

# Deep-Learning for Customs Risk Management

And Measuring Success

PART OF  
AD PORTS GROUP





# Agenda

1

**Pre-requisites** for advanced analytics and machine learning

2

Process of **developing machine learning models**

3

Measuring **model's effectiveness**

4

Can **Large Language Models** assist with **Risk Management?**

5

Measuring **real world effectiveness** at the checkpoint

# Pre-requisite: Generate Derived Transactional Data Model

Attribute	Value	Tariff unit of measure	Data quality
Weight	12,000	kg	2.1
Quantity	600	kg	0.4
Exporter	Various		0.1
Consignee	Lucky Supermarket		1.2
Country of Origin	US		0.5
Description	600 * 20kg sack jasmine rice - FCL no wood		1.3
Date	09/25/2023		2.1
HSCode	10.06.3000		1.1
Declared Customs Value	\$ 6,600.00		0.8
Declared Customs Value unit price	\$ 11.00		0.3

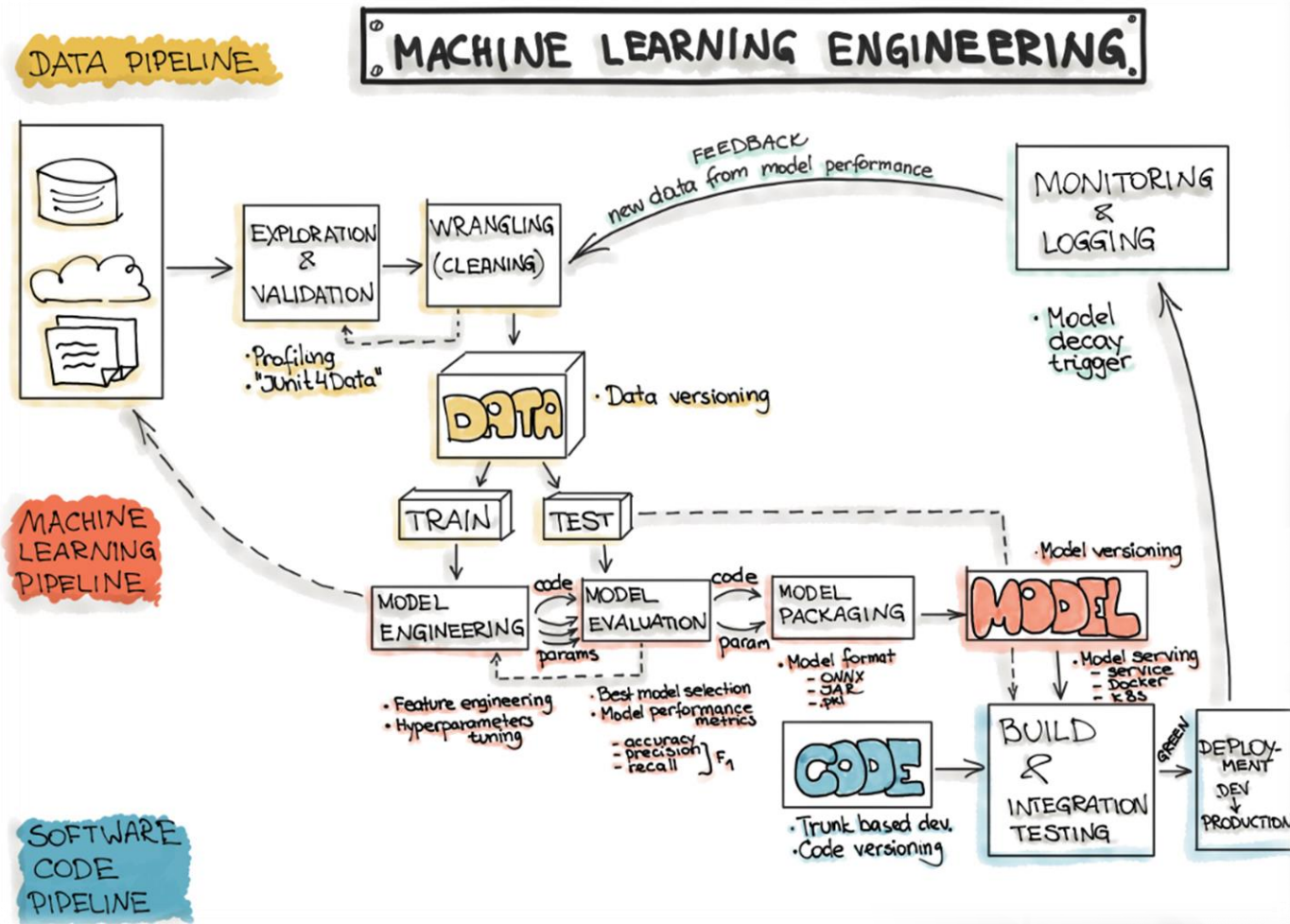
Attribute	Value	Tariff unit of measure
Weight	12,000	kg
Quantity	12000	kg
Exporter	Various	
Consignee	Lucky Trading JSC	
Country of Origin	TH	
Description	Jasmine Rice	
Date	09/25/2023	
HSCode	10.06.4000	
Declared Customs Value	\$ 6,600.00	
Predicted Customs Value	\$ 9,600.00	

```



```

# Process: Building the Data Pipeline



## Technical Skills

- Data extraction, training & loading
- Advanced statistics
- Advanced mathematics
- SQL
- Python/R/Pytorch/Keras/Bert
- DevOps – Docker/K8S/helm/git
- Webservices & API development
- Application integration

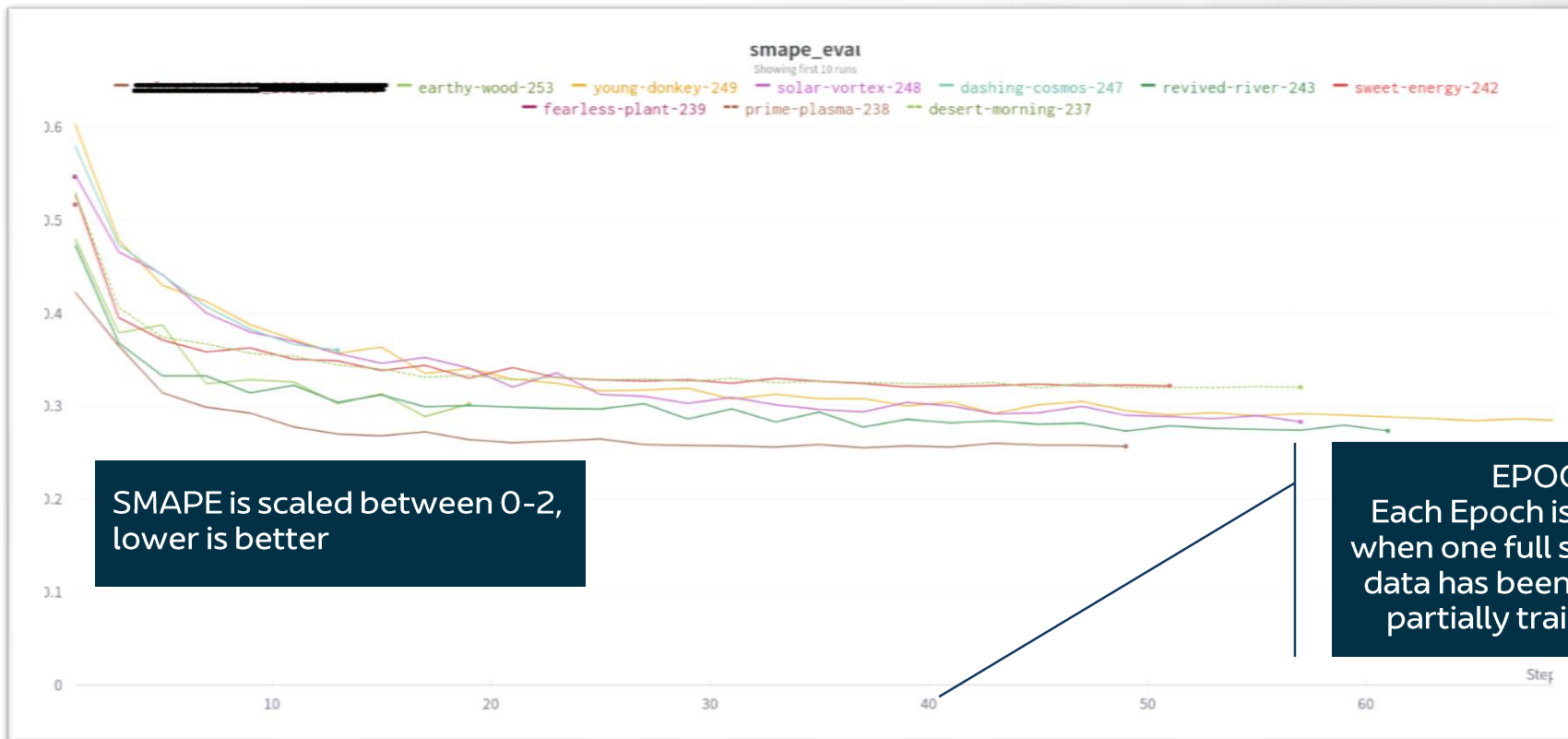
## Infrastructure (or cloud) Investment

- Secure, containerised application infrastructure hosted in an environment that complies with data security and sovereignty rules
- Powerful compute capabilities
- Nvidia Tesla GPU cards

# Process Verification: Measuring Model's Effectiveness

Measuring SMAPE or Symmetric Mean Abolute Percentage Error per Epoch helps us:

- Compare prototype models
- Minimise over-fitting
- Determine when a model is as accurate as possible

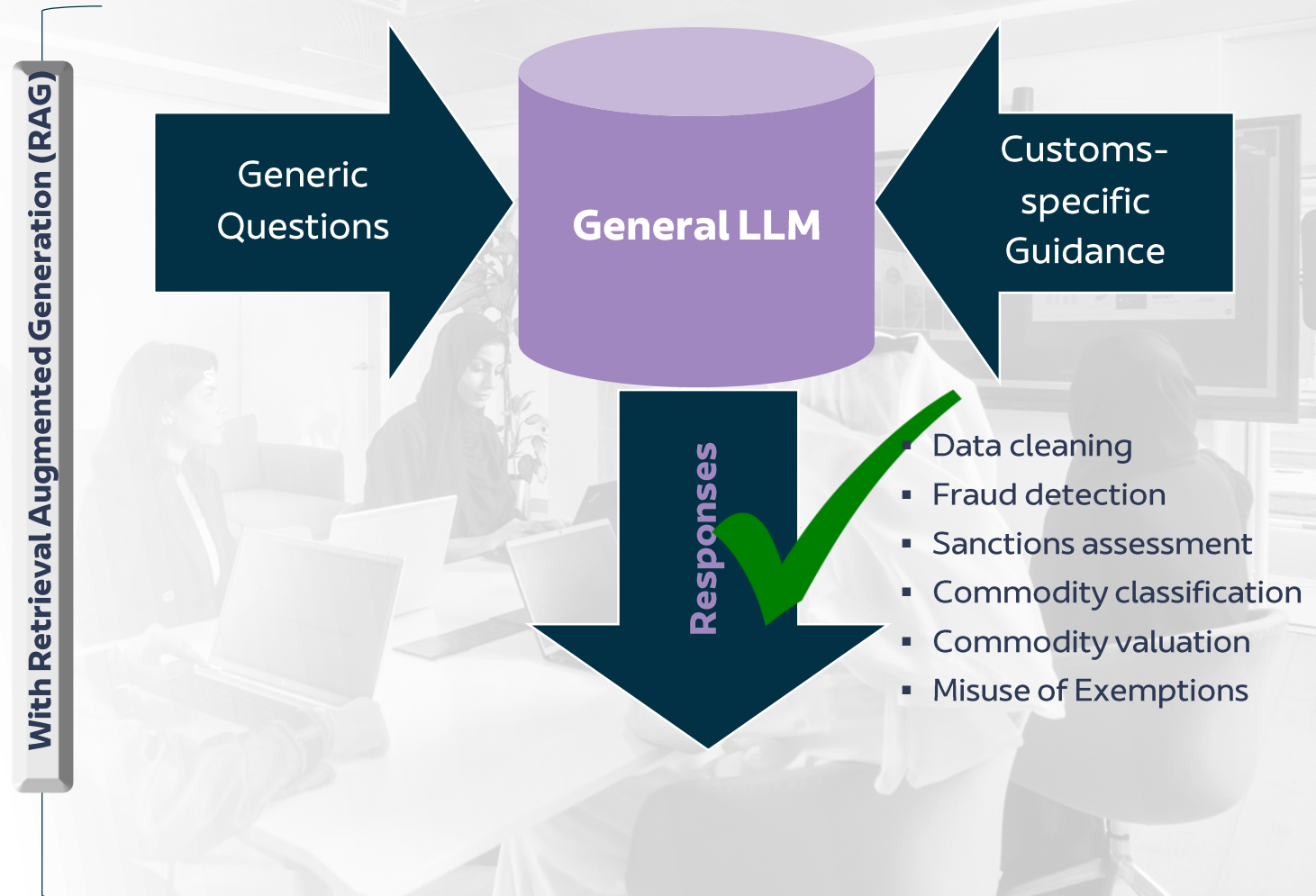
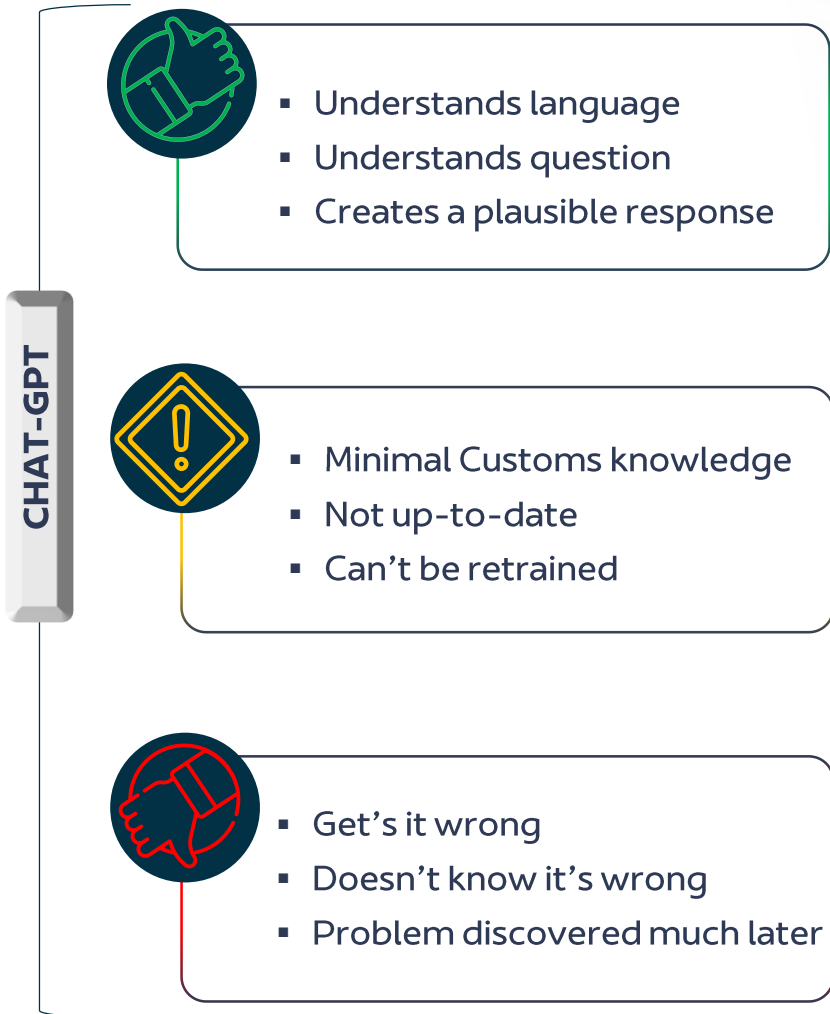


SMAPE is scaled between 0-2, lower is better

EPOCHS  
Each Epoch is completed when one full set of training data has been applied to a partially trained model



# Question: Can CHAT-GPT Modernize Customs Risk Assessment?





# Example: Commodity Classification with RAG

## General LLM

02.07	<b>Meat and edible offal, of the poultry of Heading 01.05, fresh, chilled or frozen.</b>		
	- Of fowls of the species <b>Gallus domesticus</b> :		
0207.1100	-- Not cut in pieces, fresh or chilled	30%	
0207.1200	-- Not cut in pieces, frozen	30%	
0207.13	-- Cuts and offal, fresh or chilled		
0207.1310	--- Breasts	10%	
0207.1320	--- Drumsticks	10%	
0207.1330	--- Thighs	10%	

- 'Gallus Domesticus' – 'chicken'
- Identifies parts & characteristics of a chicken shipment
- Contextualises words that have been misspelt

## Custom Specific Model



- Parts of a chicken are important
- Fresh vs chilled vs frozen is important
- Specific exporters are likely to shop specific types of product



# Results: Consolidation and Sorting

Risk Categories

Risk Impact

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Type				Declaration Reference	Inserted Date / Time	Submitted Date	Case Status	Potential Revenue Loss/Gain	Ac
PR				<a href="#">2023DEC0001261707</a>	17-09-2023, 05:50	17-09-2023, 05:49	UNDER REVIEW	91,790,524.24 <small>BSD</small>	
PR				<a href="#">2023DEC0001263244</a>	19-09-2023, 19:38	19-09-2023, 19:37	UNDER REVIEW	18,549,191.42 <small>BSD</small>	
PR				<a href="#">2023DEC0001262570</a>	18-09-2023, 23:32	18-09-2023, 23:31	UNDER REVIEW	2,630,551.41 <small>BSD</small>	
PR				<a href="#">2023DEC0001265832</a>	21-09-2023, 10:36	21-09-2023, 10:35	UNDER REVIEW	2,082,172.32 <small>BSD</small>	
PR				<a href="#">2023DEC0001267246</a>	22-09-2023, 19:47	22-09-2023, 19:46	UNDER REVIEW	1,327,896.34 <small>BSD</small>	
PR				<a href="#">2023DEC0001268374</a>	25-09-2023, 14:29	24-09-2023, 05:21	UNDER REVIEW	1,152,508.31 <small>BSD</small>	
PR				<a href="#">2023DEC0001262028</a>	19-09-2023, 01:32	19-09-2023, 01:31	UNDER REVIEW	1,040,667.26 <small>BSD</small>	
PR				<a href="#">2023DEC0001263044</a>	19-09-2023, 03:50	19-09-2023, 03:49	UNDER REVIEW	655,002.63 <small>BSD</small>	
PR				<a href="#">2023DEC0001254951</a>	19-09-2023, 21:18	19-09-2023, 21:18	UNDER REVIEW	646,308.24 <small>BSD</small>	
PR				<a href="#">2023DEC0001228866</a>	22-09-2023, 13:35	22-09-2023, 13:34	UNDER REVIEW	600,230.88 <small>BSD</small>	





# Results: Detailed Analysis and Explainability

REV-HS001 The difference between the declared code and the classifier results suggests potential misclassification

Accurate measure of confidence

Declared Code: **9403.40.00**  
 DUTY: **0%** | EXCISE: **0** | VAT: **10%**  
 WOODEN PANELS, DOOR AND DRAWER BOXES FOR WARDROBES

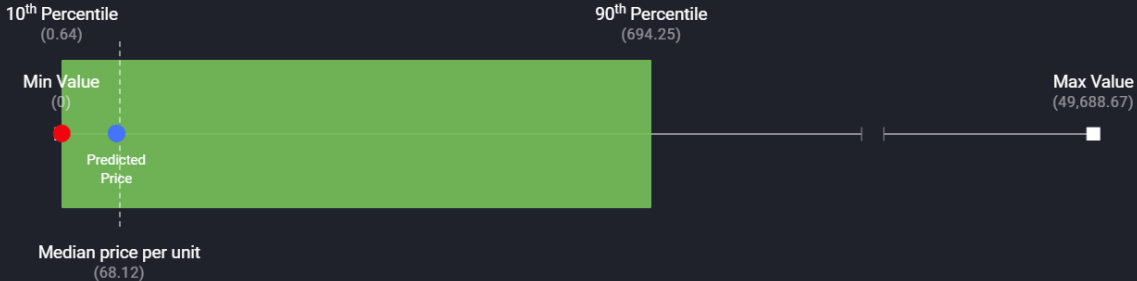


Potential Revenue Loss  
**42,179.45 BSD**

HS Code	Description	Specific Excise Rate	Specific Duty Rate	Ad Valorem Excise Rate	Ad
9403.90.00	Other furniture and parts thereof. - Parts	0			0
9403.40.00	Other furniture and parts thereof. - Wooden furniture of a kind used in the kitchen	0			0
9403.60.90	Other furniture and parts thereof. - Wooden furniture of a kind used in the bedroom: - Other wooden furniture: - Other	0			0

REV-003 The item unit FOB price for the declared commodity is unusually low compared to historical trends, suggesting potential undervaluation

Potential Revenue Loss: **600,230.88 BSD** | Import Duty: **25%**  
 Country of Origin: **US** | Excise: **0**  
 HS Code: **6907.40.00** | VAT: **10%**  
 Sample Size: **1441**



Anomalies

Deviation from normal



# Highlights



**1.5M+** risk indicators updated by customs experts



Up to **70%** reduction in release times between Customs & other Government agencies



**Hundreds of Millions** in additional Customs revenue (\$) collected

مرحباً بكم في المنطقة الرقمية

# Thank you

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