Heart Disease Risk Assessment - User Guide

For Healthcare Professionals

Getting Started

Access the application at: **https://heartdisease.duminduthushan.com**

The system provides two main functions:

- Single patient risk assessment
- Batch processing for multiple patients

Single Patient Assessment

Required Clinical Parameters

Parameter	Description	Valid Range	Unit
Age	Patient age	18-120	years
Sex	Biological sex	Male/Female	-
Chest Pain Type	Clinical classification	Typical Angina, Atypical Angina, Non-anginal Pain, Asymptomatic	-
Resting Blood Pressure	Systolic pressure at rest	80-250	mm Hg
Serum Cholesterol	Total cholesterol level	100-600	mg/dl
Fasting Blood Sugar	Blood glucose after fasting	≤120 mg/dl, >120 mg/dl	-
Resting ECG	Electrocardiogram at rest	Normal, ST-T abnormality, LVH	-
Max Heart Rate	Peak heart rate during exercise	60-220	bpm
Exercise Angina	Chest pain during exercise	Yes/No	-
ST Depression	Exercise-induced ST depression	0.0-10.0	mm
ST Slope	Peak exercise ST segment slope	Upsloping, Flat, Downsloping	-
Major Vessels	Vessels colored by fluoroscopy	0-4	count
Thalassemia	Thalassemia test result	Normal, Fixed Defect, Reversible Defect	-

Input Process

1. Navigate to the Risk Calculator page
2. Fill in all required clinical parameters
3. Ensure values are within acceptable medical ranges
4. Click "Analyze Risk" to generate assessment

Interpreting Results

Risk Categories

- **Low Risk (<30%)** - Green indicator
  - Low probability of coronary artery disease
  - Continue preventive care and annual screening
  - Lifestyle counseling for modifiable risk factors
- **Medium Risk (30-70%)** - Yellow indicator
  - Moderate probability requiring intervention
  - Enhanced monitoring and lifestyle modification
  - Consider stress testing or imaging studies
  - Semi-annual cardiovascular assessment
- **High Risk (>70%)** - Red indicator
  - High probability of significant coronary disease
  - Immediate cardiology consultation recommended
  - Comprehensive cardiac evaluation indicated
  - Urgent risk factor modification

Additional Metrics

- **Risk Percentage**: Precise probability score (0-100%)
- **Model Confidence**: Algorithm certainty level (typically >80%)
- **Key Risk Factors**: SHAP-based feature importance analysis
- **Medical Interpretations**: Clinical context for risk factors

Personalized Recommendations

The system generates specific recommendations based on:

- Individual risk factor profile

- Age and demographic considerations
- Modifiable vs non-modifiable risk factors
- Clinical guidelines and best practices

Batch Processing

CSV Format Requirements

Use the provided template for correct formatting:

- Maximum 100 patients per batch
- All columns must be present with exact header names
- Numeric values must be within clinical ranges
- Missing values will be flagged during validation

Processing Steps

1. Navigate to Batch Processing page
2. Download the CSV template
3. Fill patient data following the format exactly
4. Upload completed file
5. Review validation results and address any errors
6. Process the batch and download detailed results

Batch Results Include

- Individual risk assessments for all patients
- Population-level statistics and risk distribution
- High-risk patient identification for prioritization
- Comprehensive export file with all data and predictions

Quality Assurance and Validation

Model Performance

- Training dataset: UCI Heart Disease (303 patients)
- Cross-validation accuracy: 81.39% ± 5.95%
- Independent test accuracy: 86.89%
- AUC-ROC: 95.35% (excellent discrimination)

- Calibration: Well-calibrated probability estimates

Clinical Validation

- Model trained on established cardiovascular risk factors
- Feature engineering based on cardiology guidelines
- Risk thresholds aligned with clinical practice
- Regular performance monitoring and updates

Integration with Clinical Workflow

Primary Care Settings

- Use for routine cardiovascular screening
- Supplement clinical judgment, not replace it
- Document risk scores in patient records
- Use for patient education and counseling

Specialist Referrals

- High-risk patients require cardiology consultation
- Include risk assessment in referral documentation
- Medium-risk patients may benefit from subspecialty input
- Use for care coordination and planning

Population Health

- Identify high-risk patient cohorts
- Target interventions and resources
- Monitor risk factor trends over time
- Support quality improvement initiatives

Important Medical Disclaimers

Clinical Decision Support Only

This tool provides clinical decision support and should not replace professional medical judgment. All risk assessments should be interpreted within the broader clinical context.

Limitations

- Model trained on specific demographic populations
- Performance may vary in different ethnic groups
- Requires validation in your specific patient population
- Should be used alongside established clinical guidelines

Regulatory Considerations

- Not FDA-approved as a medical device
- Intended for healthcare professional use only
- Results should be documented appropriately
- Follow institutional policies for AI tool usage

Technical Support

System Requirements

- Modern web browser with JavaScript enabled
- Stable internet connection for real-time processing
- No software installation required

Troubleshooting

- If predictions fail, check input parameter ranges
- For batch processing errors, verify CSV format
- Contact support for technical assistance
- Check system status at the health endpoint

Data Privacy

- No patient data is stored permanently
- All communications encrypted with SSL/TLS
- HIPAA-aware processing practices
- Local processing ensures data privacy

Getting Help

For technical issues or clinical questions:

- Check the API documentation for integration details
- Review validation error messages carefully

- Ensure all parameters are within specified ranges
- Contact development team for system enhancements