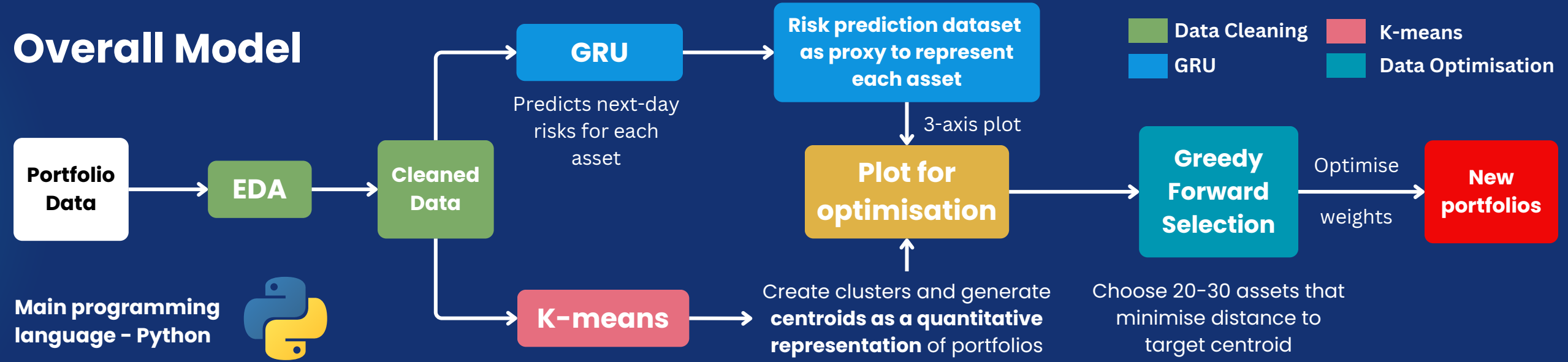


## Project Objectives

- Automate the typically manual portfolio construction process
- Efficient allocation of new assets to existing portfolios

## Overall Model



**Principal Asset Management**  
Asset management company focused on fixed-income investment portfolios

### DATA CLEANING

**DATA STRUCTURE** One row = one asset/holding in one portfolio on one day

- Null handling
- Scaling
- Remove duplicates
- Keep outliers
- Create dummy variables for sectors

### DATA PROCESSING

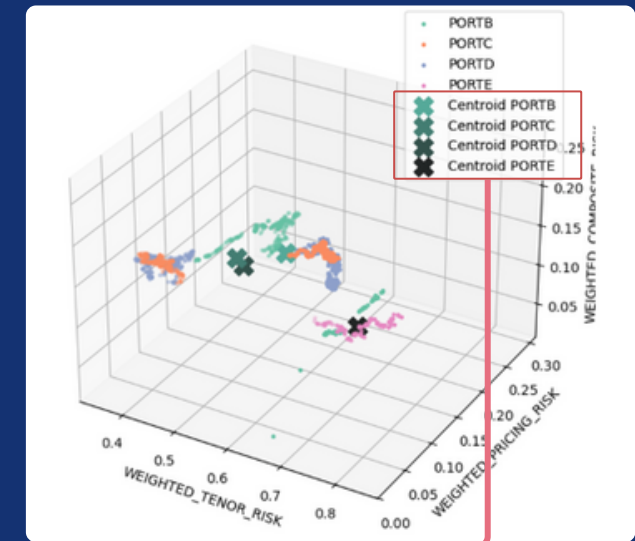
**GATED RECURRENT UNIT (GRU)**  
Type of recurrent neural network (RNN) that enhances the speed performance of LSTM networks by simplifying the structure with two gates: **UPDATE** gate and **RESET** gate

- Predict next-day risks for each asset**
- Alternative: Long-short term memory (LSTM)**
- Tuning Method:**
  - Hyperband
  - Bayesian Optimisation

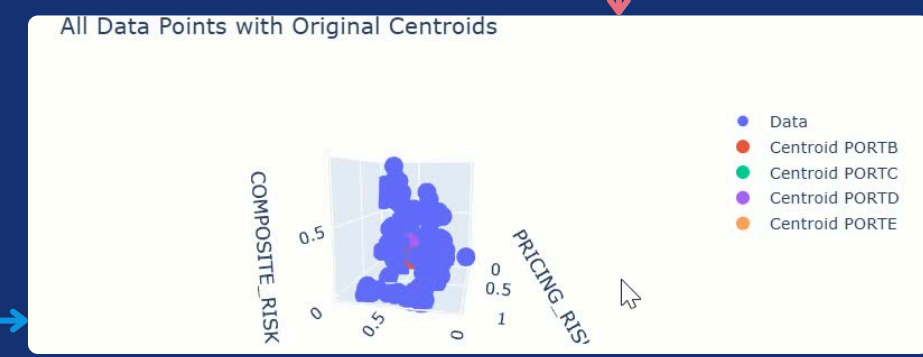
### Finding Centroid of each original portfolio

### K-MEANS

- Unique Portfolios (k=4)
- 1 centroid / portfolio
- Based on 3 risk variables



### Plot for optimisation



### DATA OPTIMISATION



- K-means plot** with individual asset holdings and portfolio centroids
- Form portfolios of n assets with **Greedy Forward Selection** (between 20 to 30 assets for each)
- Optimise weights** within each portfolio to minimize Duration, OAS, Spread Duration

### Sample Output - Each row represents one unique asset

ID	ASOF_DATE	Predicted_TENOR_RISK	Predicted_PRICING_RISK	Predicted_COMPOSITE_RISK
483497688V565200_PORTB	2023-12-02 00:00:00	0.277839035	0.064609185	0.057282925
4885254880788724_PORTC	2023-12-30 00:00:00	0.370347232	0.054287083	0.115448296
483544865M5085V4_PORTD	2023-12-02 00:00:00	0.277886719	0.033561487	0.108701207
84XLKDD7007887V9_PORTE	2025-01-01 00:00:00	0.722639203	0.064777873	0.165103272
86XGYGG88M7987I3_PORTE	2025-01-01 00:00:00	0.702783108	0.065225407	0.154975578

Plot risk measures on 3-axis plot

### Results - Original Portfolio vs New Portfolio

