Exp No: 8 Date:	Mini Project: Framework based Examination of Road Accidents using KDD

Aim

To design and implement a **KDD-based analytical framework** for examining road accident data in order to extract **predictive and actionable insights** that can help improve **road safety** by identifying accident-prone areas, influential factors (like time, weather, and location), and high-risk groups.

Algorithm / Methodology

Step 1: Data Selection

- Collect datasets from multiple reliable sources such as government accident records, open data portals, and traffic sensor data.
- Choose relevant attributes such as date, time, location, weather, vehicle type, and severity.

Step 2: Data Preprocessing

- Handle missing or incomplete data (e.g., replace with mean/mode or remove noisy entries).
- Normalize and clean the dataset to ensure consistency.
- Remove duplicate and irrelevant records.

Step 3: Data Transformation

- Convert raw data into structured form suitable for mining.
- Aggregate and engineer new features (e.g., accident frequency per location, severity index).
- Encode categorical data (e.g., weather = sunny, rainy, foggy).

Step 4: Data Mining

- Apply **Clustering** (e.g., K-Means) to group similar accident patterns.
- Use **Association Rule Mining** (e.g., Apriori algorithm) to find relationships like "If rainy + nighttime → high severity."
- Apply **Classification** (e.g., Decision Tree, Random Forest) to predict accident severity.

Step 5: Pattern Evaluation

- Evaluate mined patterns for relevance, accuracy, and usefulness.
- Rank insights based on confidence and support values (for association rules) or accuracy (for classification).

Step 6: Knowledge Presentation

- Visualize results using dashboards, bar charts, heatmaps, or maps.
- Present actionable findings for policymakers — e.g., hotspot zones, risky time periods, or weather impacts.

CODE:

```
<!DOCTYPE html>

<html lang="en">

<head>

   <meta charset="UTF-8">

   <meta name="viewport" content="width=device-width, initial-scale=1.0">

   <title>AccidentInsight - Road Safety Analytics</title>

   <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/6.4.0/css/all.min.css">

   <script src="https://cdn.jsdelivr.net/npm/chart.js"></script>

   <style>

      * {
```

```
    margin: 0;
    padding: 0;
    box-sizing: border-box;
    font-family: 'Segoe UI', Tahoma, Geneva, Verdana, sans-serif;
}

:root {
    --primary: #2c3e50;
    --primary-light: #34495e;
    --primary-dark: #1a252f;
    --secondary: #e74c3c;
    --accent: #3498db;
    --light: #ecf0f1;
    --dark: #2c3e50;
    --gray: #7f8c8d;
    --white: #ffffff;
    --success: #27ae60;
    --warning: #f39c12;
    --shadow: 0 4px 6px rgba(0, 0, 0, 0.1);
    --transition: all 0.3s ease;
}

body {
```

```
    background: linear-gradient(135deg, #667eea 0%, #764ba2 100%);
    min-height: 100vh;
    display: flex;
    justify-content: center;
    align-items: center;
    padding: 20px;
}

.container {
    width: 100%;
    max-width: 1400px;
    background-color: var(--white);
    border-radius: 15px;
    box-shadow: var(--shadow);
    overflow: hidden;
    transition: var(--transition);
}

.page {
    display: none;
    padding: 30px;
    animation: fadeIn 0.5s ease;
}
```

```
.active {
    display: block;
}

@keyframes fadeIn {
    from { opacity: 0; transform: translateY(10px); }
    to { opacity: 1; transform: translateY(0); }
}

/* Login Page Styles */
.login-container {
    display: flex;
    height: 600px;
}

.login-left {
    flex: 1;
    background: linear-gradient(135deg, var(--primary), var(--primary-dark));
    color: var(--white);
    padding: 50px;
    display: flex;
    flex-direction: column;
```

```
    justify-content: center;
}

.login-left h1 {
    font-size: 36px;
    margin-bottom: 20px;
}

.login-left p {
    font-size: 18px;
    line-height: 1.6;
    margin-bottom: 30px;
}

.kdd-steps {
    margin-top: 30px;
}

.kdd-step {
    display: flex;
    align-items: center;
    margin-bottom: 15px;
}
```

```
.step-number {
    width: 30px;
    height: 30px;
    background-color: var(--accent);
    border-radius: 50%;
    display: flex;
    align-items: center;
    justify-content: center;
    margin-right: 15px;
    font-weight: bold;
}

.login-right {
    flex: 1;
    display: flex;
    justify-content: center;
    align-items: center;
    padding: 40px;
}

.login-form {
    width: 100%;
```

```
.form-group label {
    display: block;
    margin-bottom: 8px;
    color: var(--dark);
    font-weight: 500;
}

.form-control {
    width: 100%;
    padding: 12px 15px;
    border: 1px solid #ddd;
    border-radius: 5px;
    font-size: 16px;
    transition: var(--transition);
}

.form-control:focus {
    border-color: var(--primary);
    outline: none;
    box-shadow: 0 0 0 2px rgba(44, 62, 80, 0.2);
}
```

```
.btn {
    display: inline-block;
    padding: 12px 25px;
    background-color: var(--primary);
    color: var(--white);
    border: none;
    border-radius: 5px;
    font-size: 16px;
    font-weight: 600;
    cursor: pointer;
    transition: var(--transition);
    text-align: center;
}

.btn:hover {
    background-color: var(--primary-dark);
    transform: translateY(-2px);
}

.btn-block {
    display: block;
    width: 100%;
}
```

```
    color: var(--primary);
    text-decoration: none;
    font-weight: 500;
}

/* Dashboard Styles */
.dashboard-header {
    display: flex;
    justify-content: space-between;
    align-items: center;
    margin-bottom: 30px;
    padding-bottom: 15px;
    border-bottom: 1px solid #eee;
}

.dashboard-header h1 {
    color: var(--primary-dark);
}

.user-info {
    display: flex;
    align-items: center;
```

```
}

.user-info i {
    font-size: 24px;
    color: var(--primary);
    margin-right: 10px;
}

.stats-container {
    display: grid;
    grid-template-columns: repeat(auto-fit, minmax(250px, 1fr));
    gap: 20px;
    margin-bottom: 30px;
}

.stat-card {
    background-color: var(--white);
    padding: 25px;
    border-radius: 10px;
    box-shadow: var(--shadow);
    transition: var(--transition);
    border-left: 5px solid var(--accent);
}
```

```
.analysis-tab.active {
    color: var(--primary);
    border-bottom: 3px solid var(--primary);
}

.analysis-content {
    display: none;
}

.analysis-content.active {
    display: block;
}

.data-upload {
    background-color: var(--light);
    padding: 30px;
    border-radius: 10px;
    margin-bottom: 30px;
}

.upload-area {
```

```
.kdd-process {
    background-color: var(--white);
    border-radius: 10px;
    padding: 25px;
    box-shadow: var(--shadow);
    margin-bottom: 30px;
}

.process-steps {
    display: flex;
    justify-content: space-between;
    margin-top: 20px;
    position: relative;
}

.process-steps::before {
    content: '';
    position: absolute;
    top: 30px;
    left: 0;
    right: 0;
    height: 2px;
```

```
    background-color: #E0E0E0;
    z-index: 1;
}

.process-step {
    text-align: center;
    position: relative;
    z-index: 2;
    flex: 1;
}

.step-icon {
    width: 60px;
    height: 60px;
    background-color: var(--primary);
    border-radius: 50%;
    display: flex;
    align-items: center;
    justify-content: center;
    margin: 0 auto 15px;
    color: var(--white);
    font-size: 24px;
}
```

```
.process-step.active .step-icon {
    background-color: var(--accent);
}

.process-step.completed .step-icon {
    background-color: var(--success);
}

.step-title {
    font-weight: 600;
    margin-bottom: 5px;
}

.step-desc {
    font-size: 12px;
    color: var(--gray);
}

.results-container {
    display: grid;
    grid-template-columns: 2fr 1fr;
    gap: 20px;
```

```
}

@media (max-width: 992px) {
    .results-container {
        grid-template-columns: 1fr;
    }
}

.insights-panel {
    background-color: var(--white);
    border-radius: 10px;
    padding: 25px;
    box-shadow: var(--shadow);
}

.insights-panel h2 {
    color: var(--primary-dark);
    margin-bottom: 20px;
}

.insight-item {
    padding: 15px;
    border-left: 4px solid var(--accent);
```

```
.factor-item:last-child {
    border-bottom: none;
}

.factor-name {
    font-weight: 500;
}

.factor-impact {
    color: var(--secondary);
    font-weight: 600;
}

/* Reports Page Styles */
.filters-panel {
    background-color: var(--white);
    border-radius: 10px;
    padding: 20px;
    box-shadow: var(--shadow);
    margin-bottom: 30px;
}
```

```
@media (max-width: 768px) {
    .login-container {
        flex-direction: column;
        height: auto;
    }

    .dashboard-header {
        flex-direction: column;
        align-items: flex-start;
    }

    .user-info {
        margin-top: 15px;
    }

    .navigation {
        flex-direction: column;
        gap: 10px;
    }

    .btn {
        width: 100%;
    }
```

```
            .process-steps {
                flex-direction: column;
                gap: 20px;
            }

            .process-steps::before {
                display: none;
            }
        }
    </style>
</head>
<body>
    <div class="container">
        <!-- Login Page -->
        <div id="login-page" class="page active">
            <div class="login-container">
                <div class="login-left">
                    <h1>AccidentInsight Analytics</h1>
                    <p>Leveraging the KDD methodology to extract meaningful insights from accident data, aiming to make our roads safer and our analysis more predictive.</p>

                    <div class="kdd-steps">
```

```
        <div class="kdd-step">
            <div class="step-number">1</div>
            <div>Data Selection & Integration</div>
        </div>
        <div class="kdd-step">
            <div class="step-number">2</div>
            <div>Data Preprocessing & Cleaning</div>
        </div>
        <div class="kdd-step">
            <div class="step-number">3</div>
            <div>Data Transformation</div>
        </div>
        <div class="kdd-step">
            <div class="step-number">4</div>
            <div>Data Mining</div>
        </div>
        <div class="kdd-step">
            <div class="step-number">5</div>
            <div>Pattern Evaluation</div>
        </div>
    </div>
</div>
<div class="login-right">
```

```
            <div class="login-form">
                <div class="logo">
                    <i class="fas fa-car-crash"></i>
                    <h1>AccidentInsight</h1>
                </div>
                <div class="form-group">
                    <label for="username">Username</label>
                    <input type="text" id="username" class="form-control" placeholder="Enter your username">
                </div>
                <div class="form-group">
                    <label for="password">Password</label>
                    <input type="password" id="password" class="form-control" placeholder="Enter your password">
                </div>
                <button id="login-btn" class="btn btn-block">Login</button>
                <div class="signup-link">
                    Don't have an account? <a href="#">Request access</a>
                </div>
            </div>
        </div>
    </div>
```

```
<!-- Dashboard Page -->
<div id="dashboard-page" class="page">
    <div class="chart-card">
        <h2>Monthly Accident Trends</h2>
        <div class="chart-placeholder">
            <canvas id="monthlyTrendsChart"></canvas>
        </div>
    </div>
    <div class="chart-card">
        <h2>Contributing Factors</h2>
        <div class="chart-placeholder">
            <canvas id="factorsChart"></canvas>
        </div>
    </div>
</div>

<div class="navigation">
    <button id="logout-btn" class="btn">
        <i class="fas fa-sign-out-alt"></i> Logout
    </button>
    <button id="to-analysis-btn" class="btn btn-accent">
        KDD Analysis <i class="fas fa-arrow-right"></i>
    </button>
```

```
            <i class="fas fa-database"></i>
        </div>
        <div class="step-title">Data Selection</div>
        <div class="step-desc">Identify relevant data sources</div>
    </div>
    <div class="process-step completed">
        <div class="step-icon">
            <i class="fas fa-broom"></i>
        </div>
        <div class="step-title">Preprocessing</div>
        <div class="step-desc">Clean and prepare data</div>
    </div>
    <div class="process-step active">
        <div class="step-icon">
            <i class="fas fa-exchange-alt"></i>
        </div>
        <div class="step-title">Transformation</div>
        <div class="step-desc">Transform to suitable format</div>
    </div>
    <div class="process-step">
        <div class="step-icon">
            <i class="fas fa-digging"></i>
        </div>
```

```
            <div class="step-title">Data Mining</div>
            <div class="step-desc">Extract patterns</div>
        </div>
        <div class="process-step">
            <div class="step-icon">
                <i class="fas fa-chart-bar"></i>
            </div>
            <div class="step-title">Evaluation</div>
            <div class="step-desc">Interpret and evaluate</div>
        </div>
    </div>
</div>

<div class="chart-card">
    <h2>Data Quality Metrics</h2>
    <div class="chart-placeholder">
        <canvas id="qualityChart"></canvas>
        </div>
        <div class="factor-item">
            <span class="factor-name">Time of Day</span>
            <span class="factor-impact">Medium</span>
        </div>
        <div class="factor-item">
```

```
                    <span class="factor-name">Vehicle Condition</span>
                    <span class="factor-impact">Low</span>
                </div>
            </div>
        </div>

        <div class="chart-card" style="margin-top: 20px;">
            <h2>Accident Hotspots</h2>
            <div class="chart-placeholder">
                <div style="padding: 20px; text-align: center;">
                    <i class="fas fa-map-marked-alt" style="font-size: 50px; color: #7f8c8d; margin-bottom: 15px;"></i>
                    <p>Interactive map showing accident hotspots based on KDD analysis</p>
                </div>
            </div>
        </div>
    </div>

    <div class="navigation">
        <button id="to-dashboard-btn" class="btn">
            <i class="fas fa-arrow-left"></i> Back to Dashboard
        </button>
        <button id="to-reports-btn" class="btn btn-accent">
```

```
            <option>Prevention Strategies</option>
        </select>
    </div>
    <div class="form-group">
        <label for="date-generated">Date Generated</label>
        <select id="date-generated" class="form-control">
            <option>Any Date</option>
            <option>Last 7 days</option>
            <option>Last 30 days</option>
            <option>Last 6 months</option>
        </select>
    </div>
    <div class="form-group">
        <label for="report-status">Status</label>
        <select id="report-status" class="form-control">
            <option>All Status</option>
            <option>Completed</option>
            <option>In Progress</option>
            <option>Scheduled</option>
        </select>
    </div>
</div>
```

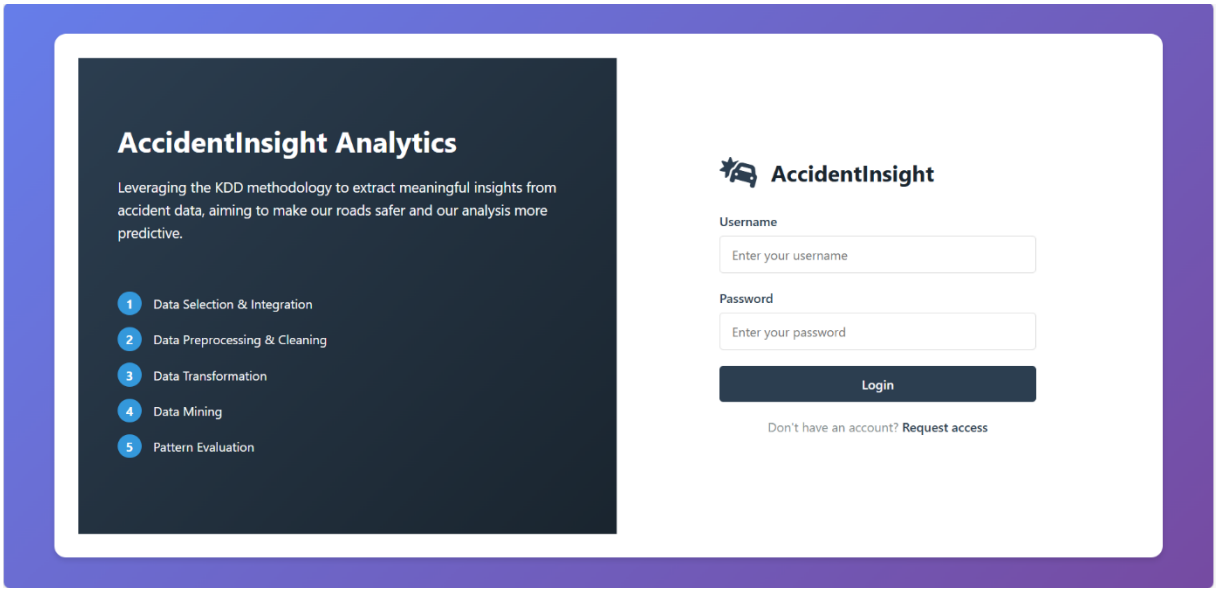
```
                </button>
                <div class="report-meta">
                    <span>Generated: 1 month ago</span>
                    <span>PDF, 2.7 MB</span>
                </div>
            </div>
            <div class="report-card">
                <h3>Pedestrian Safety Report</h3>
                <p>Focused analysis on accidents involving pedestrians with recommendations for infrastructure improvements.</p>
                <button class="btn btn-accent" style="padding: 8px 15px;">
                    <i class="fas fa-download"></i> Download
                </button>
                <div class="report-meta">
                    <span>Generated: 1 month ago</span>
                    <span>PDF, 2.2 MB</span>
                </div>
            </div>
            <div class="report-card">
                <h3>Prevention Strategy Evaluation</h3>
                <p>Assessment of implemented safety measures and their effectiveness in reducing accident rates.</p>
                <button class="btn btn-accent" style="padding: 8px 15px;">
                    <i class="fas fa-download"></i> Download
```

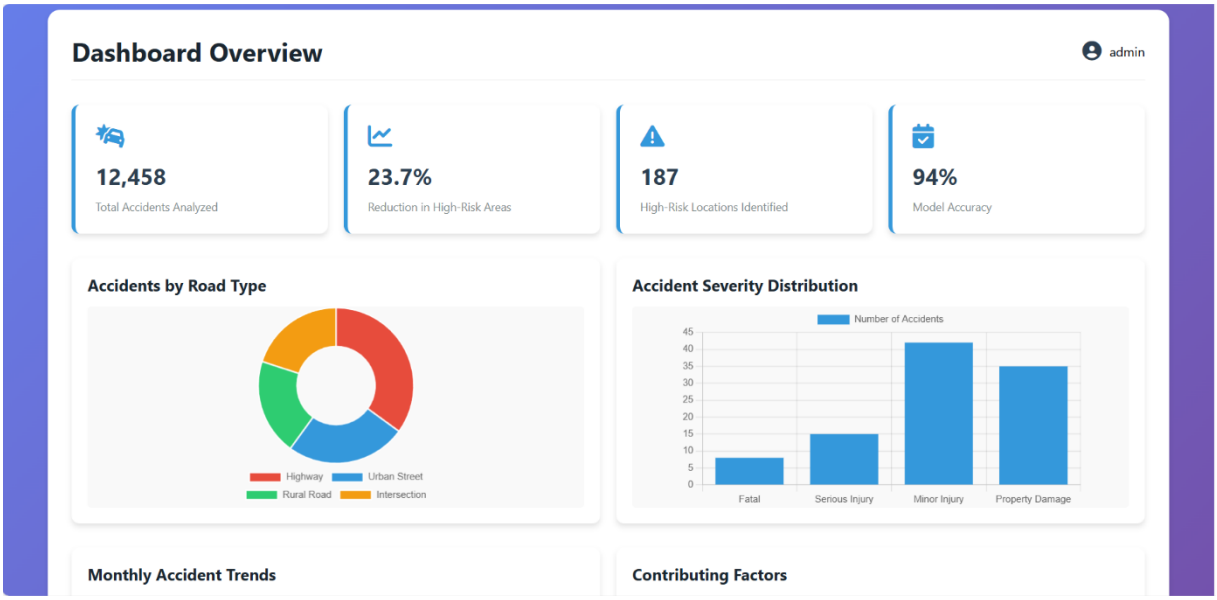
```
        const analysisPage = document.getElementById('analysis-page');
        const reportsPage = document.getElementById('reports-page');

        const loginBtn = document.getElementById('login-btn');
        const logoutBtn = document.getElementById('logout-btn');
        const toAnalysisBtn = document.getElementById('to-analysis-btn');
        const toDashboardBtn = document.getElementById('to-dashboard-btn');
        const toReportsBtn = document.getElementById('to-reports-btn');
        const toAnalysisFromReportsBtn = document.getElementById('to-analysis-from-
reports');

        const usernameInput = document.getElementById('username');
        const userDisplay = document.getElementById('user-display');

        const analysisTabs = document.querySelectorAll('.analysis-tab');
        const analysisContents = document.querySelectorAll('.analysis-content');

        const fileInput = document.getElementById('file-input');
        const uploadArea = document.getElementById('upload-area');

        // Event Listeners
        loginBtn.addEventListener('click', login);
        logoutBtn.addEventListener('click', logout);
```

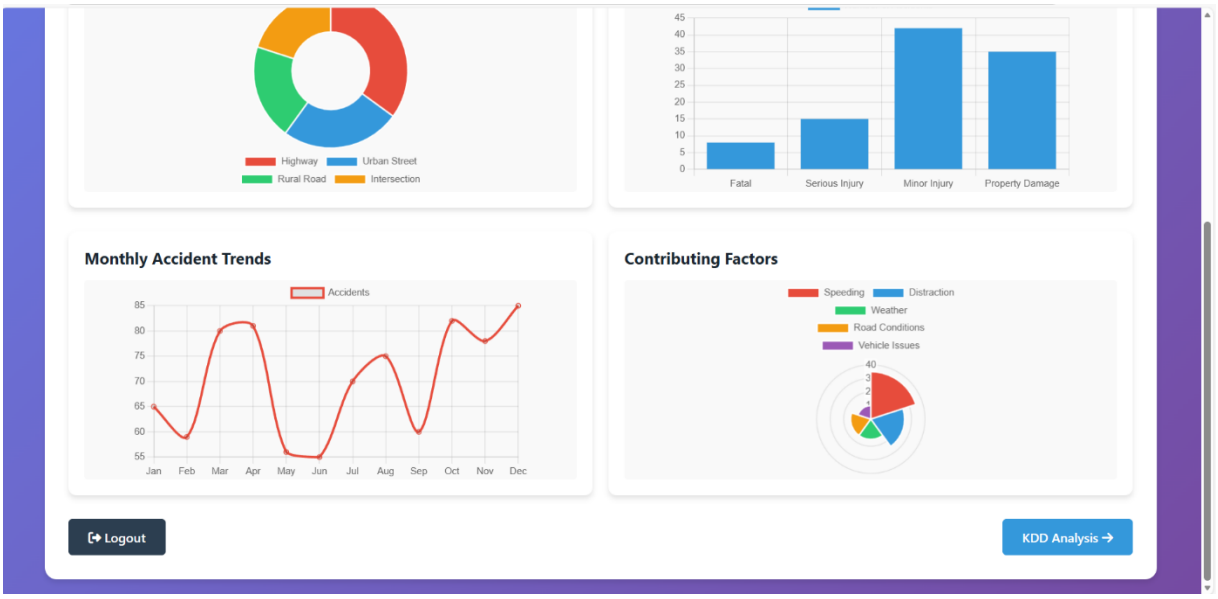
```
toAnalysisBtn.addEventListener('click', () => showPage(analysisPage));
toDashboardBtn.addEventListener('click', () => showPage(dashboardPage));
toReportsBtn.addEventListener('click', () => showPage(reportsPage));
toAnalysisFromReportsBtn.addEventListener('click', () => showPage(analysisPage));

analysisTabs.forEach(tab => {
    tab.addEventListener('click', () => {
        const tabId = tab.getAttribute('data-tab');

        // Update active tab
        analysisTabs.forEach(t => t.classList.remove('active'));
        tab.classList.add('active');

        // Show corresponding content
        analysisContents.forEach(content => {
            content.classList.remove('active');
            if (content.id === tabId) {
                content.classList.add('active');
            }
        });
    });
});
```

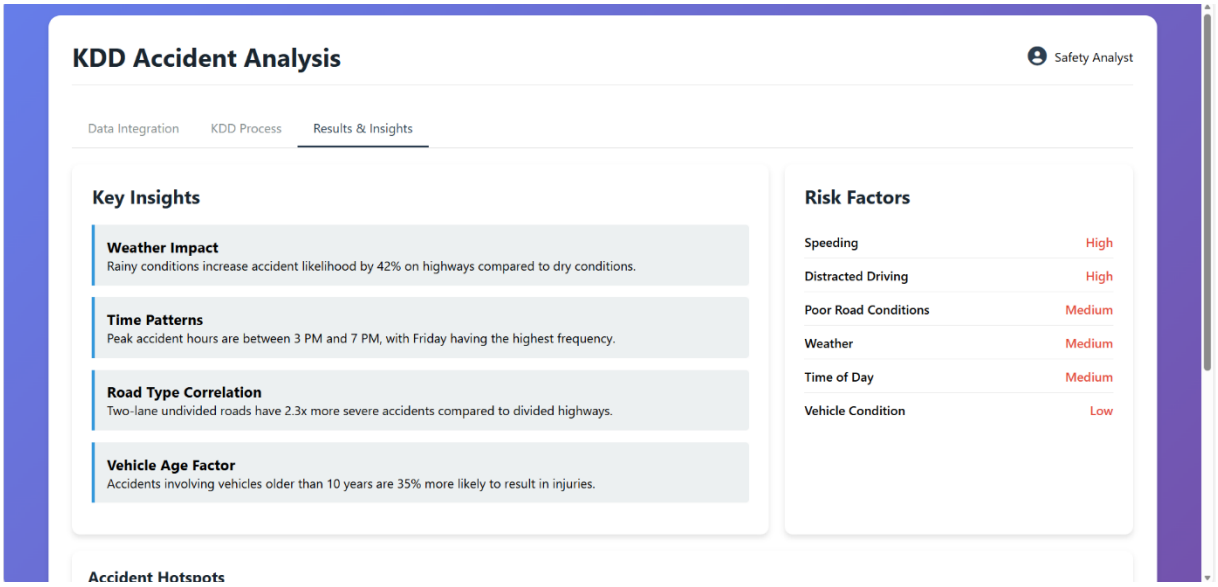
```
    data: {
        labels: ['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug', 'Sep', 'Oct', 'Nov', 'Dec'],
        datasets: [{
            label: 'Accidents',
            data: [65, 59, 80, 81, 56, 55, 70, 75, 60, 82, 78, 85],
            borderColor: '#e74c3c',
            tension: 0.3,
            fill: false
        }]
    },
    options: {
        responsive: true
    }
});

// Factors Chart
const factorsCtx = document.getElementById('factorsChart').getContext('2d');
new Chart(factorsCtx, {
    type: 'polarArea',
    data: {
        labels: ['Speeding', 'Distraction', 'Weather', 'Road Conditions', 'Vehicle Issues'],
        datasets: [{
```

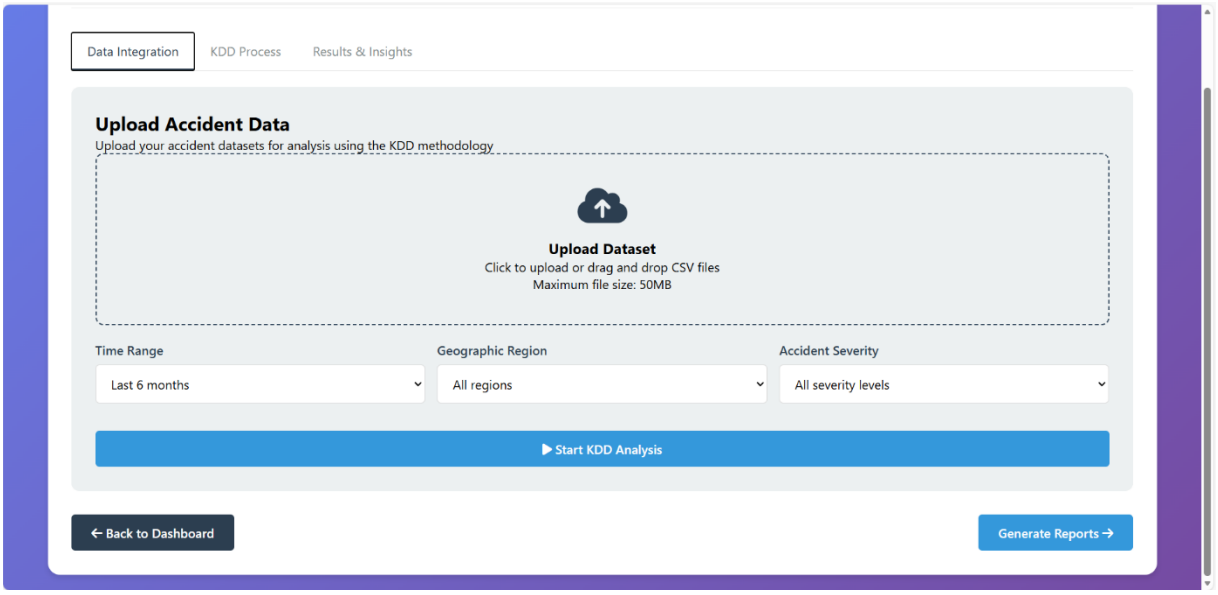
```
                data: [85, 78, 92, 80, 88],
                backgroundColor: 'rgba(52, 152, 219, 0.2)',
                borderColor: '#3498db',
                pointBackgroundColor: '#3498db'
            }]
        },
        options: {
            responsive: true,
            scales: {
                r: {
                    angleLines: {
                        display: true
                    },
                    suggestedMin: 0,
                    suggestedMax: 100
                }
            }
        }
    });
}
</script>
</body>
</html>
```

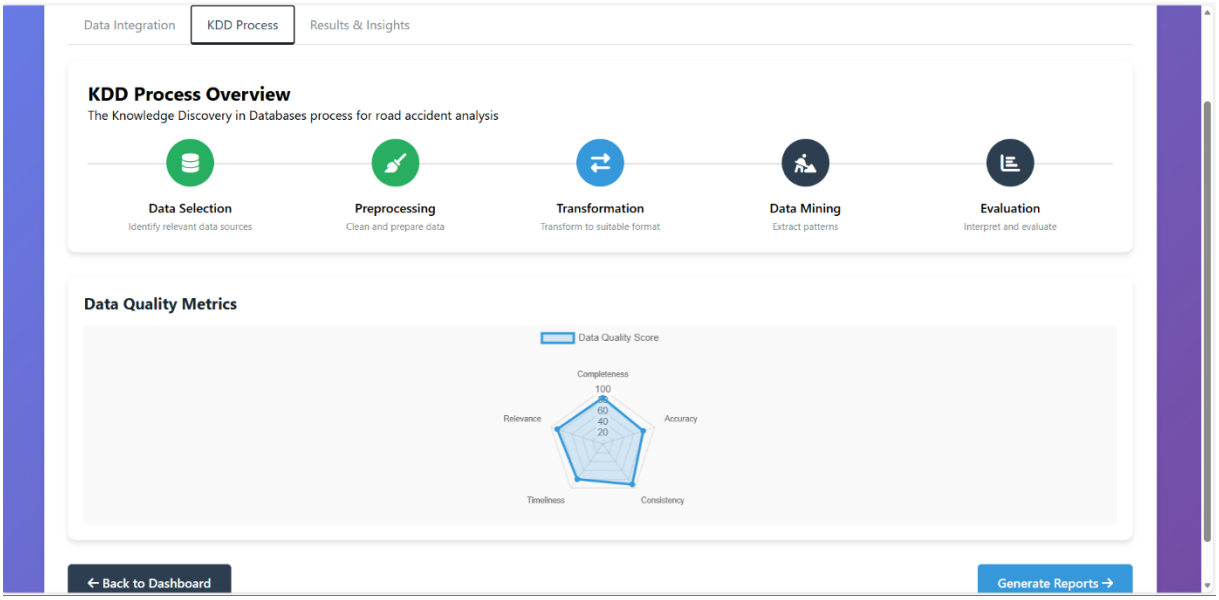

AccidentInsight Analytics
Leveraging the KDD methodology to extract meaningful insights from accident data, aiming to make our roads safer and our analysis more predictive.
1 Data Selection & Integration
2 Data Preprocessing & Cleaning
3 Data Transformation
4 Data Mining
5 Pattern Evaluation
AccidentInsight
Username
Enter your username
Password
Enter your password
Login
Don't have an account? Request access


Dashboard Overview
admin
12,458
Total Accidents Analyzed
23.7%
Reduction in High-Risk Areas
187
High-Risk Locations Identified
94%
Model Accuracy
Accidents by Road Type
Highway
Urban Street
Rural Road
Intersection
Accident Severity Distribution
Number of Accidents
45
40
35
30
25
20
15
10
5
0
Fatal
Serious Injury
Minor Injury
Property Damage
Monthly Accident Trends
Contributing Factors


Highway
Urban Street
Rural Road
Intersection
45
40
35
30
25
20
15
10
5
0
Fatal
Serious Injury
Minor Injury
Property Damage
Monthly Accident Trends
Accidents
85
80
75
70
65
60
55
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Contributing Factors
Speeding
Distraction
Weather
Road Conditions
Vehicle Issues
40
3
2
1
Logout
KDD Analysis →


KDD Accident Analysis
Safety Analyst
Data Integration
KDD Process
Results & Insights
Key Insights
Weather Impact
Rainy conditions increase accident likelihood by 42% on highways compared to dry conditions.
Time Patterns
Peak accident hours are between 3 PM and 7 PM, with Friday having the highest frequency.
Road Type Correlation
Two-lane undivided roads have 2.3x more severe accidents compared to divided highways.
Vehicle Age Factor
Accidents involving vehicles older than 10 years are 35% more likely to result in injuries.
Risk Factors
Speeding High
Distracted Driving High
Poor Road Conditions Medium
Weather Medium
Time of Day Medium
Vehicle Condition Low
Accident Hotspots





Result:

This project analyzes road accident data using a **KDD-based framework** to uncover hidden patterns and predictive insights. It applies **data mining techniques** like clustering, association rule mining, and classification to identify accident hotspots and risk factors. The goal is to enable **data-driven road safety decisions** and preventive strategies for reducing accidents.