National College of Ireland

Configuration Manual

MSc Research Project
MSc AI for Business

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MSc Project Submission Sheet

School of Computing

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Configuration Manual

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1 System Set up

This project integrates a rule-based CRM prototype built in Airtable with machine learning models developed in Google Colab. The purpose of this manual is to provide all details required to replicate the system.

Airtable: Base for rule-based CRM prototype.

Google Colab: Notebook environment with Python 3 runtime.

Python Libraries:

- `pandas`, `numpy`, `scikit-learn`, `matplotlib`, `seaborn`, `tensorflow`

2 Data Preparation

The dataset includes customer IDs, OCEAN personality trait scores (Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism), and CRM journey labels. Use this code in Google Colab to upload, clean, and prepare the dataset for model training and evaluation.

```
import pandas as pd
import io

# Load dataset
df = pd.read_csv(io.BytesIO(uploaded['UPDATEDCRM.csv']))

# Drop duplicate header row and reset index
df = df.drop(index=0).reset_index(drop=True)

# Rename columns for clarity
df.columns = [
    'Customer_ID', 'Openness', 'Conscientiousness', 'Extraversion',
    'Agreeableness', 'Neuroticism', 'Assigned_Journey',
    'AI_Journey_Formula',          'Match',          'CRM_Record_ID',
'AI_Journey_Encoded'
]

# Remove missing values
df.dropna(inplace=True)
```

Now, the dataset is uploaded, does not have duplicate headers, no missing values and it's reformatted with consistent column names.

3 Airtable Prototype Configuration

The Airtable prototype was designed to simulate customer journey mapping based on personality traits and compare it to traditional CRM systems.

Steps to Configure Airtable

1. Create a new Airtable Base and import the dataset.
2. Add formula fields to assign journeys based on OCEAN scores. Example formula:

```
IF(AND({Extraversion} > 60, {Openness} > 60), "Extrovert CRM Flow",
IF(AND({Extraversion} < 40, {Neuroticism} > 60), "Introvert CRM Flow",
IF({Agreeableness} > 70, "VIP Loyalty Flow",
IF({Neuroticism} > 70, "Low Engagement Nurture Flow",
"Standard CRM Flow"))))
```

3. Create a comparison field to highlight whether AI-generated journeys match traditional assignments or if there is a different customer journey as an account of using the dominant OCEAN Trait:

```
IF({Assigned Journey} = {AI Journey Formula}, "✓ Same", "✗ Different")
```

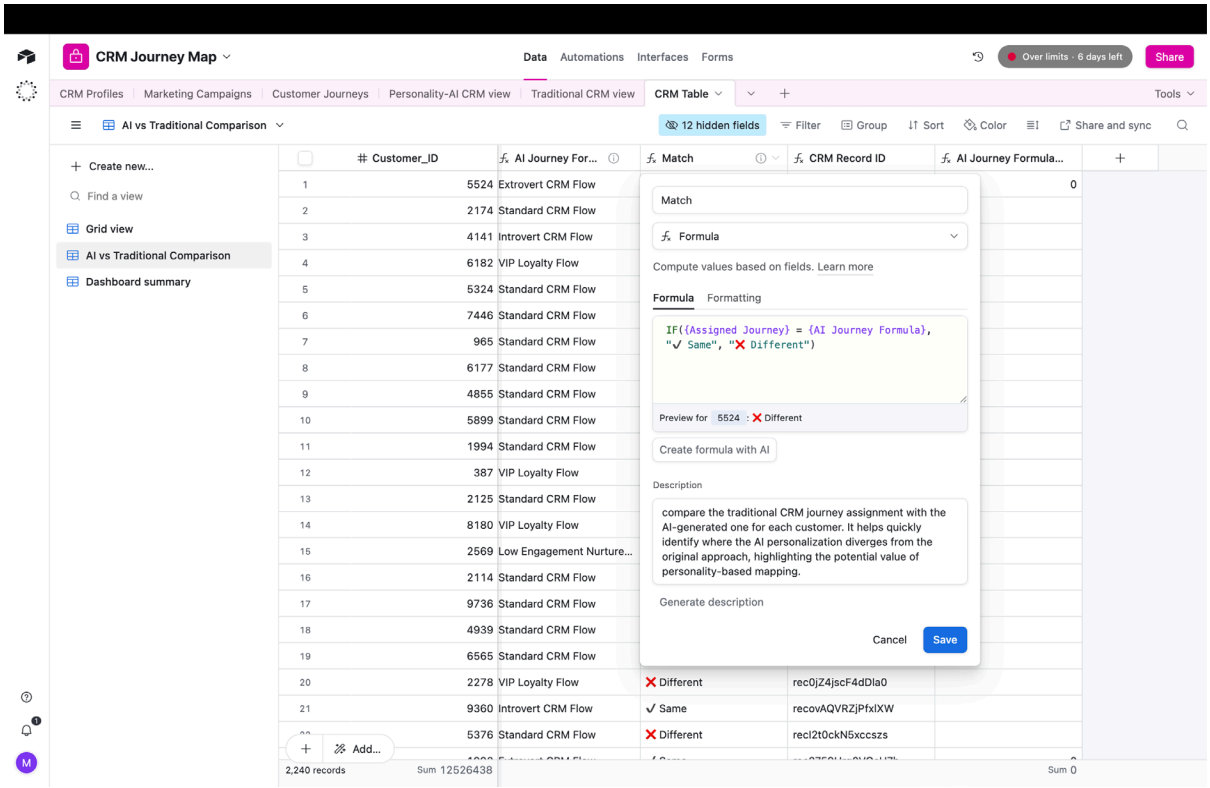

Figure 3. Airtable comparison view of AI vs traditional CRM journeys using the match formula

Build multiple views to analyze and compare customer journeys:

- Traditional CRM View: Displays journeys assigned using the original rule-based approach (loyalty versus standard journey)
- Personality-AI CRM View: Displays assigned journeys through personality-based AI logic
- AI vs Traditional Comparison View: Places both assignments side by side and flags matches or differences

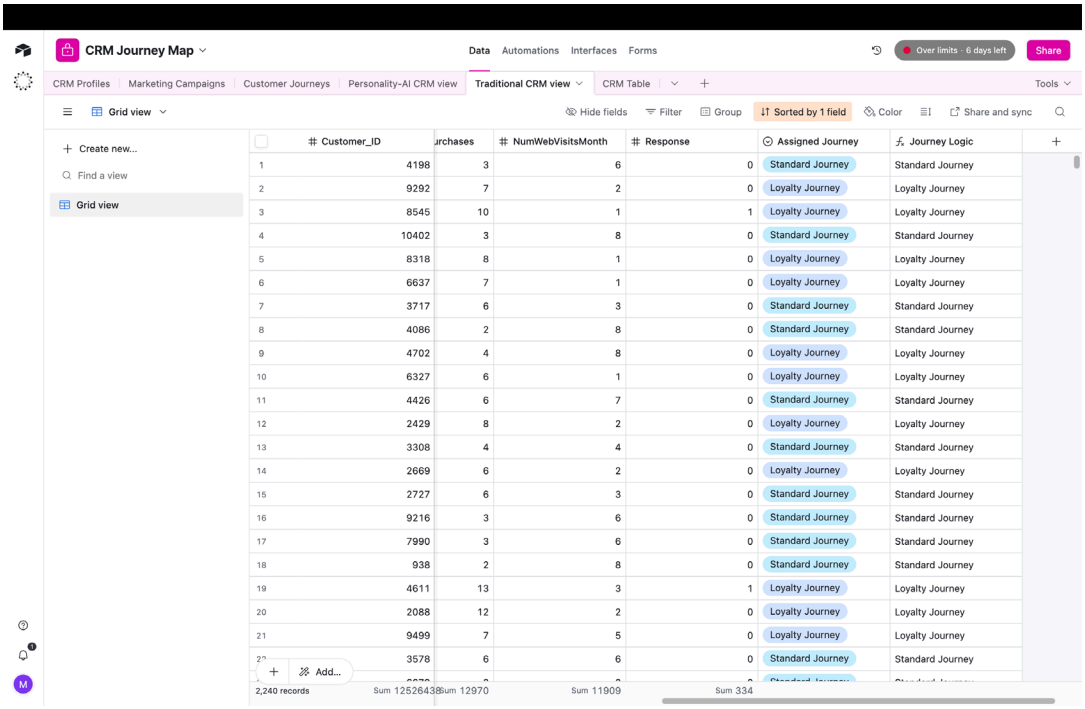

Figure 2. Airtable dataset structure with traditional crm assigned journeys

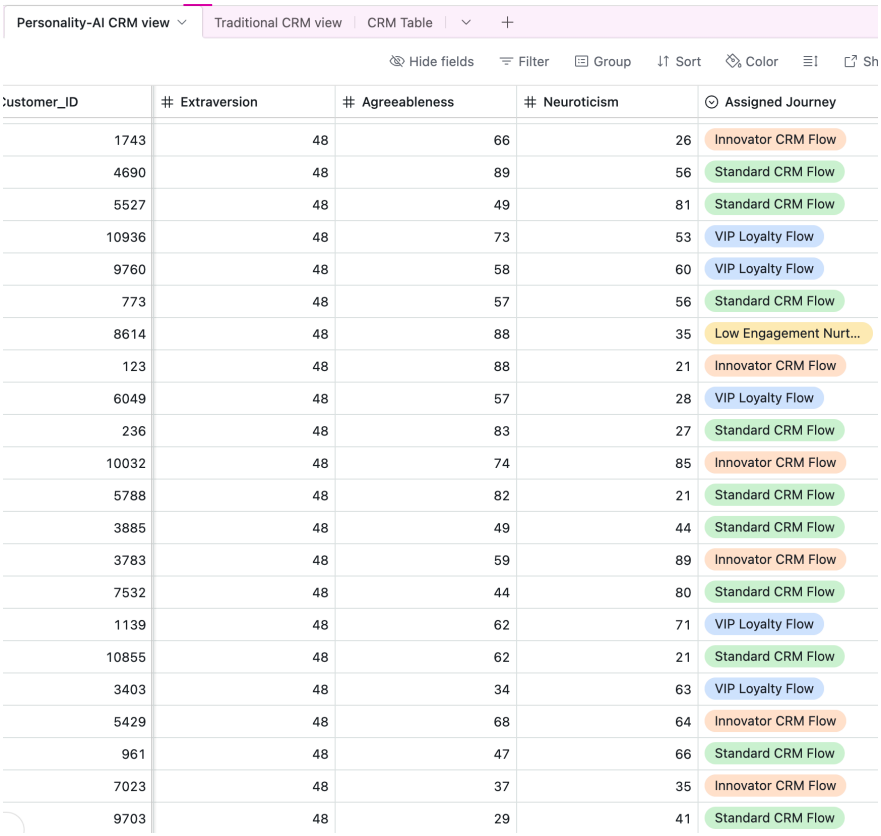

Figure 3. Airtable dataset structure with OCEAN traits and assigned journeys

4 Machine Learning Models in Colab

Two models were implemented in Google Colab to evaluate the effectiveness of AI-driven personalization: a Random Forest Classifier and a Convolutional Neural Network.

Feature Selection and Split

```
X=df[['Openness','Conscientiousness','Extraversion',
'Agreeableness', 'Neuroticism']] y = df['AI_Journey_Encoded']

from sklearn.model_selection import train_test_split
X_train,   X_test,   y_train,   y_test   =   train_test_split(X,   y,
test_size=0.2, random_state=42)
```

This code selects the five OCEAN traits as features, encodes the target journey labels, and splits the dataset into training and test sets for evaluation.

Random Forest Classifier

```
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, classification_report

rf_model = RandomForestClassifier(random_state=42)
rf_model.fit(X_train, y_train)

y_pred = rf_model.predict(X_test)
print("Random Forest Accuracy:", accuracy_score(y_test, y_pred))
print(classification_report(y_test, y_pred))
```

This trains a Random Forest Classifier on the training data and evaluates its accuracy and classification performance on the test set.

Convolutional Neural Network (CNN)

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Dropout
from sklearn.preprocessing import MinMaxScaler
import matplotlib.pyplot as plt

# Normalize features
scaler = MinMaxScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)

# Build CNN model
cnn_model = Sequential([
    Dense(64, activation='relu', input_shape=(X_train.shape[1],)),
    Dropout(0.3),
    Dense(32, activation='relu'),
    Dense(len(y.unique()), activation='softmax')
])

cnn_model.compile(optimizer='adam',
loss='sparse_categorical_crossentropy', metrics=['accuracy'])

# Train model
history   =   cnn_model.fit(X_train_scaled,   y_train,   epochs=30,
validation_split=0.2, verbose=1)

# Evaluate
```

```
test_loss, test_acc = cnn_model.evaluate(X_test_scaled, y_test,
verbose=2)
print("CNN Test Accuracy:", test_acc)

# Plot accuracy graph
plt.plot(history.history['accuracy'], label='Train Accuracy')
plt.plot(history.history['val_accuracy'], label='Validation
Accuracy')
plt.legend()
plt.show()
```

This code trains a Convolutional Neural Network (CNN) to classify customer journeys using OCEAN personality trait scores. It prepares the data through normalization, defines the CNN architecture with hidden layers and dropout for regularization, compiles the model, and runs training for 30 epochs.

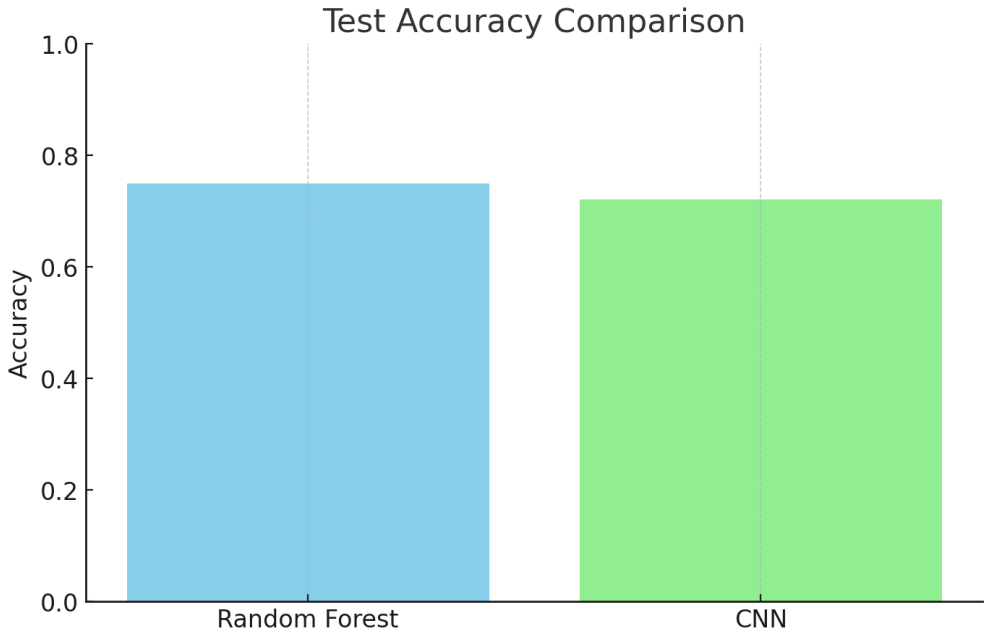

Figure 4: comparison of RF and CNN on its model accuracy

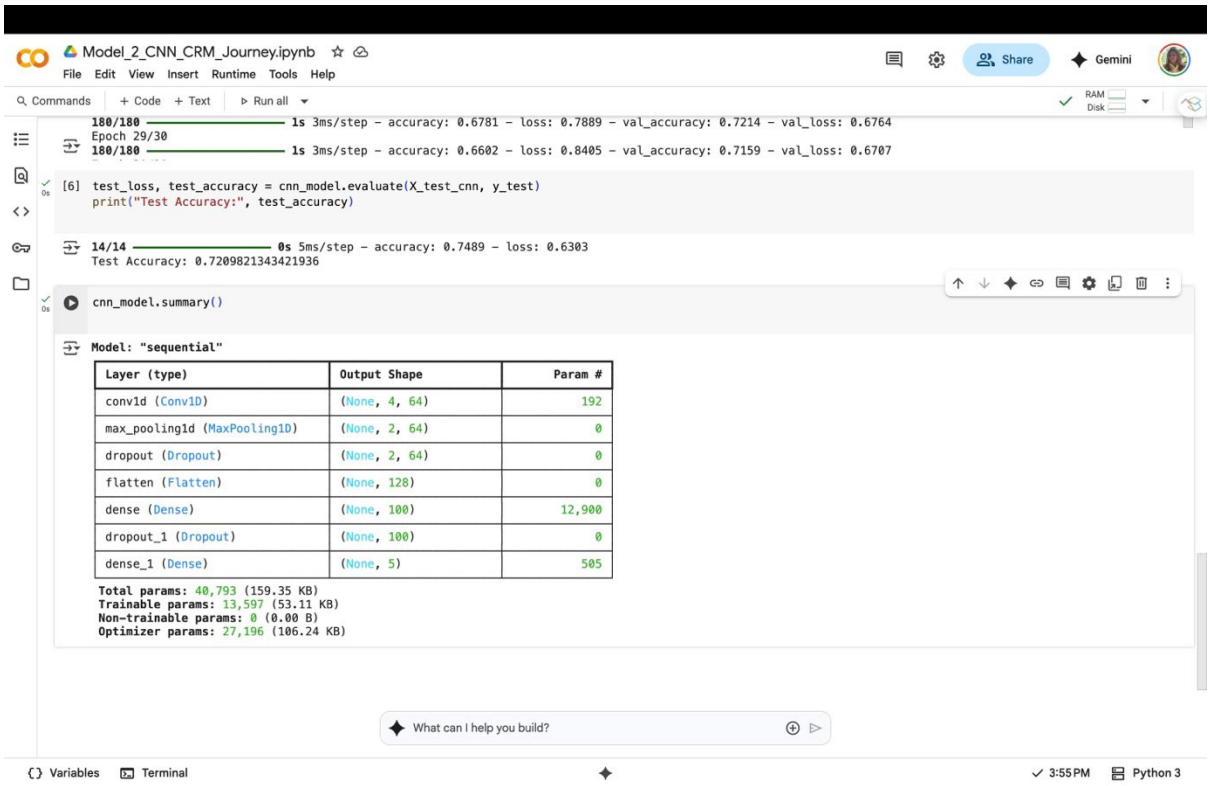

Figure 5: CNN Model Architecture and Test Accuracy

4. Conclusion

This configuration manual provides a guide to replicating the personality-based CRM prototype developed for this research. It outlines the setup of both the Airtable rule-based system and the Google Colab machine learning models, including all required libraries, data preparation steps, and execution instructions