SEABORN

HDSC Winter: Capstone Project

Using Diet Analysis to Predict and Prevent Child Malnutrition

Team Seaborn

Using Diet Analysis to Predict and Prevent Child Malnutrition

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HDSC WINTER: CAPSTONE PROJECT

AGENDA

- Our Team
- Agenda
- Introduction
- Problem Statement
- Existing solution
- Our Approach
- Dataset Description
- Models
- Summary & Recommendation

UNDERSTANDING CHILD MALNUTRITION

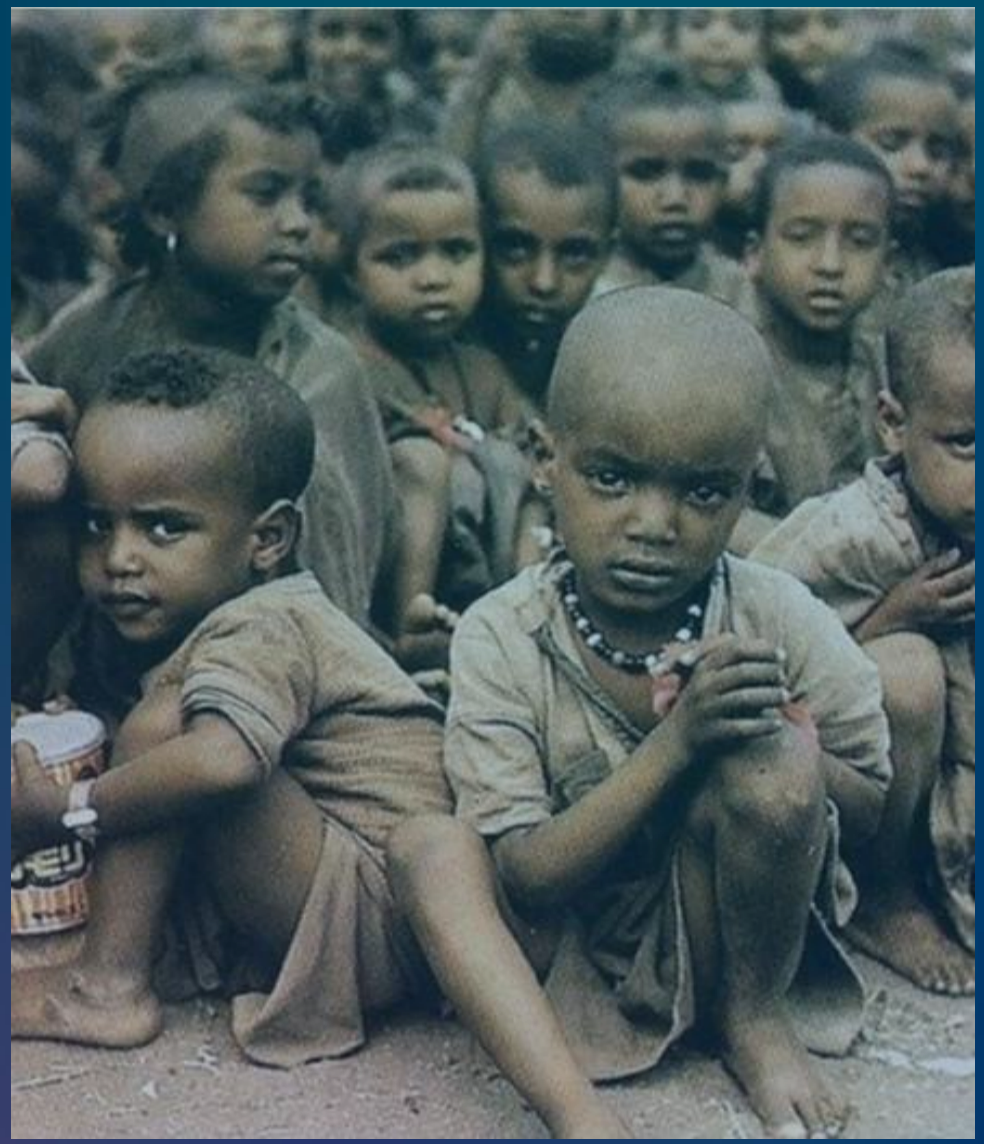
Using Diet Analysis to Predict and Prevent Child malnutrition

Child Malnutrition

- Child malnutrition refers to a condition where a child's body does not get adequate nutrients required for growth and development

Types

- Undernutrition
- Micronutrient deficiencies
- Micronutrient deficiencies



PROBLEM STATEMENT

USING DIET ANALYSIS TO PREDICT AND PREVENT CHILD MALNUTRITION

Diet analysis can be a valuable tool in predicting and preventing child malnutrition.

PREDICT

Accessing dietary intake and Identifying nutritional gaps.

PREVENT

Discus solution to mitigate the problem using diet analysis.

EXISTING SOLUTION

MACHINE LEARNING MODEL

Existing products and solutions such as:

- WFTP's NutriGIS
- NutriPhone

OUR APPROACH

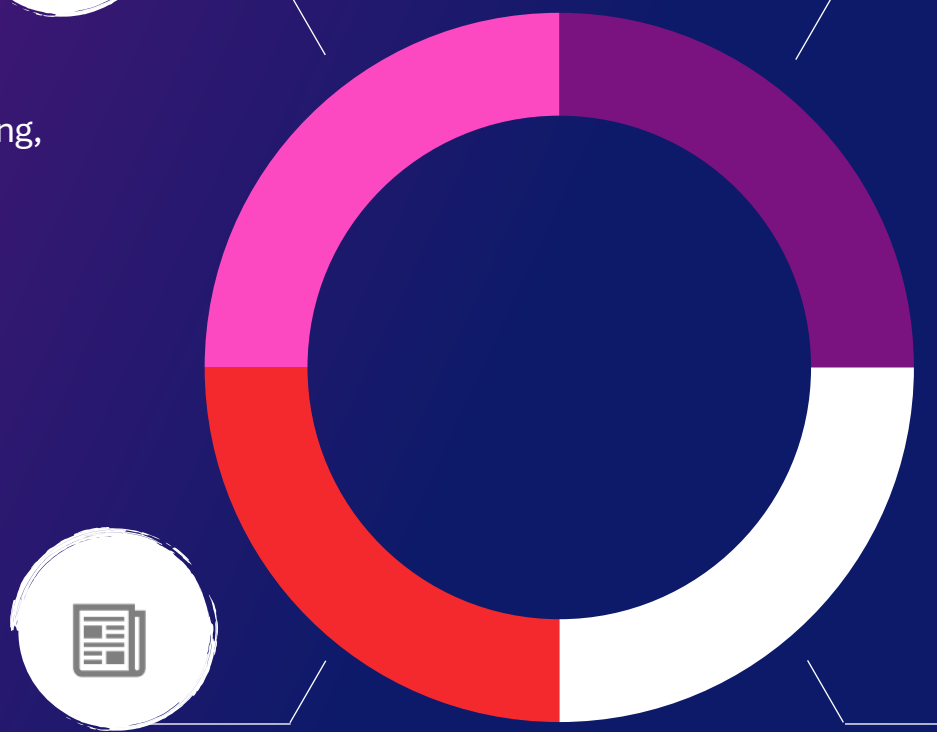
OPEN EXPLORATORY ANALYSIS

Examining the data without any preconceptions or assumptions, allowing for unexpected patterns and insights to emerge.

SPRINT APPROACH

Breaking down the analysis into smaller, more focused tasks that can be completed within a short period of time.

OUR APPROACH



Data Preparation

Collection, Pre-processing, and Cleaning

Model Evaluation

Identify key dietary patterns using ML

Training Dataset

Training using Scikit-learn

Model Result

Dietary factor anlysis

DATASET DESCRIPTION

COUNTRY NUTRITION PROFILE

Contains datasets on:

- Information on adult
- Adolescent and child diet
- Burden of malnutrition
- Nutrition strategies and financing
- Social determinant of nutrition

UNDERSTANDING THE CONTEXT

KEY METRICS

Collection of data.

Preparation of dataset for the country_burden as X and Y feature.

Fill all null value with zeros(0).

```
df_country_diet.isnull()
```

	iso3	country	region	subregion	disaggregation	disagg.value	section	cont
0	False	False	False	False	False	False	False	
1	False	False	False	False	False	False	False	
2	False	False	False	False	False	False	False	
3	False	False	False	False	False	False	False	
4	False	False	False	False	False	False	False	
...	...	...	...	...	...	...	...	
3237	False	False	False	False	False	False	False	
3238	False	False	False	False	False	False	False	
3239	False	False	False	False	False	False	False	
3240	False	False	False	False	False	False	False	
3241	False	False	False	False	False	False	False	

3242 rows × 132 columns

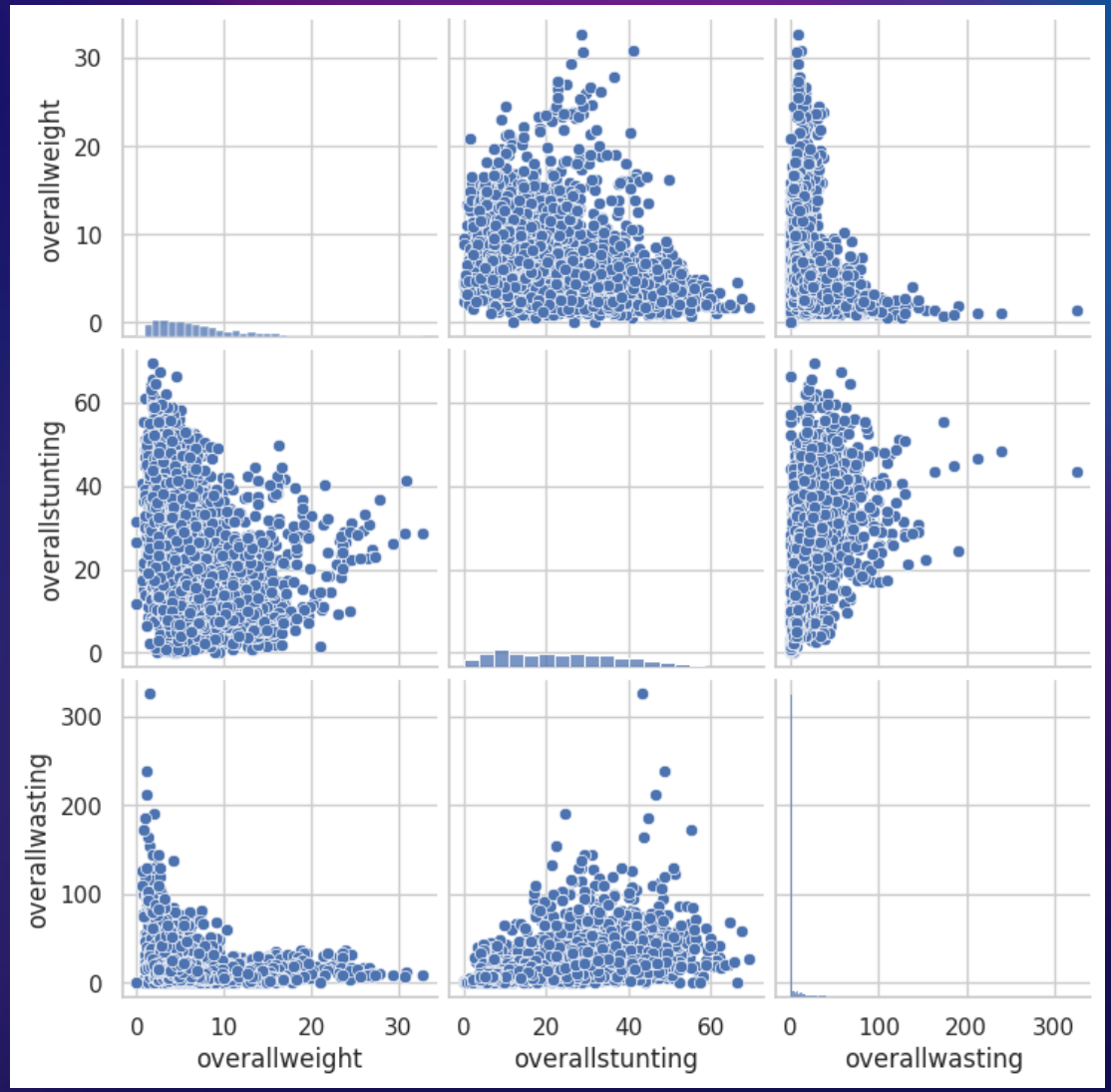
EXPLORATORY DATA ANALYSIS

KEY METRICS

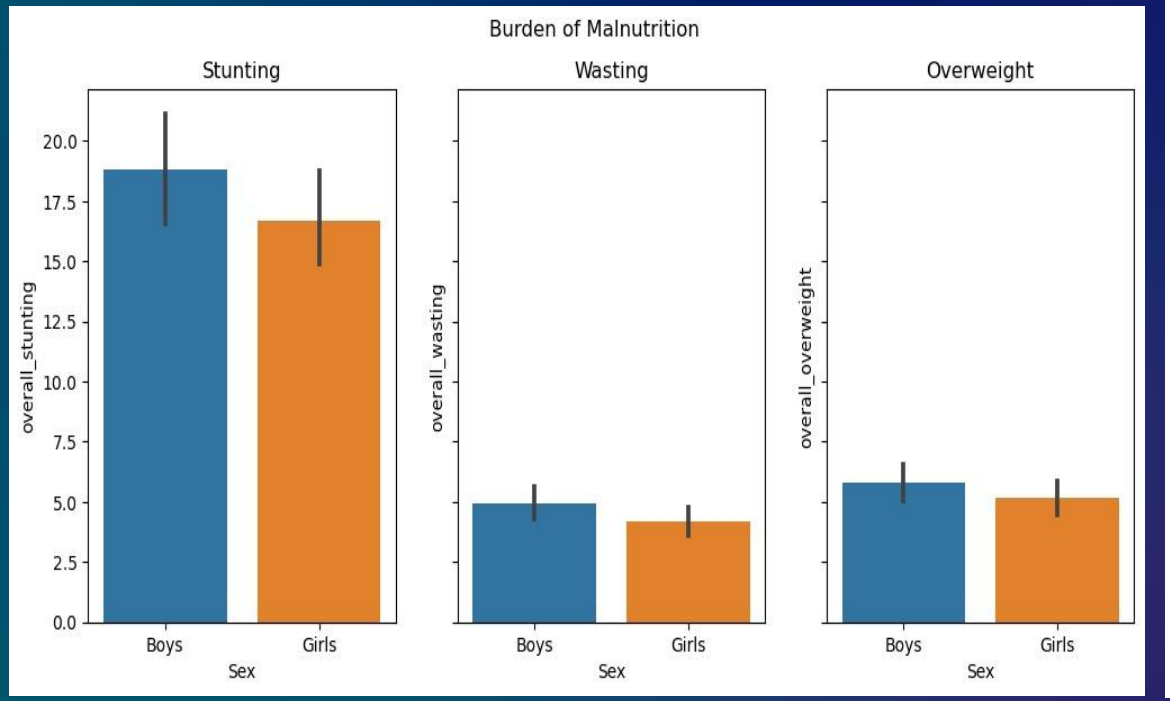
Combine overweight, wasting column into a single column

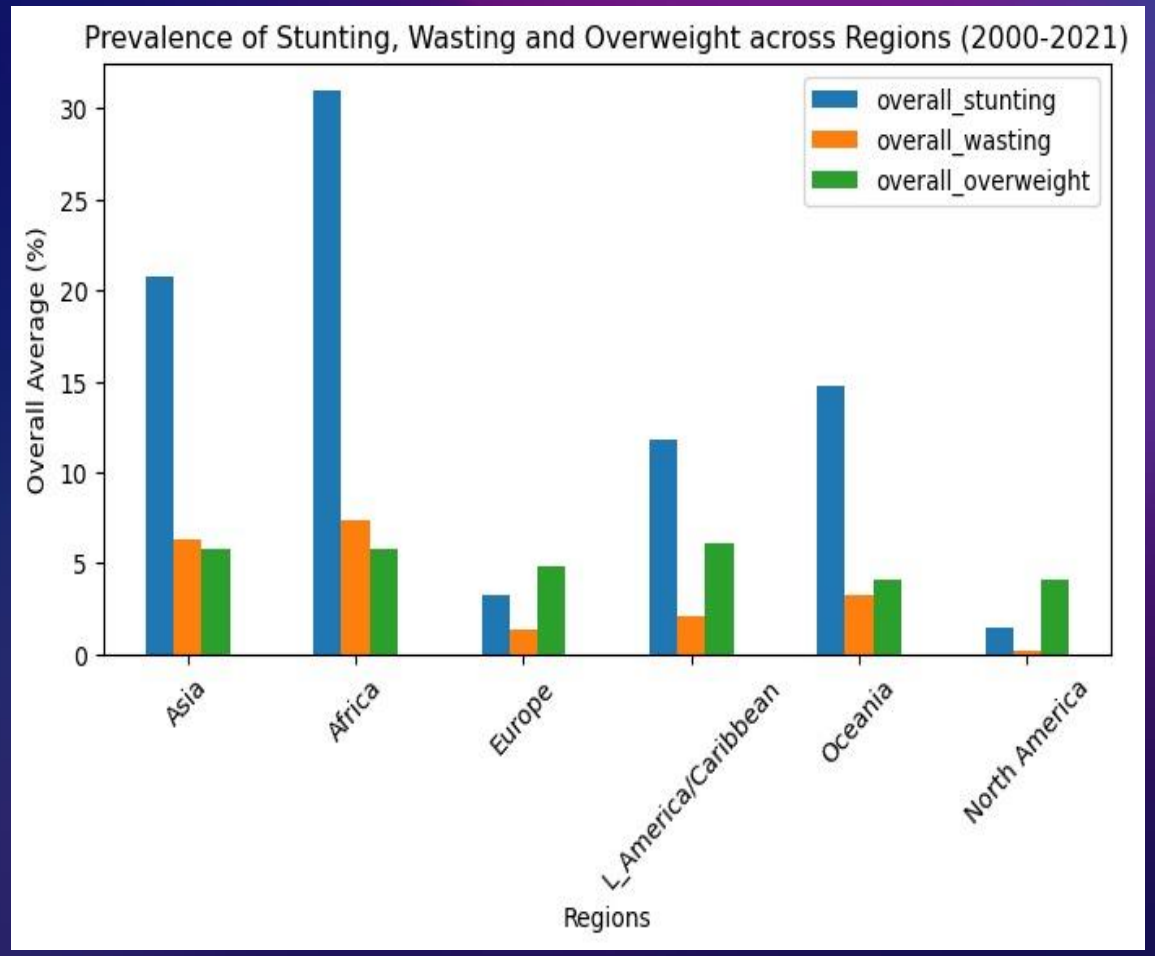
Encode process & dataset splitting.

Obtain result for country with overweight columns.



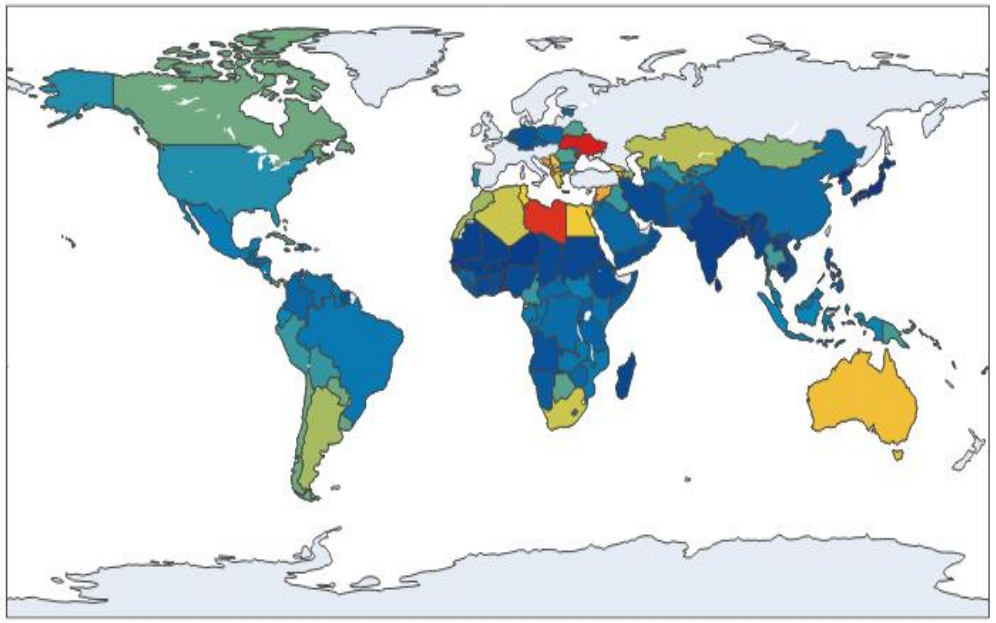
EXPLORATORY DATA ANALYSIS





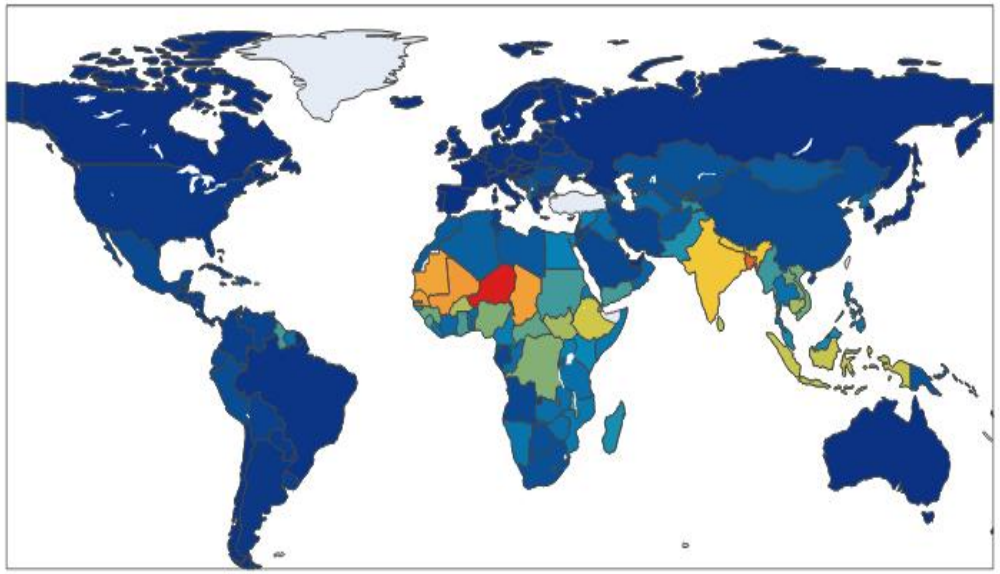
EXPLORATORY DATA ANALYSIS

Severe Overweight % around the world



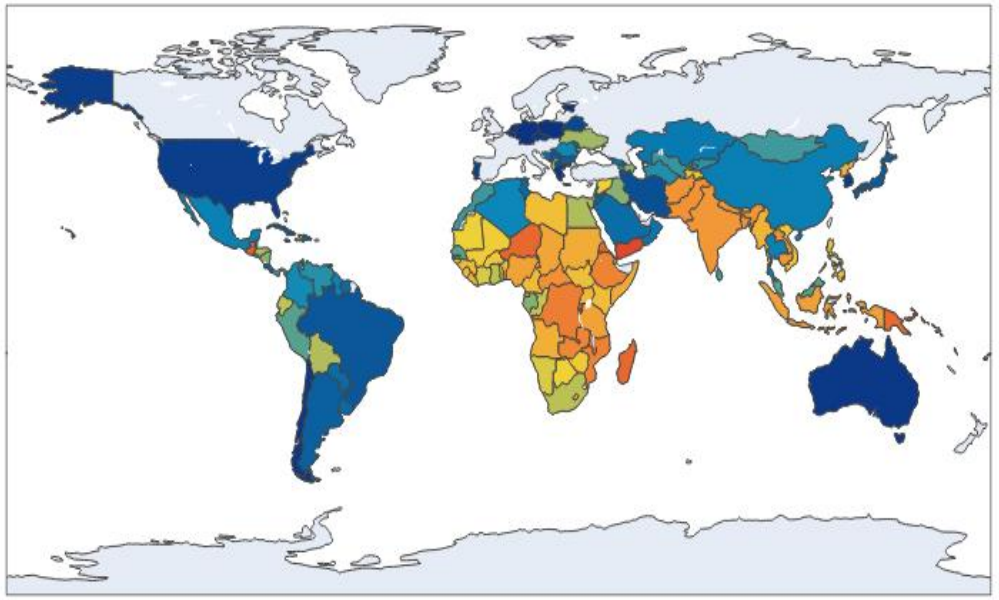
EXPLORATORY DATA ANALYSIS

Severe Wasting % around the world

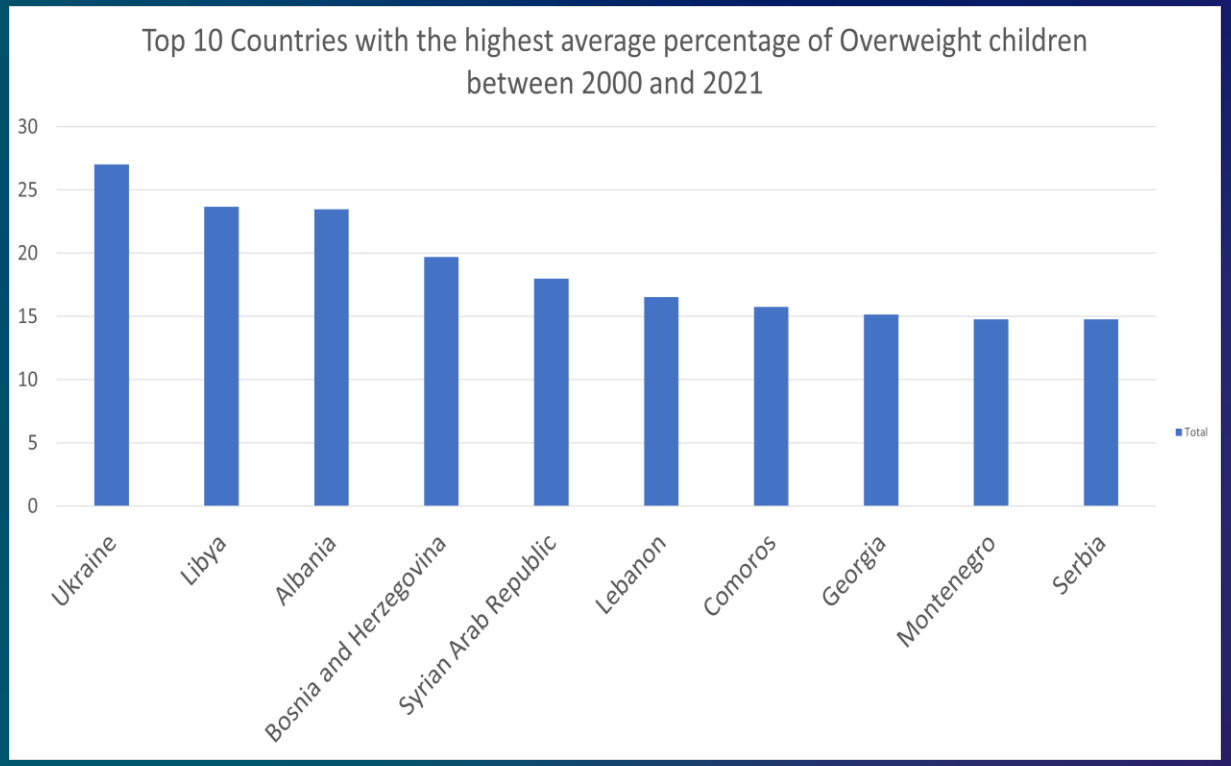


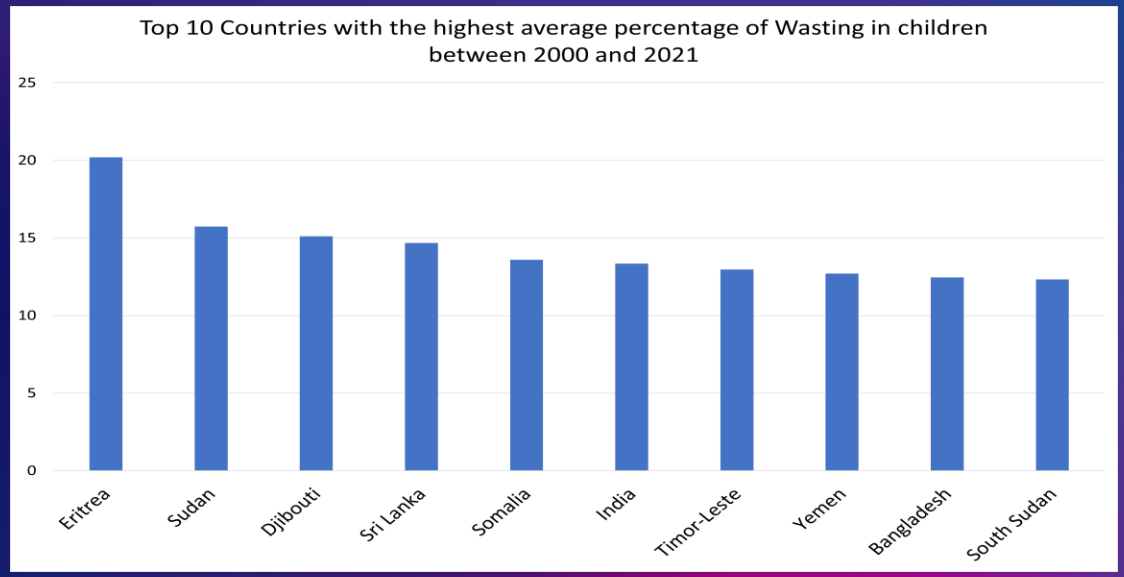
EXPLORATORY DATA ANALYSIS

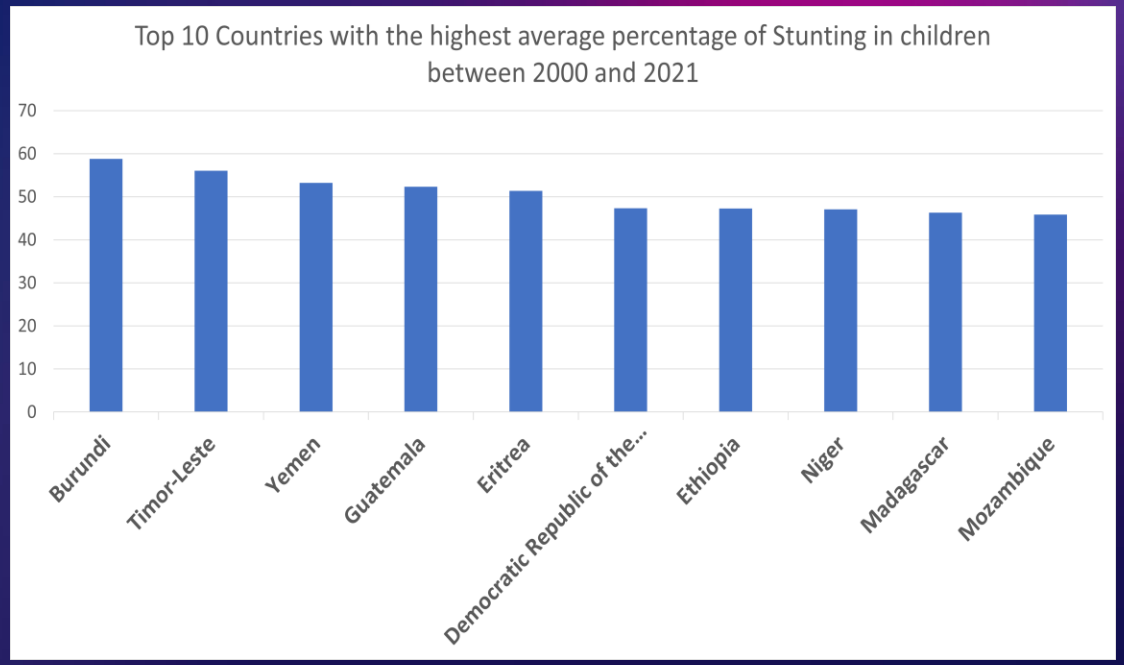
Severe Stunting % around the world



EXPLORATORY DATA ANALYSIS







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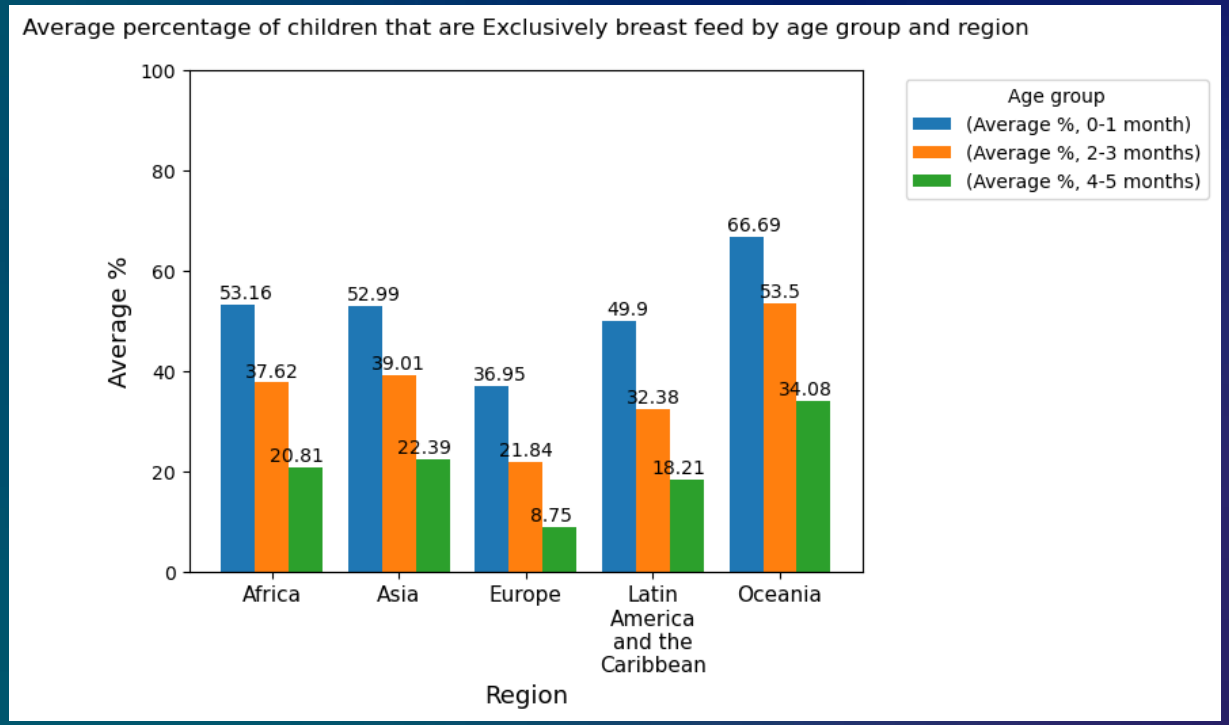

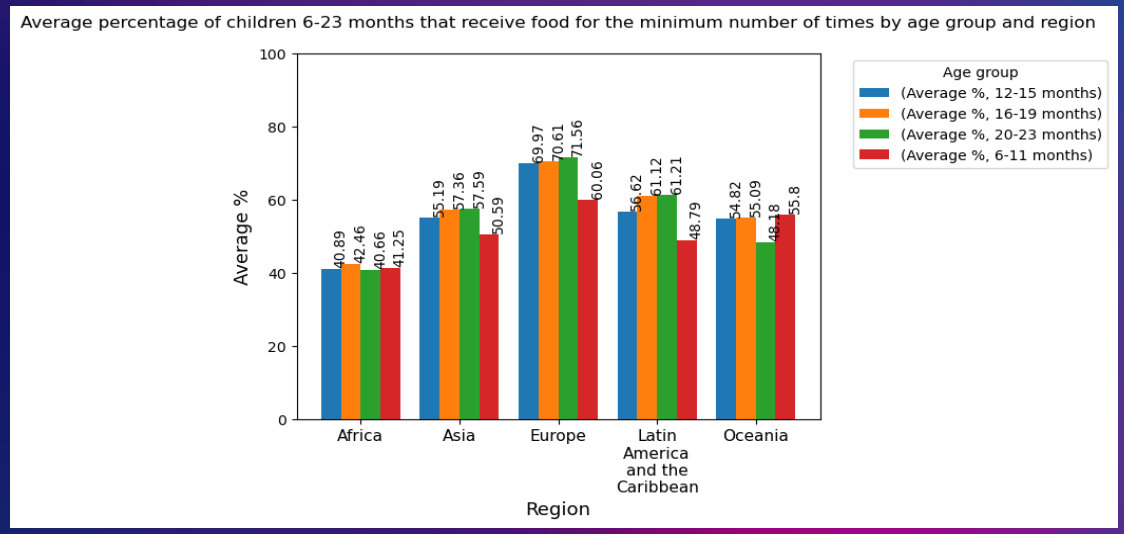

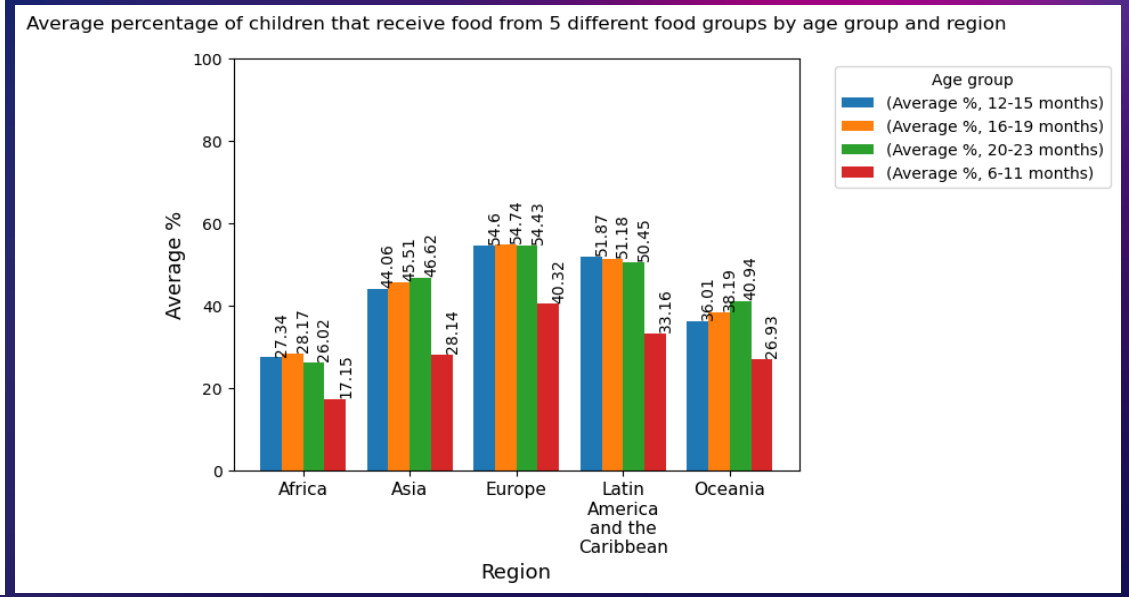

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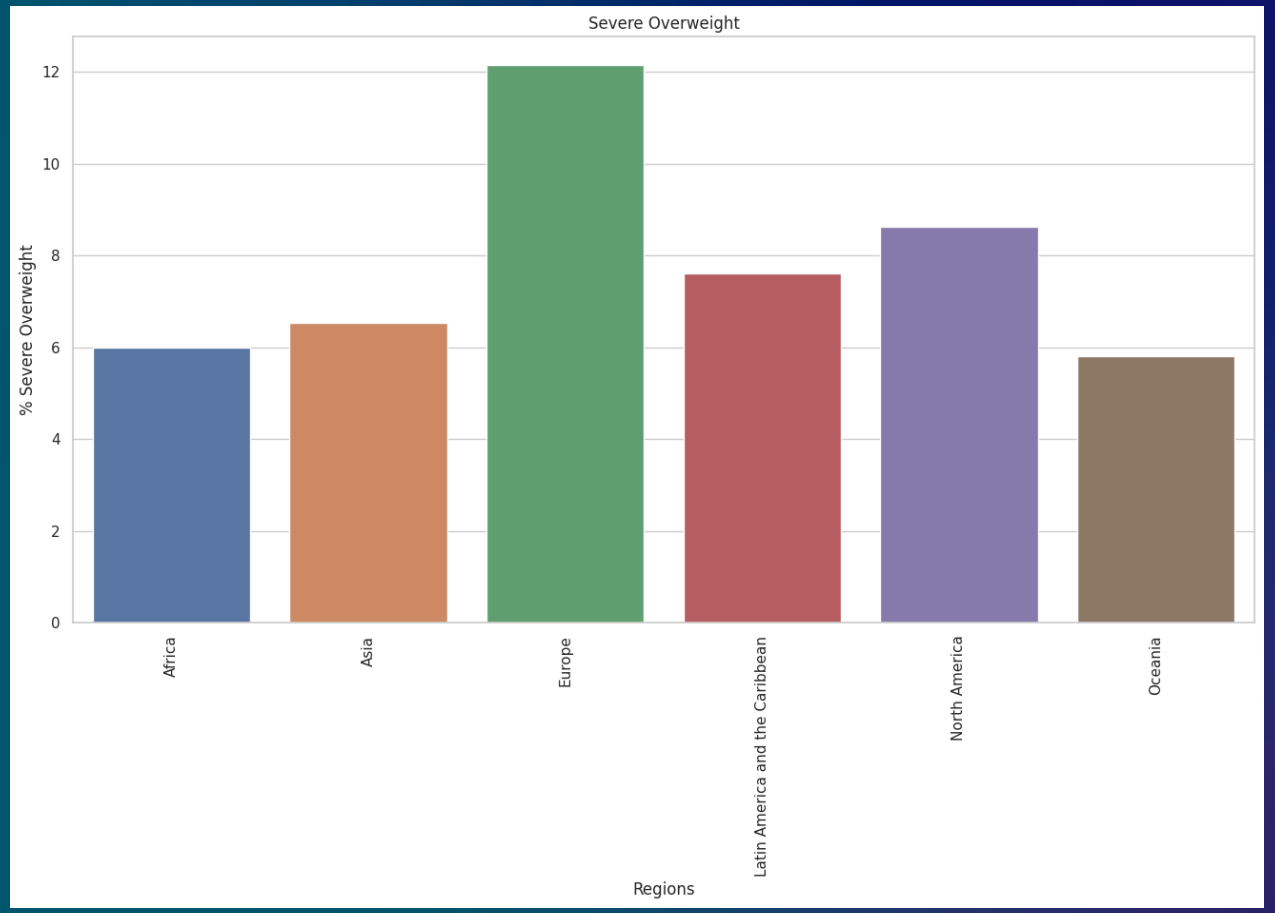
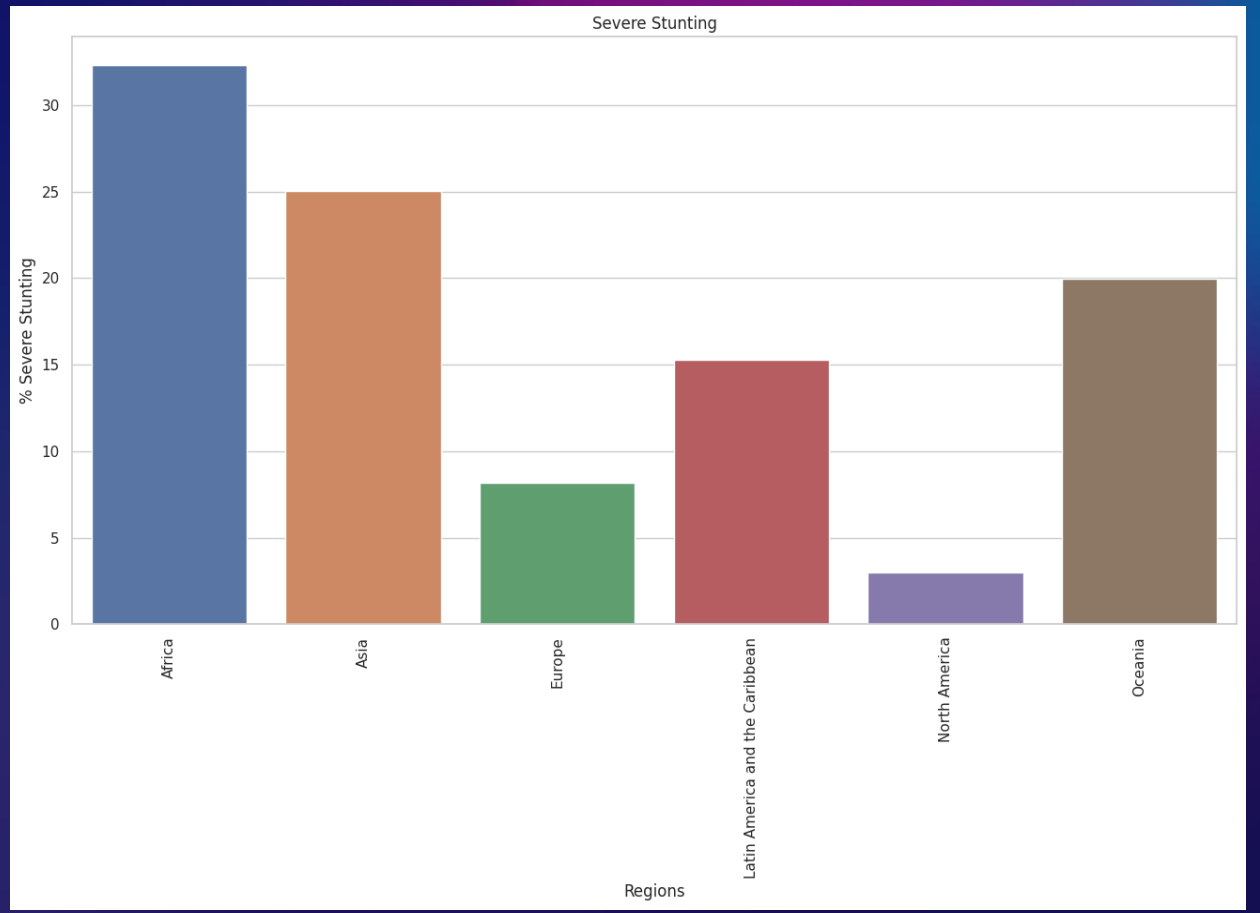




DATASET TRAINING & MODELLING

KEY METRICS

Spilt data into testing and training set.

Import and train the dataset, using Linear Regression, Decision Tree Regressor, Lasso, Ridge.

Make predictions on test data.

MODEL RESULT

MODELS	R^2 SCORE	MEAN SQUARE ERROR
Linear Regression	0.0058352075731706 78	14.467726149476086
Decision Tree Regressor	0.0025273591327529214	14.533422493511958
Lassos	0.00	14.47909136936741
Ridge	0.01	14.46772604916935
Polynomial features	-1792690688056920916361216.00	2.853136802364168e+25

DATASET TRAINING & MODELLING

```
[ ]  import tensorflow as tf

     # Set random seed
     tf.random.set_seed(42)

     # Add an extra layer and increase number of units
     model_1 = tf.keras.Sequential([
       tf.keras.layers.Dense(100), # 100 units
       tf.keras.layers.Dense(10), # 10 units
       tf.keras.layers.Dense(1) # 1 unit (important for output layer)
     ])

     # Compile the model
     model_1.compile(loss=tf.keras.losses.mae,
                              optimizer=tf.keras.optimizers.Adam(), # Adam works but SGD doesn't
                              metrics=['mae'])

     # Fit the model and save the history (we can plot this)
     history_1= model_1.fit(X_train, y_train, epochs=100, verbose=0)
```

HYPER TUNING & EVALUATION

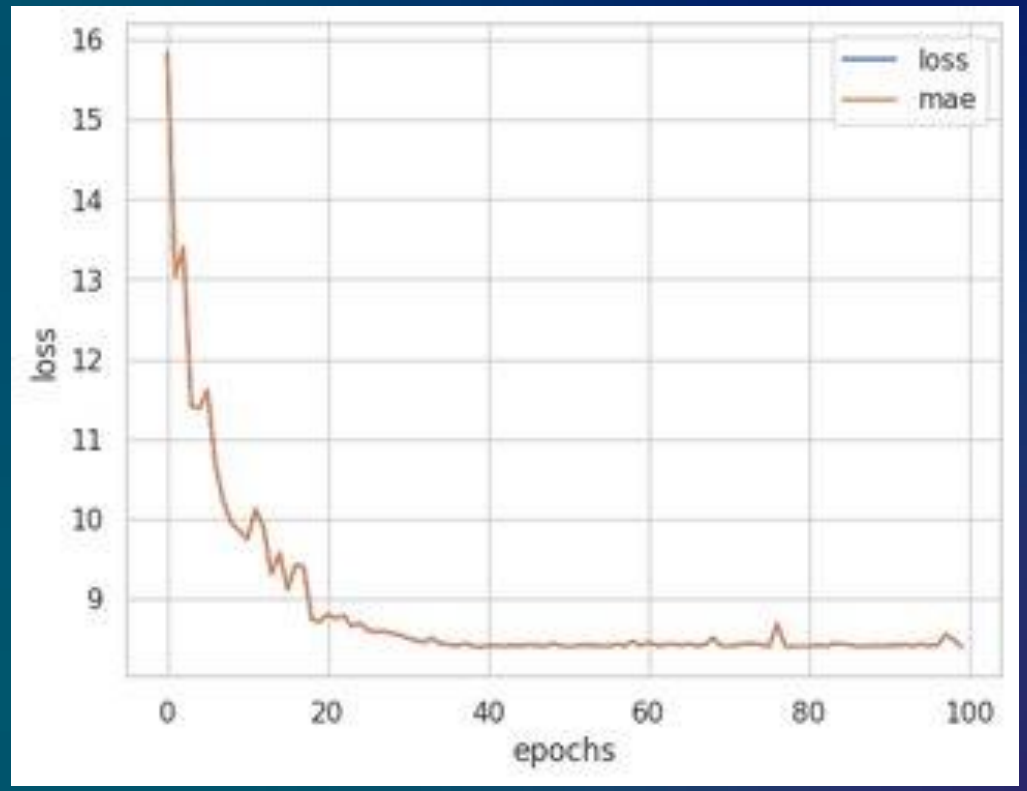
KEY METRICS

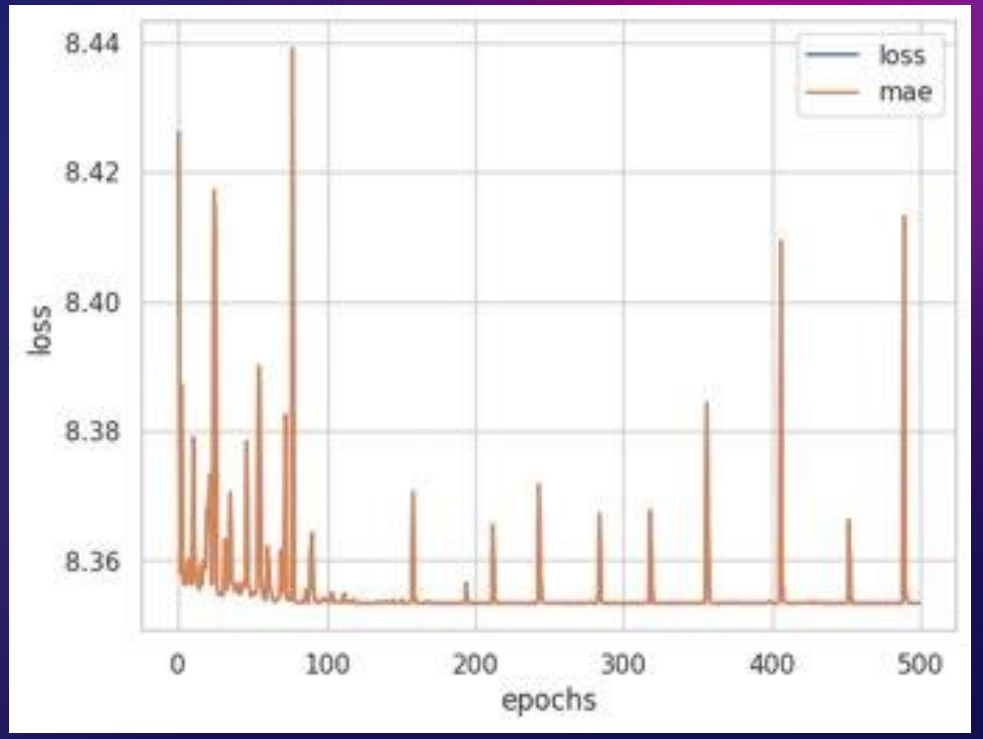
```
model_1.evaluate(X_test, y_test)
```

```
37/37 [==============================] - 0s 2ms/step - loss: 7.9043 - mae: 7.9043
[7.9043192863464355, 7.9043192863464355]
```

```
# Evaluate the model trained for 500 total epochs
model_2_loss, model_2_mae = model_1.evaluate(X_test, y_test)
model_2_loss, model_2_mae
```

```
37/37 [==============================] - 0s 3ms/step - loss: 7.8388 - mae: 7.8388
(7.838763236999512, 7.838763236999512)
```





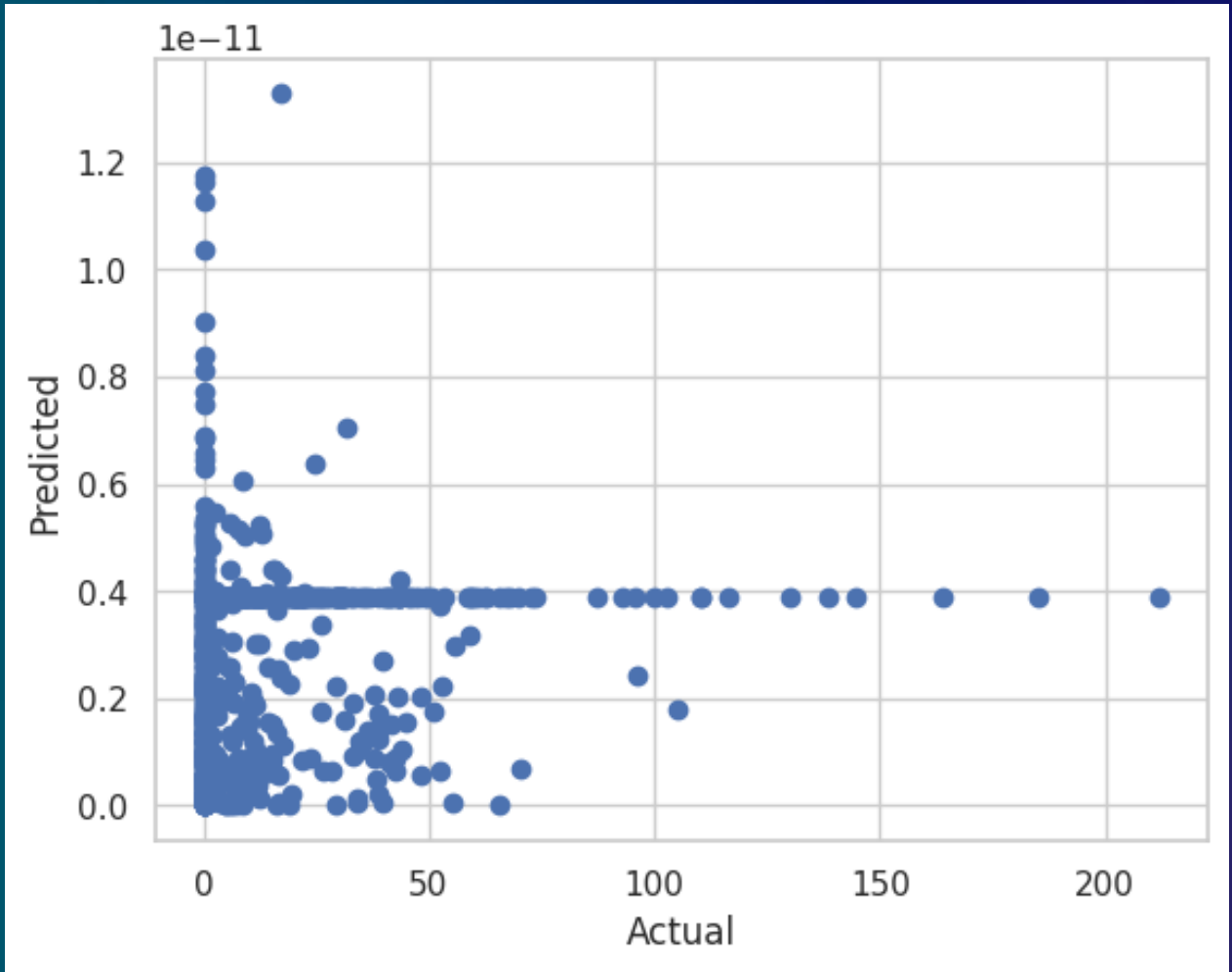
DATASET TRAINING & MODELLING

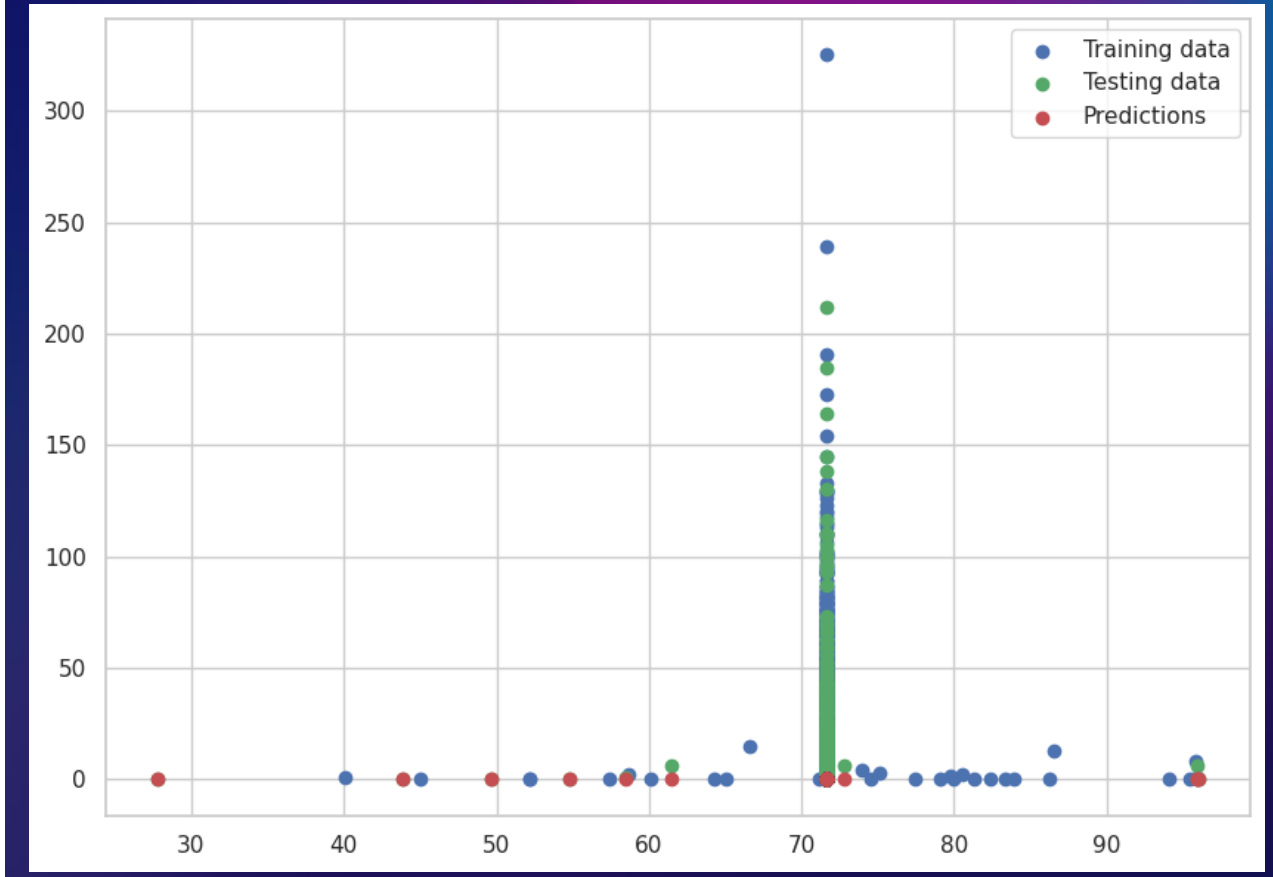
```
[ ]  import tensorflow as tf

    # Assume X_train_padded has a shape of (num_samples, max_length)
    # and y_train has a shape of (num_samples,)

    # Reshape X_train_padded to add a third dimension
    max_length = 100

    # Define your model as usual
    model = tf.keras.Sequential([
        tf.keras.layers.Conv1D(32, 5, activation='relu', input_shape=(124, 1)),
        tf.keras.layers.MaxPooling1D(3),
        tf.keras.layers.Conv1D(32, 5, activation='relu'),
        tf.keras.layers.MaxPooling1D(3),
        tf.keras.layers.Flatten(),
        tf.keras.layers.Dense(1, activation='sigmoid')
    ])

    # Compile the model as usual
    model.compile(optimizer='adam', loss='mean_absolute_error', metrics=['mae'])

    # Fit the model with the reshaped input data
    model.fit(X_train, y_train, epochs=100)
```

```
[ ]  model.summary()

Model: "sequential_5"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv1d (Conv1D)             (None, 120, 32)           192

 max_pooling1d (MaxPooling1D  (None, 40, 32)           0
 )

 conv1d_1 (Conv1D)           (None, 36, 32)            5152

 max_pooling1d_1 (MaxPooling  (None, 12, 32)           0
 1D)

 flatten (Flatten)           (None, 384)               0

 dense_15 (Dense)            (None, 1)                 385

=================================================================
Total params: 5,729
Trainable params: 5,729
Non-trainable params: 0
_________________________________________________________________
```

```
Epoch 93/100
148/148 [==============================] - 2s 13ms/step - loss: 8.3533 - mae: 8.3533
Epoch 94/100
148/148 [==============================] - 2s 13ms/step - loss: 8.3533 - mae: 8.3533
Epoch 95/100
148/148 [==============================] - 2s 13ms/step - loss: 8.3533 - mae: 8.3533
Epoch 96/100
148/148 [==============================] - 1s 8ms/step - loss: 8.3533 - mae: 8.3533
Epoch 97/100
148/148 [==============================] - 1s 8ms/step - loss: 8.3533 - mae: 8.3533
Epoch 98/100
148/148 [==============================] - 1s 8ms/step - loss: 8.3533 - mae: 8.3533
Epoch 99/100
148/148 [==============================] - 1s 9ms/step - loss: 8.3533 - mae: 8.3533
Epoch 100/100
148/148 [==============================] - 1s 8ms/step - loss: 8.3533 - mae: 8.3533
<keras.callbacks.History at 0x7f4e78355e10>
```

DATASET TRAINING & MODELLING





SUMMARY

Child malnutrition is a serious global health issue that requires innovative solutions. The results of this study demonstrate the potential of AI in analyzing dietary patterns to predict and prevent child malnutrition.

RECOMMENDATION

- Intervention to support exculsive breast feeding for atleast the first five months.
- Increased efforts be made to improve the dietary diversity in regions with lower percentages of children receiving food from multiple groups, particularly in younger age groups