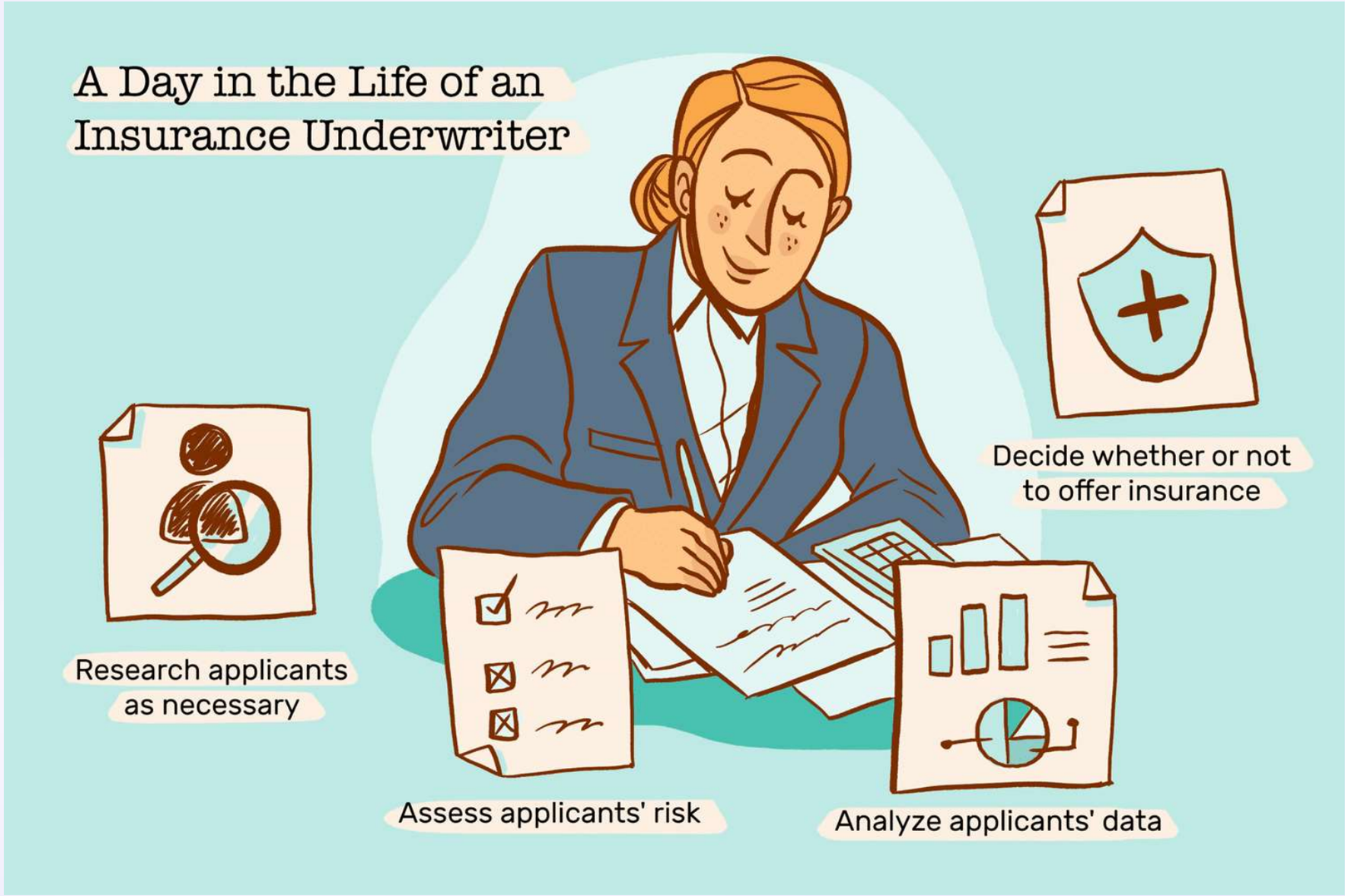
Automated Insurance Underwriting



Problem Statement

- **Insurance** is vital for financial safety, yet underwriting is slow and error-prone.
- Manual processes cause **delays**, **hidden biases**, and **opaque decisions**, and even if it is Automated system
- **What if AI** delivered instant, fair assessments with clear explanations?

Wouldn’t that redefine trust in insurance?

Solution

- This system analyzes applicant data—such as demographics, health metrics, and financial information—to calculate risk scores and make underwriting decisions Confidence Levels: A visual representation of the confidence levels for each decision (e.g., bar charts).
- system uses SHAP (SHapley Additive exPlanations) to provide detailed explanations for each underwriting decision. This includes SHAP values, and feature importance visualizations. SHAP Explanation: A visualization of how each feature contributed to the decision (e.g., bar charts for SHAP values).
- Manual Override: An option for underwriters to manually override the decision.

Stakeholder

- a. Insurance Companies (Insurers)Role: The primary users of the system, responsible for underwriting policies and managing risk.
- b. Underwriters Role: Professionals who evaluate and approve insurance applications.
- c. Applicants (Policyholders)Role: Individuals or businesses applying for insurance policies.

Statistics

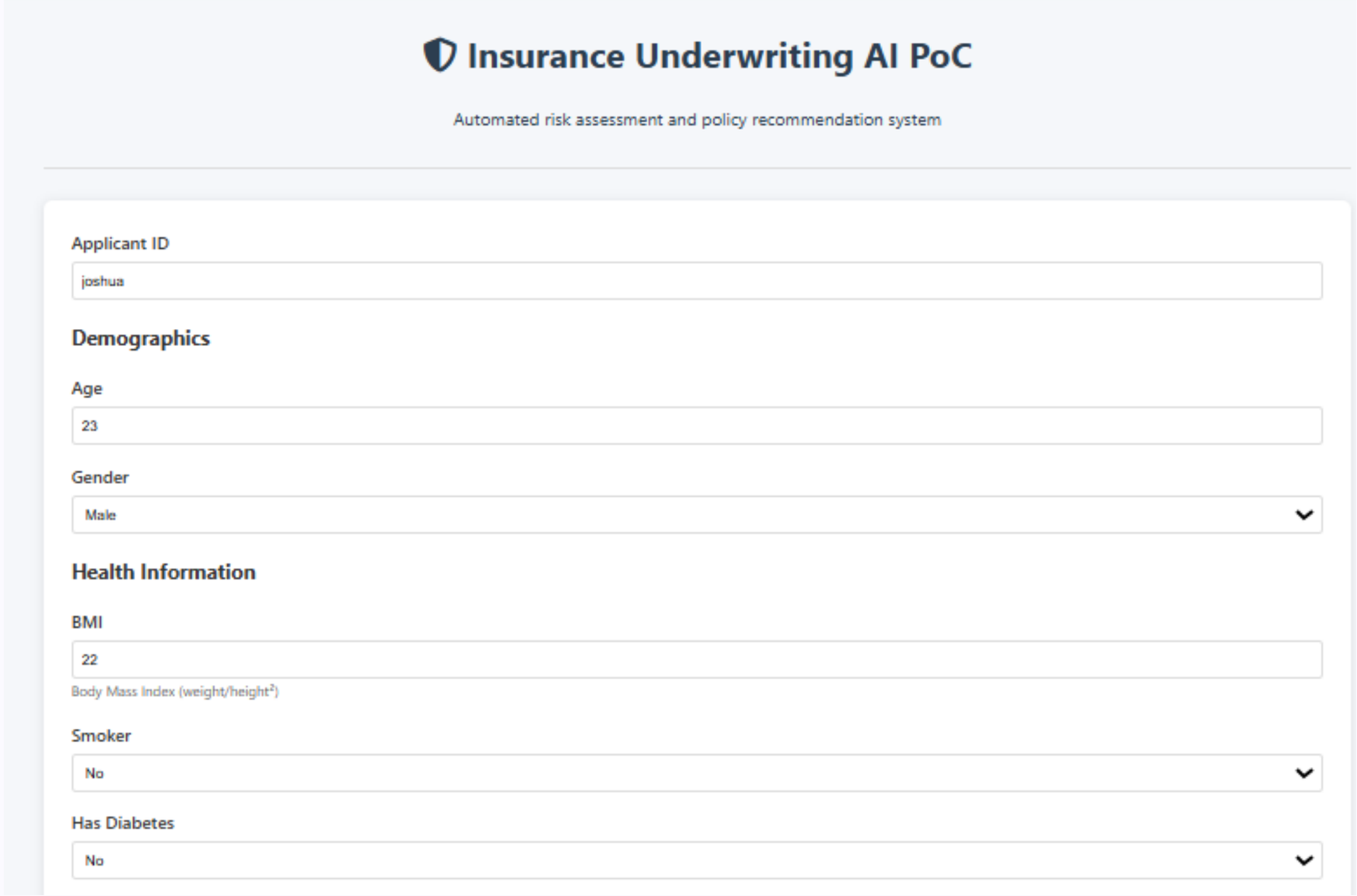
Key features

- Data Input: A user-friendly form for applicant details (age, BMI, income, etc.).
- Risk Calculation: A simplified algorithm to compute health, financial, and overall risk scores.
- Underwriting Decision: Automated approval, conditional approval, or decline decisions.
- Confidence Levels: Display of confidence levels for each decision.
- Risk Factor Analysis: Highlighting key risk factors and findings.
- SHAP Value Explanation: Visualizations showing how individual features influenced the decision.
- Manual Override: Allows underwriters to manually override automated decisions.

Technology and Resources Used

- Web Framework: Flask (used for deploying the model)
- Frontend: HTML, CSS, JavaScript (used in index.html)
- Backend: Flask(used in app.py)
- Programming Language: Python
- Libraries: SHAP, scikit-learn, pandas, matplotlib, seaborn
- Modeling Framework: Random Forest
- Development Environment: VS Code
- Visualization Tools: Matplotlib, Seaborn, SHAP library plots

Implemented Output



Smoker

No

Has Diabetes

No

Has Heart Disease

No

Blood Pressure (systolic)

100

Normal range: 90-120 mmHg

Financial Information

Annual Income

100000

Credit Score

500

Range: 300-850

Debt-to-Income Ratio

0.40

Range: 0.0-1.0 (e.g., 0.35 = 35%)

Evaluate Risk

Insurance Underwriting AI PoC

Automated risk assessment and policy recommendation system

Underwriting Decision

APPROVED

Confidence | Risk Factors | SHAP Explanation | Override

Confidence Levels

Approve 92.5%

Approve with Conditions 62.5%

Decline 0.0%

New Application

Insurance Underwriting AI PoC

Automated risk assessment and policy recommendation system

Underwriting Decision

DECLINED

Confidence | Risk Factors | SHAP Explanation | Override

Confidence Levels

Approve 40.0%

Approve with Conditions 85.0%

Decline 50.0%

New Application

Insurance Underwriting AI PoC

Automated risk assessment and policy recommendation system

Underwriting Decision

DECLINED

Confidence | **Risk Factors** | SHAP Explanation | Override

Key Risk Factors

Health Risk Score	**75.0%**
Financial Risk Score	**25.0%**
Overall Risk Score	**60.0%**

Key Findings

- Applicant is a smoker
- Applicant has diabetes
- Applicant has heart disease
- Below average credit score

New Application

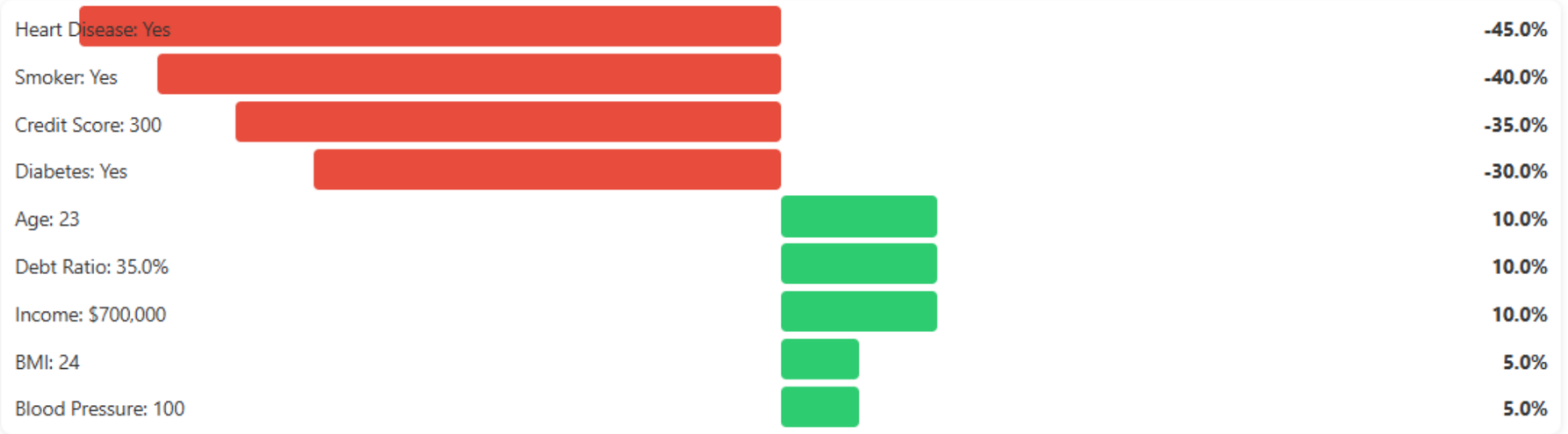
Underwriting Decision

DECLINED

Confidence | Risk Factors | **SHAP Explanation** | Override

Feature Importance (SHAP Values)

How each factor contributed to the underwriting decision:



New Application

127.0.0.1:5500 says

Override applied successfully!

OK

Underwriting Decision

DECLINED

Confidence | Risk Factors | SHAP Explanation | **Override**

Manual Override

Use this section if you need to override the automated decision based on additional information.

New Decision

Approve with Conditions

Justification

Trust and Old Customer

Submit Override

New Application

Insurance Underwriting AI PoC

Automated risk assessment and policy recommendation system

Underwriting Decision

APPROVED WITH CONDITIONS

OVERRIDDEN BY UNDERWRITER

Confidence | Risk Factors | SHAP Explanation | Override

Confidence Levels

Approve 40.0%

Approve with Conditions 85.0%

Decline 50.0%

New Application

Thank You !