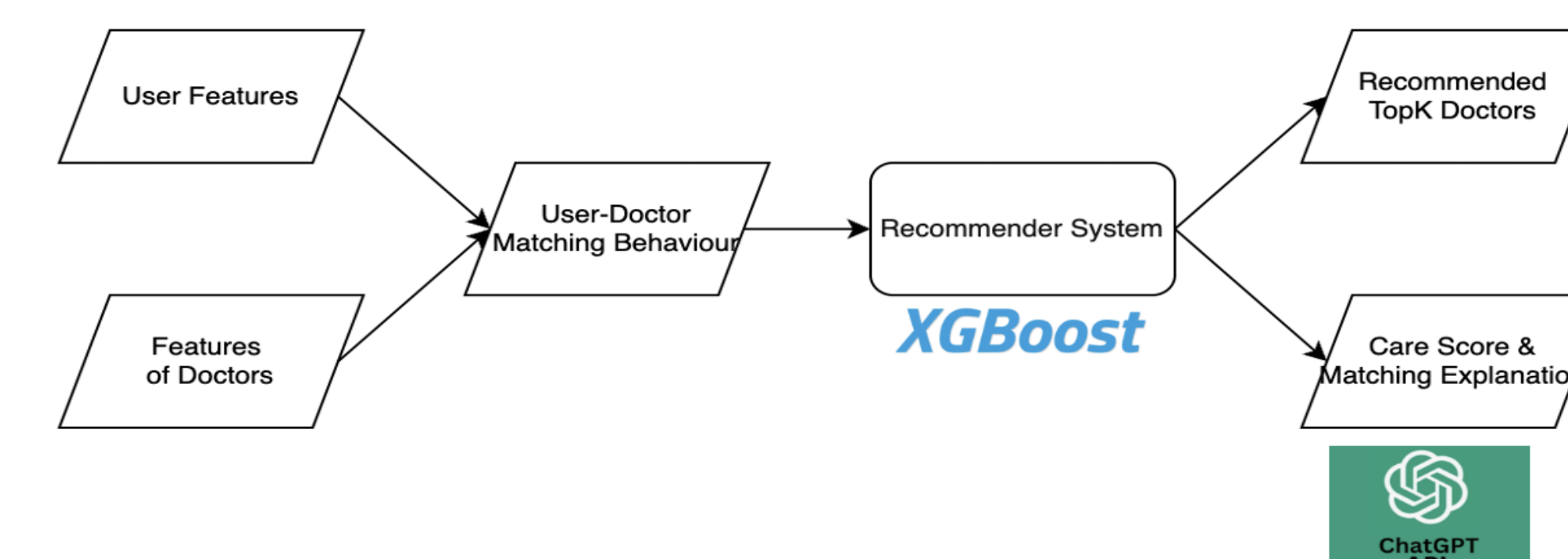
- Default: Equal weights
- Personality: Prioritize personality matching
- Distance: Prioritize the shortest distance
- Pain level: Higher pain levels → More experienced doctors

Output:

- Top 5 doctors best suited for the patient based on the Matching Algorithm

Explanation using ChatGPT API:

- Provide a detailed explanation of the care score and the reasons behind each doctor-patient match to ensure transparency and trust in the recommendations



Future Work & References

- Online appointments, telemedicine meetings
- Update users on news that is happening within the SCD world
- Chat with a chatbot to find solutions to symptoms when providers are not available
- More personalized matches with doctors considering more features
- Provide community resources such as study/job opportunities, etc. to give supports
- Upgrade the ML model with a more advanced and interpretable architecture.

[1] Sickle Cell Disease_FINAL_ComprehensiveDeck_3.29.22. Novo Nordisk

[2] Chen, T., & Guestrin, C. (2016, August). Xgboost: A scalable tree boosting system. In Proceedings of the 22nd acm sigkdd international conference on knowledge discovery and data mining (pp. 785-794).