Prosperity Prognosticator: Machine Learning for Startup Success Prediction

1. Introduction

Project Title: Prosperity Prognosticator: Machine Learning for Startup Success Prediction

Team Members: Team Leader: Ramasatya Prasuna Saladi

Team Member: Duggirala Venkata Surya

Team Member: Valluri Bhaskar Chowdary

Team Member: Kesava Prakash Kanuri

2. Project Overview Purpose:

The purpose of the Prosperity Prognosticator project is to develop a machine learning-based web application that predicts the success of startups (Acquired or Closed) using historical startup data such as funding, market, state, and business characteristics.

The system helps:

- Investors evaluate investment opportunities.
- Entrepreneurs identify key success factors.
- Policy makers design better startup support policies.

Features:

- Startup success prediction using Machine Learning
- Random Forest Classifier with hyperparameter tuning
- User-friendly web interface
- Model evaluation using multiple metrics
- Train-Test split and feature selection
- Hyperparameter tuning using GridSearchCV
- Model saving and deployment using joblib
- Web integration using Flask (Backend API)
- React-based frontend interface

3. Architecture

Overall Architecture:

Frontend (React)

↓

Backend (Node.js + Express.js)

↓

Flask ML Microservice

↓

Saved ML Model (.pkl)

↓

MongoDB Database

- **Frontend: (React)**
  - Pages:
  - Home Page
  - Adaptivity Prediction Page
  - Results Page
  - Uses Axios to send input data to backend API
  - Displays prediction results dynamically

Backend: (Node.js + Express.js)

REST API built using Express.js

Handles:

- Receiving form input
- Sending data to ML Flask service
- Managing users (if authentication implemented)

- Middleware:
  - Body Parser
  - CORS
  - JSON handling

- Machine Learning Service (Flask) Loads saved random_forest_model.pkl
- Accepts POST request with startup data
- Returns prediction result:
- Acquired
- Closed

Database: (MongoDB) MongoDB stores:

- User Data (if login implemented)
- Prediction History
- Input logs

Example Schema:

```
StartupPrediction {
  state_code: String,
  funding_total_usd: Number,
  founded_year: Number,
  prediction: String,
  createdAt: Date
}
```

4. Setup Instructions Prerequisites: Node.js (v16+)

- MongoDB
- Python (3.8+)
- Flask
- npm
- pip
- Git

Installation Steps:

Step 1: Clone Repository

```
git clone <repository-url>

cd prosperity-prognosticator
```

Step 2: Setup Backend

cd server

npm install

Create .env file:

PORT=5000

MONGO_URI=your_mongodb_connection_string

Step 3: Setup Frontend

cd client

npm install

Step 4: Setup Flask ML Service

cd flask_model

pip install -r requirements.txt

python app.py

5. Folder Structure

client/

│

├── public/

├── src/

│ ├── components/

│ ├── pages/

│ ├── App.js

│ ├── index.js

│

├── package.json

Server (Node.js Backend)

server/

│

├── controllers/

├── routes/

├── models/

├── middleware/

├── server.js

├── package.json

Flask ML Service

flask_model/

│

├── templates/

│   ├── home.html

│   ├── adaptivity.html

│   ├── results.html

│

├── random_forest_model.pkl

├── app.py

6. Running the Application

Start Backend:

cd server

npm start

Start Frontend:

cd client

npm start

Start Flask ML Model:

cd flask_model

python app.py

7. API Documentation

1. **Predict Startup Success**

   End point:

   POST /api/predict

   Request Body:

```
{
 "state_code": "CA",
 "funding_total_usd": 5000000,
 "founded_year": 2015,
 "category": "Software"
}
```

   Response:

```
{
 "prediction": "Acquired"
}
```

9. User Interface Pages Included:

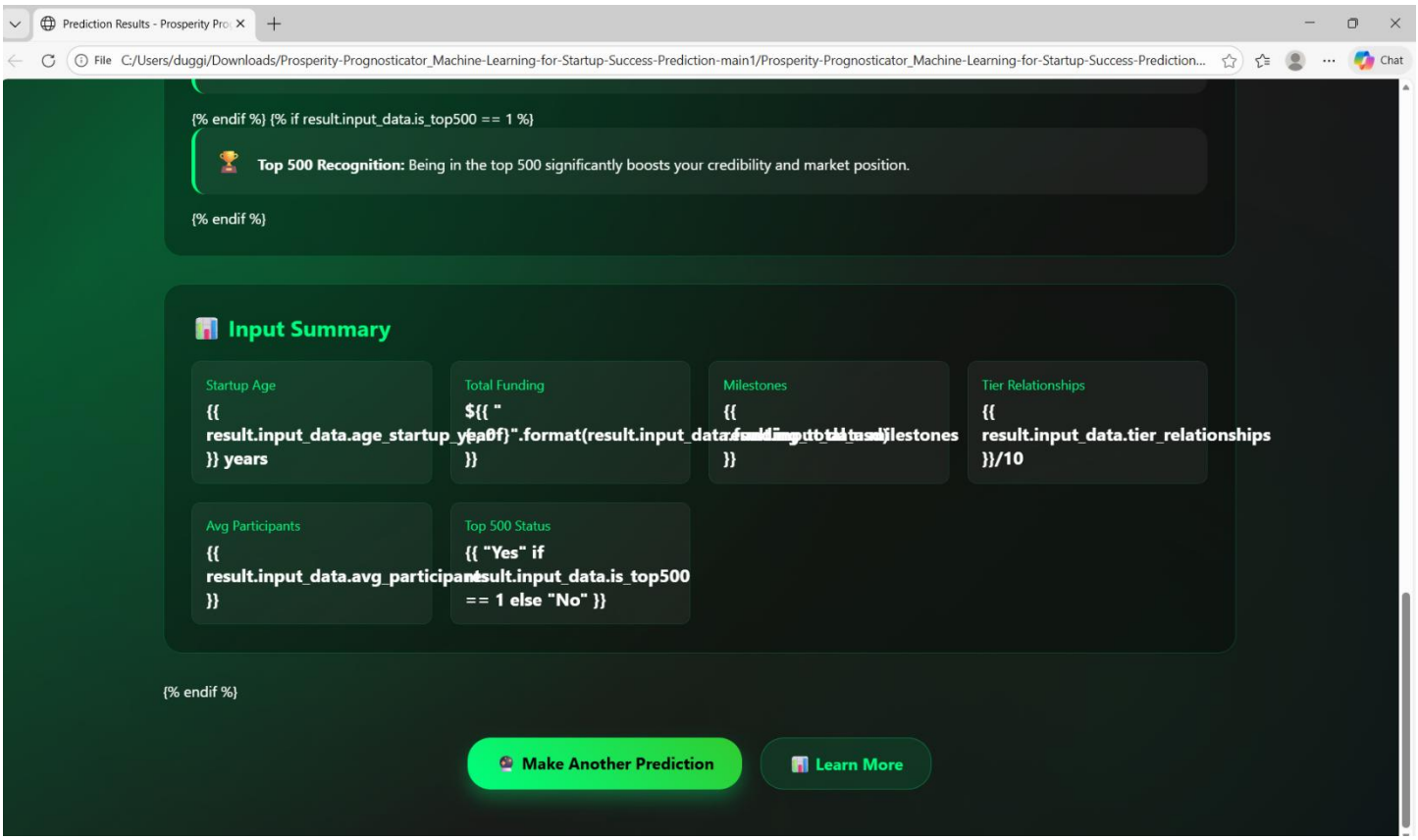
- Home Page

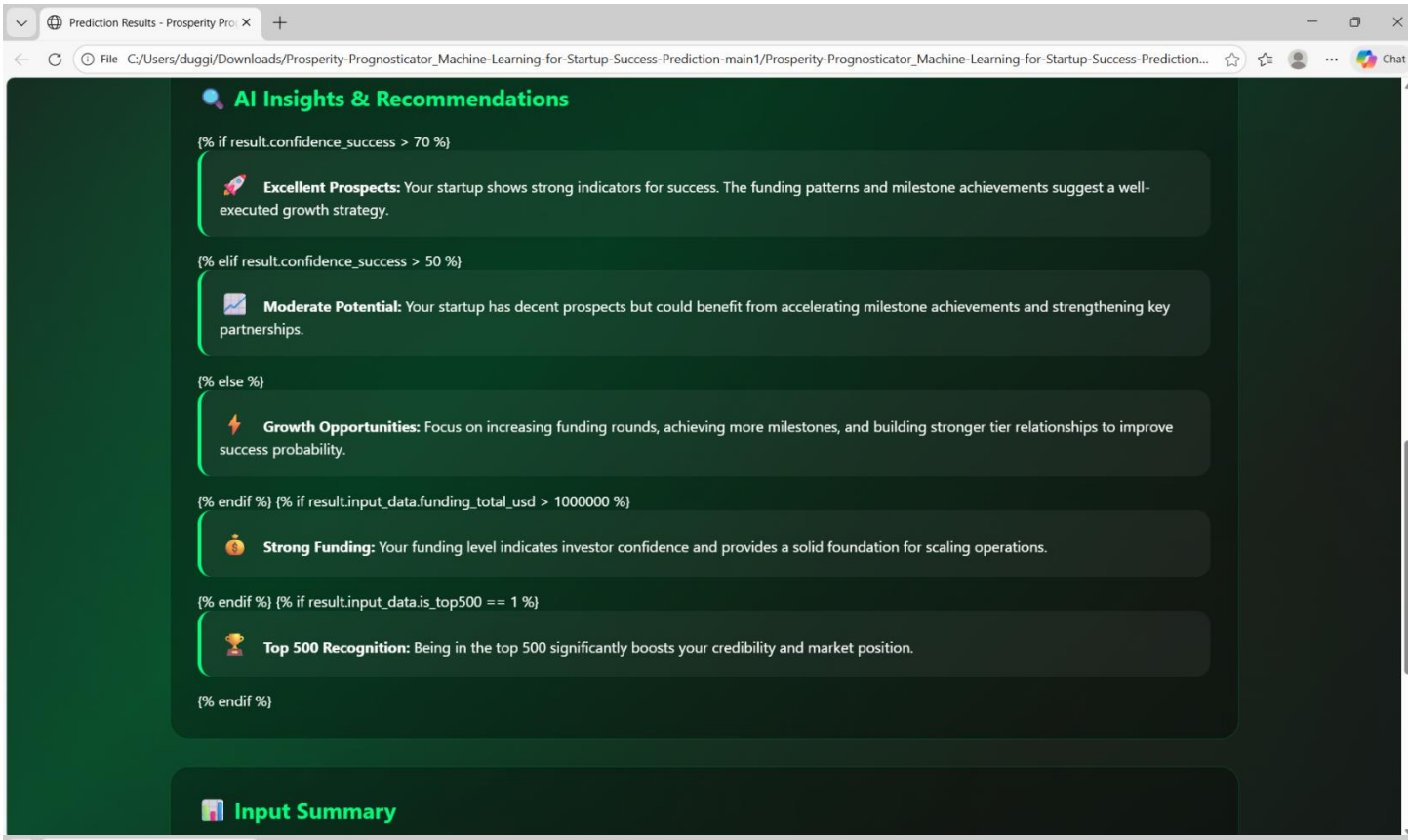
- Startup Prediction Form
- Result Page

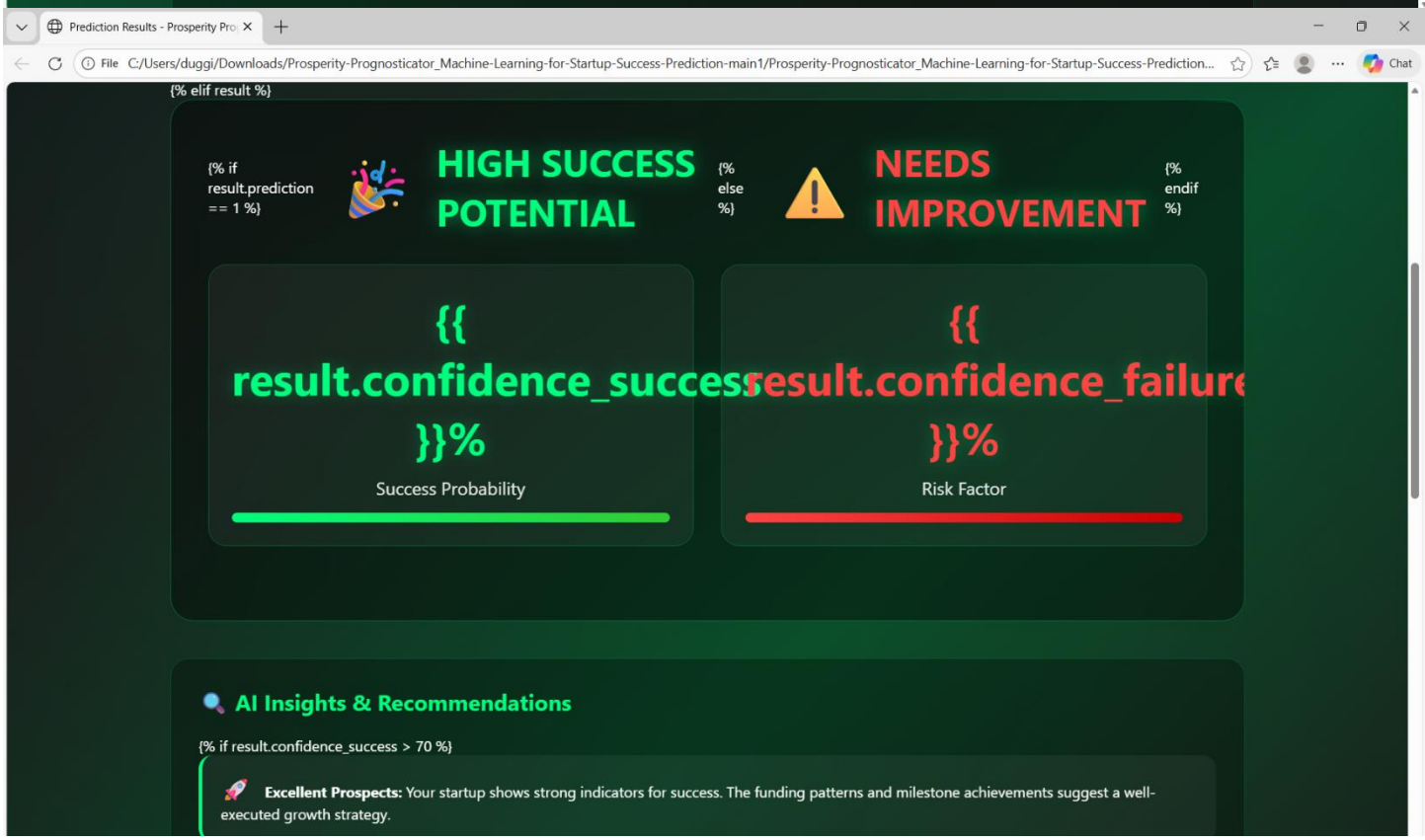
Testing Testing Strategy:

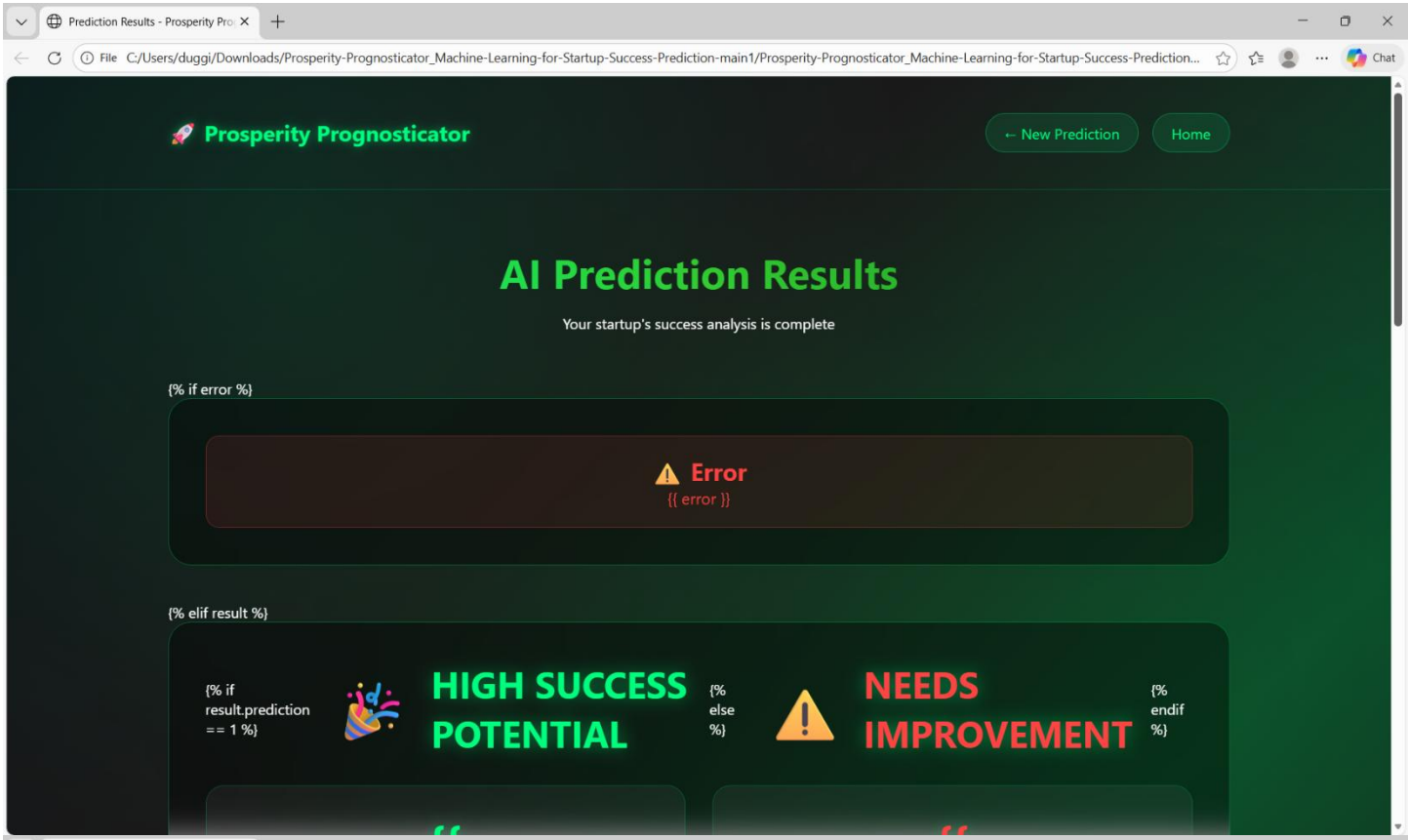
- Unit Testing (Model Accuracy Testing)
- Train-Test Split (70% - 30%)
- Cross Validation (5-fold CV)
- Hyperparameter Tuning (GridSearchCV)
- Evaluation Metrics Used: Accuracy Score
- Classification Report
- Confusion Matrix
- ROC-AUC Score
- Observations: Training Accuracy: 100%
- Testing Accuracy: 80%
- Slight overfitting detected
- Improved after hyperparameter tuning

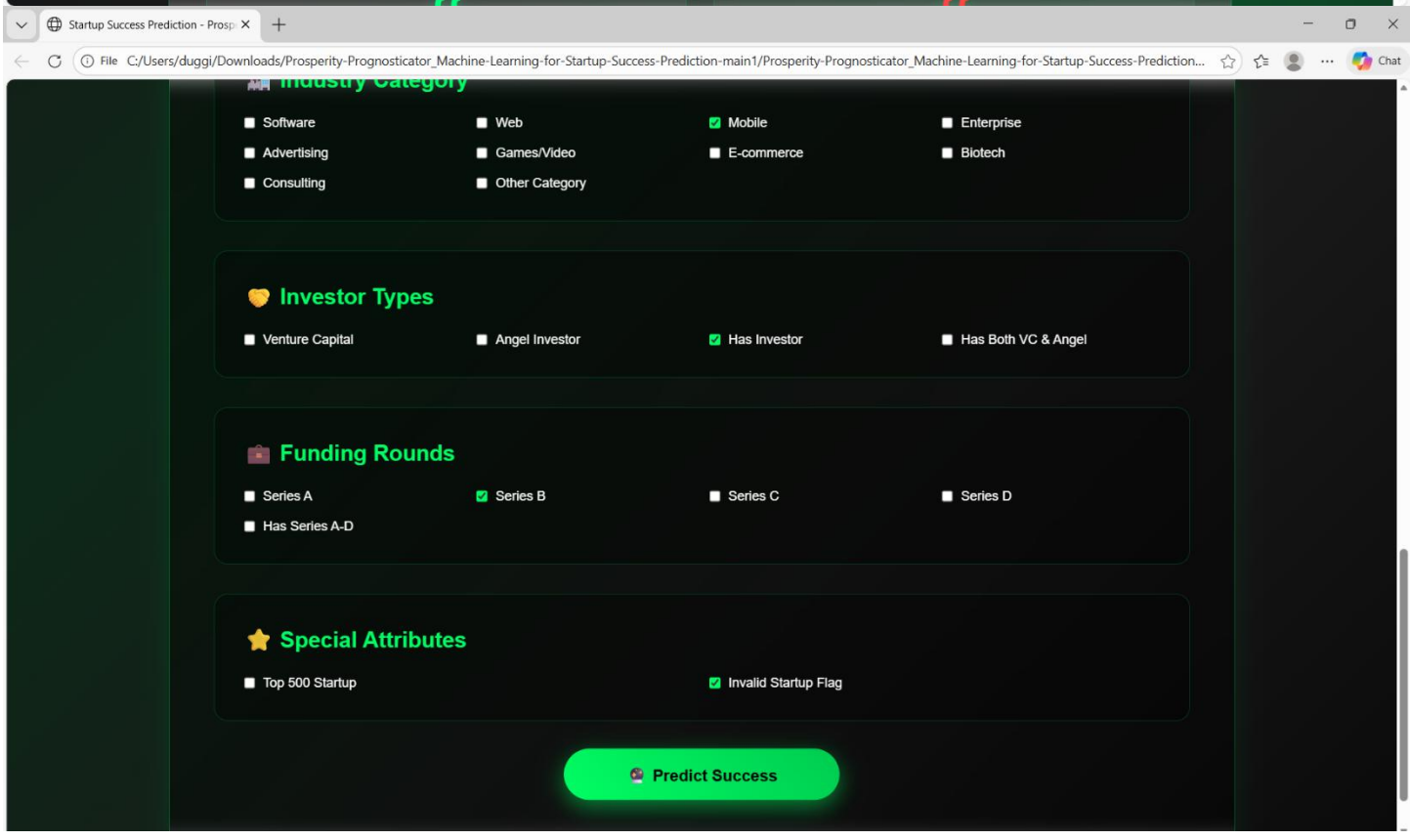
10. Screenshots or Demo

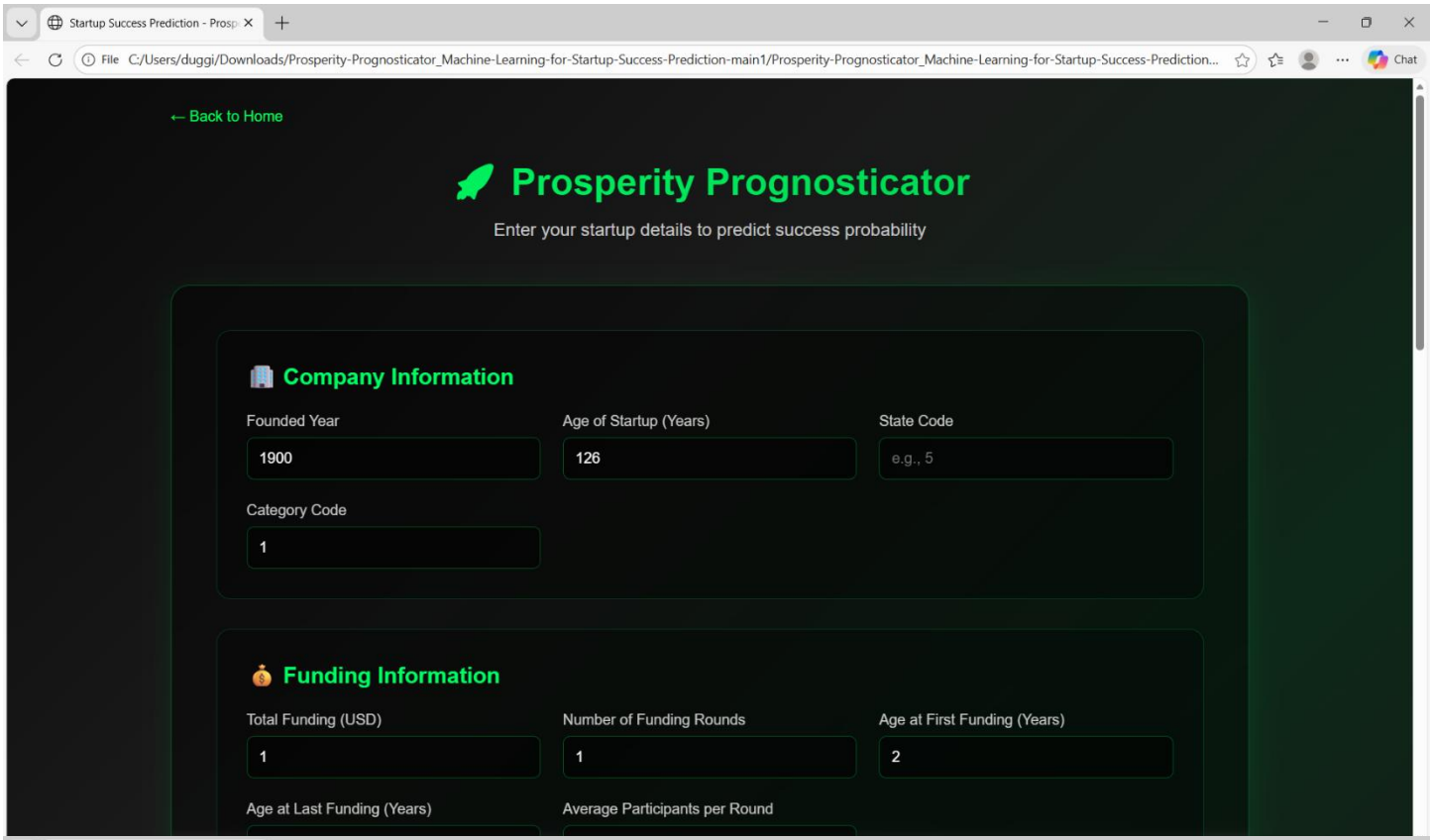


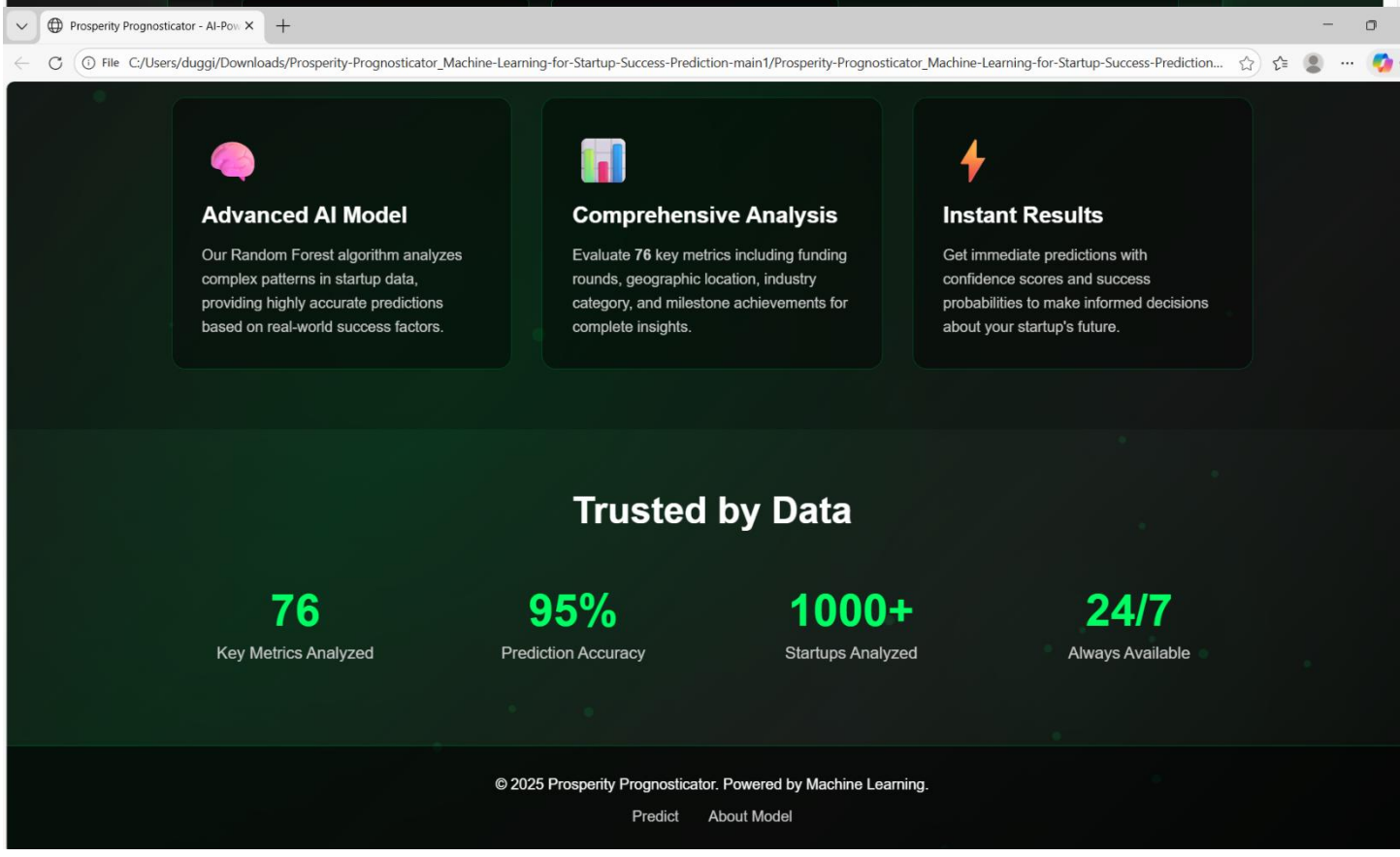

Prediction Results - Prosperity Pro
File C:/Users/duggi/Downloads/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction-main1/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction...
Chat
AI Insights & Recommendations
{% if result.confidence_success > 70 %}
Excellent Prospects: Your startup shows strong indicators for success. The funding patterns and milestone achievements suggest a well-executed growth strategy.
{% elif result.confidence_success > 50 %}
Moderate Potential: Your startup has decent prospects but could benefit from accelerating milestone achievements and strengthening key partnerships.
{% else %}
Growth Opportunities: Focus on increasing funding rounds, achieving more milestones, and building stronger tier relationships to improve success probability.
{% endif %} {% if result.input_data.funding_total_usd > 1000000 %}
Strong Funding: Your funding level indicates investor confidence and provides a solid foundation for scaling operations.
{% endif %} {% if result.input_data.is_top500 == 1 %}
Top 500 Recognition: Being in the top 500 significantly boosts your credibility and market position.
{% endif %}
Input Summary

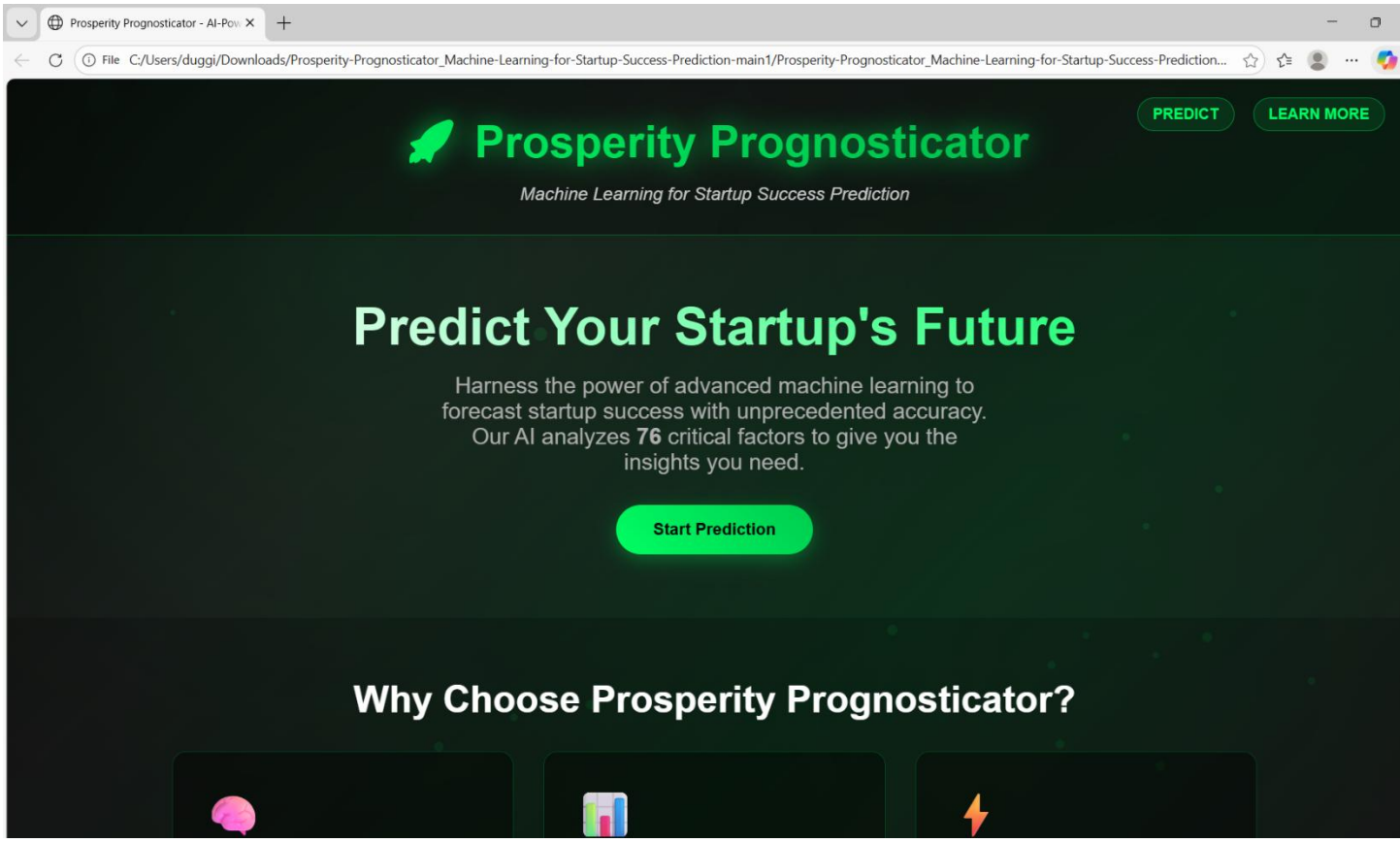

Prediction Results - Prosperity Pro
File C:/Users/duggi/Downloads/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction-main1/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction...
Chat
{% elif result %}
{% if result.prediction == 1 %}
HIGH SUCCESS POTENTIAL
{% else %}
NEEDS IMPROVEMENT
{% endif %}
{{ result.confidence_success }}%
Success Probability
{{ result.confidence_failure }}%
Risk Factor
AI Insights & Recommendations
{% if result.confidence_success > 70 %}
Excellent Prospects: Your startup shows strong indicators for success. The funding patterns and milestone achievements suggest a well-executed growth strategy.


Prediction Results - Prosperity Pro
File C:/Users/duggi/Downloads/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction-main1/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction...
Chat
Prosperity Prognosticator
← New Prediction
Home
AI Prediction Results
Your startup's success analysis is complete
{% if error %}
Error
{{ error }}
{% elif result %}
{% if result.prediction == 1 %}
HIGH SUCCESS POTENTIAL
{% else %}
NEEDS IMPROVEMENT
{% endif %}


Startup Success Prediction - Prosp
File C:/Users/duggi/Downloads/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction-main1/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction...
Chat
Industry Category
Software
Web
Mobile
Enterprise
Advertising
Games/Video
E-commerce
Biotech
Consulting
Other Category
Investor Types
Venture Capital
Angel Investor
Has Investor
Has Both VC & Angel
Funding Rounds
Series A
Series B
Series C
Series D
Has Series A-D
Special Attributes
Top 500 Startup
Invalid Startup Flag
Predict Success


Startup Success Prediction - Prosp
File C:/Users/duggi/Downloads/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction-main1/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction...
Chat
← Back to Home
Prosperity Prognosticator
Enter your startup details to predict success probability
Company Information
Founded Year
1900
Age of Startup (Years)
126
State Code
e.g., 5
Category Code
1
Funding Information
Total Funding (USD)
1
Number of Funding Rounds
1
Age at First Funding (Years)
2
Age at Last Funding (Years)
Average Participants per Round


Prosperity Prognosticator - AI-Pow
File C:/Users/duggi/Downloads/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction-main1/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction...
Advanced AI Model
Our Random Forest algorithm analyzes complex patterns in startup data, providing highly accurate predictions based on real-world success factors.
Comprehensive Analysis
Evaluate 76 key metrics including funding rounds, geographic location, industry category, and milestone achievements for complete insights.
Instant Results
Get immediate predictions with confidence scores and success probabilities to make informed decisions about your startup's future.
Trusted by Data
76
Key Metrics Analyzed
95%
Prediction Accuracy
1000+
Startups Analyzed
24/7
Always Available
© 2025 Prosperity Prognosticator. Powered by Machine Learning.
Predict
About Model



Demo video Link :

https://drive.google.com/file/d/1RbdRftsjGrNZ-oCFeUwJAV5rZrwuWSdM/view?usp=drive_link

Github Link:

https://github.com/Surya-bot123/Prosperity-Prognosticator_Machine-Learning-for-Startup-Success-Prediction.git