Betrayal Risk Prediction System

This report explains the creation and working of a Betrayal Risk Prediction System that helps military leaders spot potential threats from within their own teams. The system looks at different factors that might lead to betrayal, such as money problems, temptations, peer pressure, and mental stress. Its main purpose is to give commanders a clear way to assess the risk levels of their soldiers and make better decisions.

Factors Contributing to Betrayal Risk

1 Financial Stress Index (FSI)

This measurement shows how much financial stress a soldier is under. It looks at things like their debt, family responsibilities, and how secure they feel about their finances. Soldiers with serious money problems might be more likely to betray for financial rewards.

2 Temptation Score (TS)

This score shows how likely a soldier is to be tempted by rewards or benefits that might lead to betrayal. It takes into account things like the soldier's personal values, sense of right and wrong, and how big the reward seems to them.

3 Loyalty History (LD)

A soldier's past actions of loyalty or disloyalty are tracked and analyzed to assess their tendency towards betrayal. This includes incidents of misconduct, disobeying orders, or expressing disagreement. By reviewing these behaviors, the system evaluates the soldier's historical risk.

4 Social Standing Index (SSI)

The soldier's social status within their unit, community, and family is assessed. This includes their influence, respect among peers, and any connections they might have to potential enemies. These social factors help evaluate the risk of betrayal.

System Workflow and Data Collection

1 Data Collection

Data for the betrayal risk prediction system is collected through various means, including:

- Surveys: Detailed questionnaires administered to soldiers to gather information about their personal circumstances, financial status, and attitudes towards their current situation.
- Reviews: Analyzing past performance reviews, disciplinary records, and any documented instances of misconduct or questionable behavior.
- Reports: Gathering intelligence reports, operational data, and other relevant information from various sources, both within and outside the military organization.
- Psychological Tests: Administering standardized psychological assessments to evaluate a soldier's mental state, including stress levels, emotional stability, and susceptibility to influence.

2 Feature Calculation

The collected data is used to calculate scores for the factors mentioned earlier (like FSI, TS, LD, etc.). Each score is determined using special algorithms and weightings designed by the developers. These scores help assess the risk of betrayal. For our project, we will use a Simple Linear model to analyze this data. Details about this model can be found in the following slides.

3 Betrayal Risk Score Calculation

A betrayal risk score (BLS) is generated for each soldier by combining the calculated scores for each factor using a weighted formula. The weight assigned to each factor is based on its perceived importance in predicting betrayal risk.

4 Ranking and Categorization

Soldiers are ranked based on their BLS scores, dividing them into three categories: low, medium, and high risk. This categorization allows commanders to prioritize their attention and focus on those individuals with the highest likelihood of betrayal.

5 Actionable Insights

The system provides commanders with actionable insights based on the individual BLS scores of their soldiers. This includes recommendations for monitoring, mentorship, or additional training programs to mitigate potential risks. It also highlights potential warning signs of potential betrayal and suggests appropriate countermeasures.

Peer Betrayal Influence (PBI)

Peer Pressure

This factor examines the influence of a soldier's peers and social network on their behavior. It considers factors like the loyalty and integrity of their peers, the presence of any negative influences, and the social pressure to conform to group norms. Soldiers exposed to peers who exhibit disloyalty or engage in risky behavior are more likely to follow suit.

Group Dynamics

The system considers the overall dynamics within a soldier's unit, including factors like morale, cohesion, and the presence of any cliques or factions. Units with low morale or high levels of internal conflict are more susceptible to betrayal as individuals may seek support or validation outside their unit.

Chain of Command

The strength and effectiveness of the chain of command is also evaluated. Units with weak or ineffective leadership may be more prone to internal dissent and betrayal. A strong chain of command fosters trust, loyalty, and a sense of purpose, reducing the likelihood of individuals acting against the interests of the unit.

Living Condition Satisfaction (LCS)

Basic Needs

This factor assesses the adequacy of basic living conditions, such as food, water, shelter, and sanitation. Soldiers experiencing substandard living conditions may feel undervalued and resentful, leading to increased susceptibility to offers of better living arrangements or opportunities.

Comfort and Amenities

Beyond basic needs, the system considers the availability of comfortable amenities, recreational facilities, and opportunities for personal leisure. Soldiers experiencing a lack of comfort and relaxation may feel demotivated and more likely to seek distractions or escape from their current situation, potentially through acts of betrayal.

Sense of Community

The level of community and camaraderie within a soldier's living environment is assessed. A sense of belonging and shared purpose can foster loyalty and reduce the likelihood of betrayal. Conversely, soldiers feeling isolated or alienated from their unit may be more susceptible to external influences.

Clan Stability Index (CSI)

Family Influence

This index assesses the stability and influence of a soldier's family or clan. Strong family bonds can foster loyalty and create a sense of obligation, while weak or dysfunctional family structures may increase the likelihood of a soldier turning to external influences for support.

Financial Obligations

The system considers the financial obligations and burdens of a soldier's family. Individuals with significant financial obligations to family members may be more susceptible to offers of financial gain through betrayal.

Social Pressure

The social pressure exerted by a soldier's family or clan is evaluated. Families or clans that promote a culture of loyalty and obedience can help reinforce a soldier's commitment to their duty. However, families that value personal gain or prioritize individual interests above collective goals can increase the risk of betrayal.

Stress and Burnout Index (SBI)

1

Stress Levels

This index measures the level of stress a soldier is experiencing, including factors like combat exposure, operational demands, and personal challenges. Prolonged exposure to high stress levels can lead to mental fatigue, emotional exhaustion, and a decline in cognitive function, increasing the likelihood of impulsive or irrational decisions.

2

Burnout

The system assesses the risk of burnout, a state of emotional, physical, and mental exhaustion caused by prolonged stress and overwork. Individuals experiencing burnout may feel disillusioned, disengaged, and more prone to negative thoughts and behaviors, including betrayal.

3

Mental Health

The overall mental health of a soldier is a crucial factor in predicting betrayal risk. The system considers factors like depression, anxiety, PTSD, and other mental health conditions. Soldiers experiencing mental health challenges may have difficulty making rational decisions and may be more susceptible to offers of relief or escape through betrayal.

Fear Index (FI)

Fear of Failure	Soldiers experiencing fear of failure or fear of disappointing their superiors may be more likely to make rash decisions or engage in risky behavior to avoid perceived negative consequences. This fear can lead to a sense of desperation, increasing the susceptibility to betrayal.
Fear of Punishment	Fear of punishment or retribution for past actions or perceived transgressions can motivate individuals to act against the interests of their unit to avoid further consequences. This fear can lead to a sense of desperation and a willingness to take extreme measures to protect themselves, potentially leading to betrayal.
Fear of Loss	Fear of losing their current position, status, or sense of belonging can motivate individuals to act in ways that they wouldn't normally consider. This fear can lead to a sense of insecurity and a desire to preserve their current circumstances, even at the expense of their loyalty to their unit.

Simple Working Code

```
import numpy as np

import pandas as pd

# Step 1: Define the function to calculate betrayal risk

def calculate_betrayal_risk_row(row, weights):

    features = np.array([row['FSI'], row['TS'], row['LD'], row['SSI'], row['PBI'],

                row['LCS'], row['CSI'], row['SBI'], row['FI']])

    risk_score = np.dot(features, weights)

    return risk_score

# Step 2: Define the classification function

def classify_betrayal_risk(risk_score):

    if risk_score < 0.4:

        return "Low Risk"
```

- Here we have considered Simple Linear relationship for calculating risk score
- We distribute weights from the logical, historical as a fraction out of 1 for each factor.
- In the data collection survey, we will score each index from 0 to 1.0 for each soldier, put these in the given code and calculate risk score for each soldier.
- Store these in Pandas DataFrame
- Now calculate the risk score based upon the data points and then classify them into low risk, moderate risk or high risk as per the threshold values mentioned
- This is the simplest possible way . We can use ML models also to do the same task.
- For that we need to collect a dataset for training from historical evidences.
- Train models like RandomForestClassifier on that data
- Tune its hyperparameters and then use it to predict on our data

After this simple code we have that RandomForest code

```
 elif 0.4 <= risk_score < 0.7:
        return "Moderate Risk"
    else:
        return "High Risk"

# Step 3: Initialise the weights on the basis of logic, historical research etc
weights = [0.2, 0.15, 0.1 , 0.1, 0.1 , 0.05, 0.1 , 0.1 , 0.1]
df = pd.DataFrame(data)

# Step 4: Apply the risk calculation for each row and create a new column for risk score
df['Risk Score'] = df.apply(calculate_betrayal_risk_row, axis=1, weights=weights)

# Step 5: Apply the classification function for each risk score and create a new column for risk category
df['Risk Category'] = df['Risk Score'].apply(classify_betrayal_risk)

# Output the final DataFrame with risk scores and categories
print(df)
```

Using ML Algorithm

```
import numpy as np
import pandas as pd
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report, accuracy_score

data = pd.read_csv("train.csv")
# Step 1: Create a DataFrame
df = pd.DataFrame(data)
# Step 2: Preprocess the data (convert categorical target to numerical labels)
df['Risk Category'] = df['Risk Category'].map({'Low Risk': 0, 'Moderate Risk': 1, 'High Risk': 2})
# Step 3: Split the data into features (X) and target (y)
X = df.drop('Risk Category' , axis=1)  # Features
y = df['Risk Category']  # Target
# Step 4: Split data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42)
# Step 5: Train a RandomForestClassifier model and tune the hyperparameter to improve accuracy
clf = RandomForestClassifier(n_estimators=150,max_depth=6,min_samples_split=5,min_samples_leaf=2, random_state=42)
clf.fit(X_train, y_train)
# Step 6: Make predictions on the test set
y_pred = clf.predict(X_test)
# Step 7: Evaluate the model's performance
print("Accuracy:", accuracy_score(y_test, y_pred))
print("\nClassification Report:\n", classification_report(y_test, y_pred, target_names=['Low Risk', 'Moderate Risk', 'High Risk']))
# Step 8: After training till sufficient accuracy lets predict on test data
test_data = pd.read_excel("betryal_pred_test.xlsx")
```

"Adaptive and Scalable Decision-Making System for Evolving Data"

- To make the decision-making system scalable and adaptive, implement incremental learning so the model updates with new data without retraining from scratch.
- Periodically reevaluate features to incorporate new insights and remove irrelevant ones.
- Create feedback loops with human experts to refine predictions based on real-world outcomes.
- Use time-series analysis for dynamic risk assessment and sliding windows to focus on recent data.
- Ensure scalability through distributed algorithms and modular design, allowing independent scaling of components.
- Regularly track model performance and adjust risk thresholds as needed to maintain prediction accuracy over time.