KCS' Data-driven Customs

How does Korean Customs leverage advanced data analytics?

Korea Customs Service
Miryang Kim, 25.03.05

KCS' Data Journey - From Process Automation to AI-Powered Insights

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Big Data and AI Transformation

Unlocking Advanced Data Utilization

Adopting big data infrastructure and facilitating AI technologies
for deeper insights and predictive business processes
(**System**) AI-driven operational systems**,** Big data portal
(**Data**) Utilizing unstructured data
(**Analytical Technology**) Natural language processing,
statistical analysis,
machine learning and deep learning

Data-Driven Growth

Leveraging Data for Insights

Establishing a data warehouse and
supporting systems to improve decision-making
(**System**) Data warehouse, decision support systems
(**Data**) Utilizing structured data
(**Analytical Technology**) rule-based functions,
SQL and user-friendly functions of the data warehouse,
advanced statistical analysis

Digitalization

Automating Business Operation

Implementing automation to streamline processes
(**System**) Transactional systems(operation systems)
(**Data**) Storing unstructured and structured data
(**Analytical Technology**) simple functions for statistical information,
simple rule-based functions

Big Data • AI Strategy

✓ Korean customs focuses on 3 aspects to leverage big data and adopt AI technology.

Organization

Human Resources

System

Organization

Building organization big data culture
Designing systematic approaches in big data and AI adoption
Planning for empowering organizational data capability

Human Resources

Leading AI application in customs work
Producing best outcomes from data utilization

System

Supporting decision-making from big data and AI application
Providing environment where handle collected big data
Enabling stable AI based services by handling big data

Organization

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IT Organizations

ICT and Data Policy Bureau	
ICT and Data Planning Division	Designing ICT Direction, Conducting ISP, Controlling Data Quality
Big Data Analysis Division	Operating Big Data Platform(+ML, DL), Fostering ICT Experts, Adopting Generative AI
ICT and Data Management Division	Operating Customs Data Warehouse, Data Security
R&D and Equipment Division	Researching AI Embedded in Devices
UNI-PASS Operation Division	Operating UNI-PASS System(AI-driven Risk Management), Metadata System
Customs Border Targeting Center	Establishing AI Risk Management Models

Business Organizations

Clearance Facilitation and Control Bureau	Requesting AI Capabilities for Business Improvement
Audit and Revenue Bureau	Providing Feedback on AI and Data Models
Investigation Bureau	Providing Domain Knowledge
International Affairs Bureau	Utilizing Data Models

Branch Customs Office

+ Trained ICT Experts

Human Resources

✓ Capability on technology and domain is the key aspect allowing us to achieve the desired results from AI application

ICT Expert Training Program(2017~)

- **145** Trainees
- **53** Data projects

Curriculum

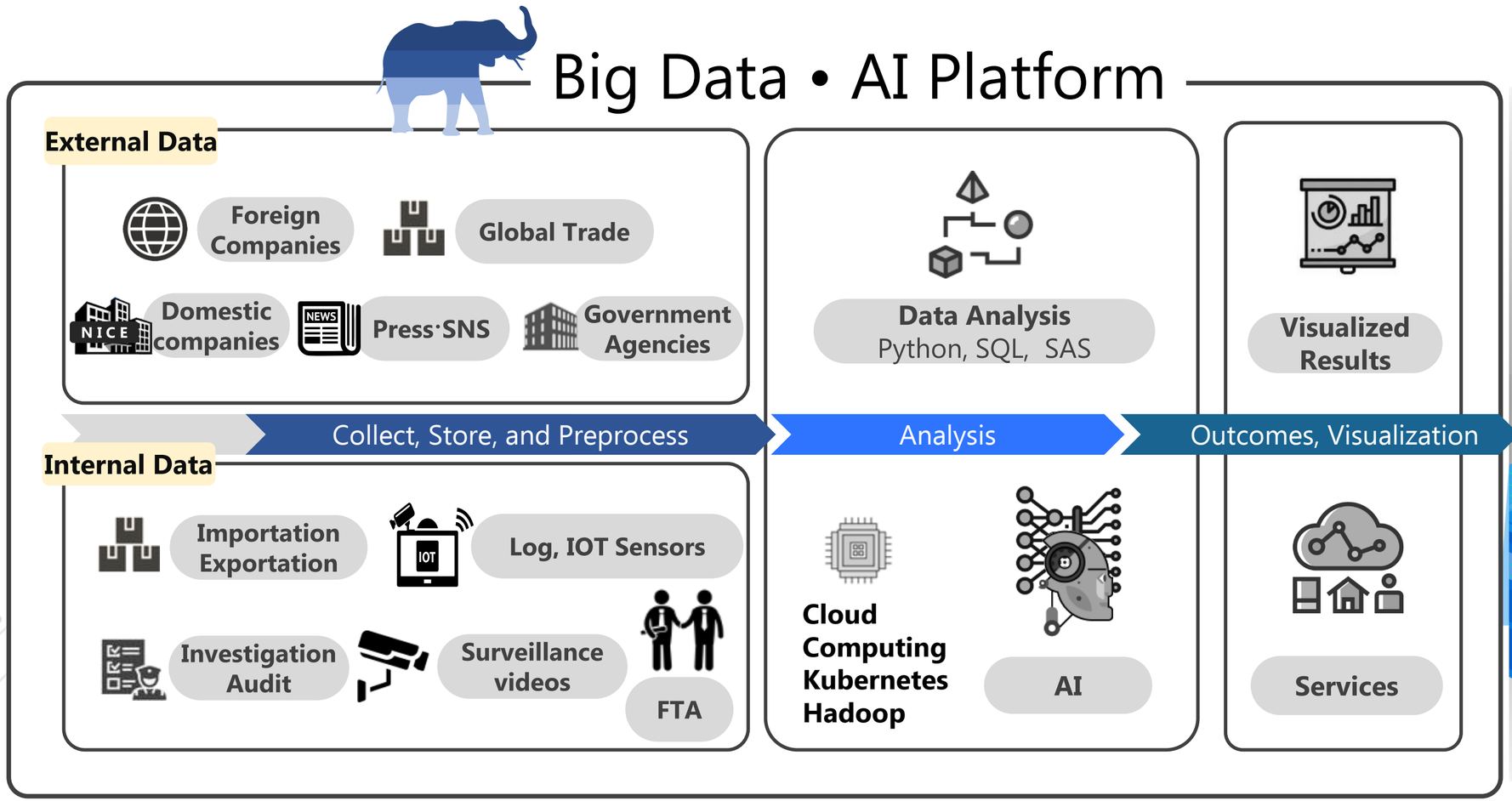
data skills	data projects	Data-based solutions
• Python, SQL, R etc. • Machine learning • Deep learning • Other analysis techniques	• Solving issues in business • AI based income prediction • AI based offender prediction in exportation and passengers etc. * RNN, DNN, LGB, CNN, Random Forest etc.	• Solving issues from fields • Data modeling competition • Supporting big data and AI adoption

Artificial Intelligence

- **Establishing big data culture**
  - Fostering organizational capability in data utilization
  - Providing diverse lectures delivering insights on cutting-edge technology

Systems (Big Data Portal)

✓ System environment allows handling big data and providing services based on AI technology



AI in Korean Customs Operations

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✓ Korean Customs applies AI(Machine Learning and Deep Learning) by using diverse data.

Data

- Structured data: data in relational database
- Unstructured data: texts, images, videos etc. 300TB

Technologies

Rule-based → Advanced Data Skills

- Statistical algorithms
- Machine learning
- Deep learning
- Natural language processing

- Classification
- Network Analysis
- Image detection
- Similarity analysis
- Time Series

Services

- Business Operations, Decision-Making Support, and Device-Embedded AI

Cases I: AI Models Controlling Risks

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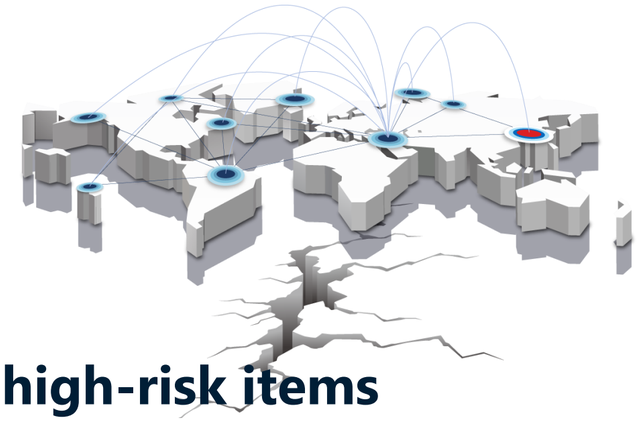
✓ AI models play the prominent roles in the risk management by controlling risk factors of importation

*** Clustering, FCNN, Random Forest, LightBGM, SVM, RNN etc.**

AI Customs Clearance Model

Finding risk levels of importation

- Machine Learning and Deep learning
- Generating group of high-risk importation for a certain period of time
- Measuring level of risks in importation by learning pattern of data



Focusing on high-risk items processing safe one through fast track

AI Prediction for possible delinquent taxpayers

Finding taxpayers with high risk

- Machine learning + Business Factors
- Calculate risk scores of taxpayers from the results of a machine learning model and business factors

Company	Risk Score	Risk Grade
정[illegible]	998	01등급
(주)에O [illegible]M	998	01등급
기[illegible]무	997	01등급
주식회사 [illegible]산	997	01등급
주식회사 듀[illegible]	997	01등급
[illegible] 주식회사 [illegible]	997	01등급
[illegible] [illegible]호	997	01등급
[illegible] Cor	996	01등급
[illegible] O	996	01등급
주식회사 스[illegible] 3C	996	01등급

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Cases II: AI Models with Expanded Range of Data

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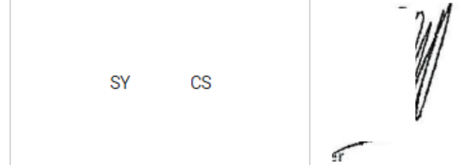
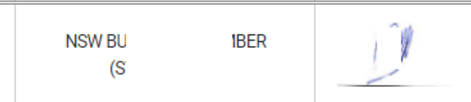
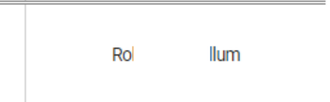
✓ Diverse data and technologies are used in AI modelling.

AI Identifying Counterfeit Documents

Comparing Similarity of Images

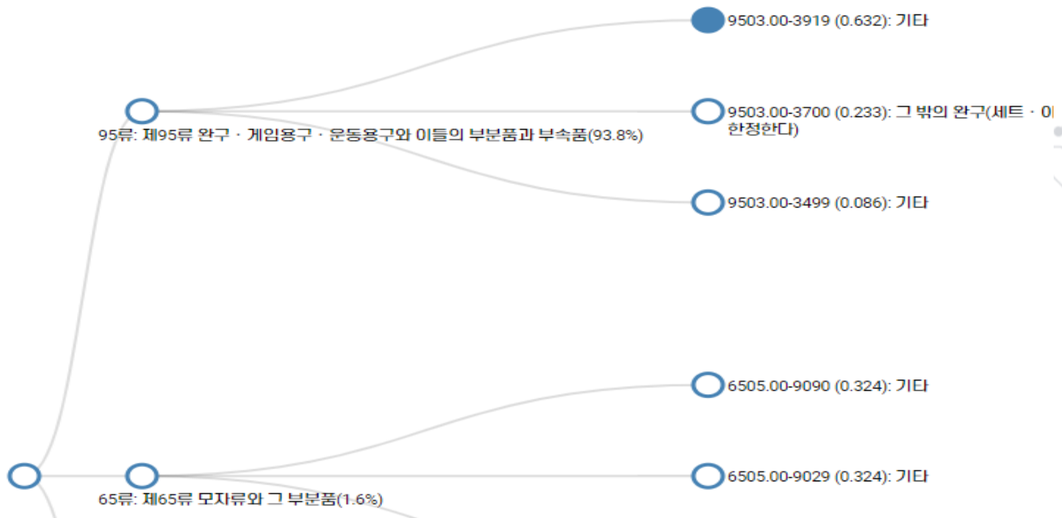
- CNN-based models
- Detecting objects(stamps and signatures from images) from the given images
- Comparing similarity of extracted images to the registered ones

Identifying counterfit Stamps/Signatures

		Issuing Authority Stamps		Issuer's Signature	
Targets					
1	Original				
	Results	60.05%	25.99%	49.17%	100%

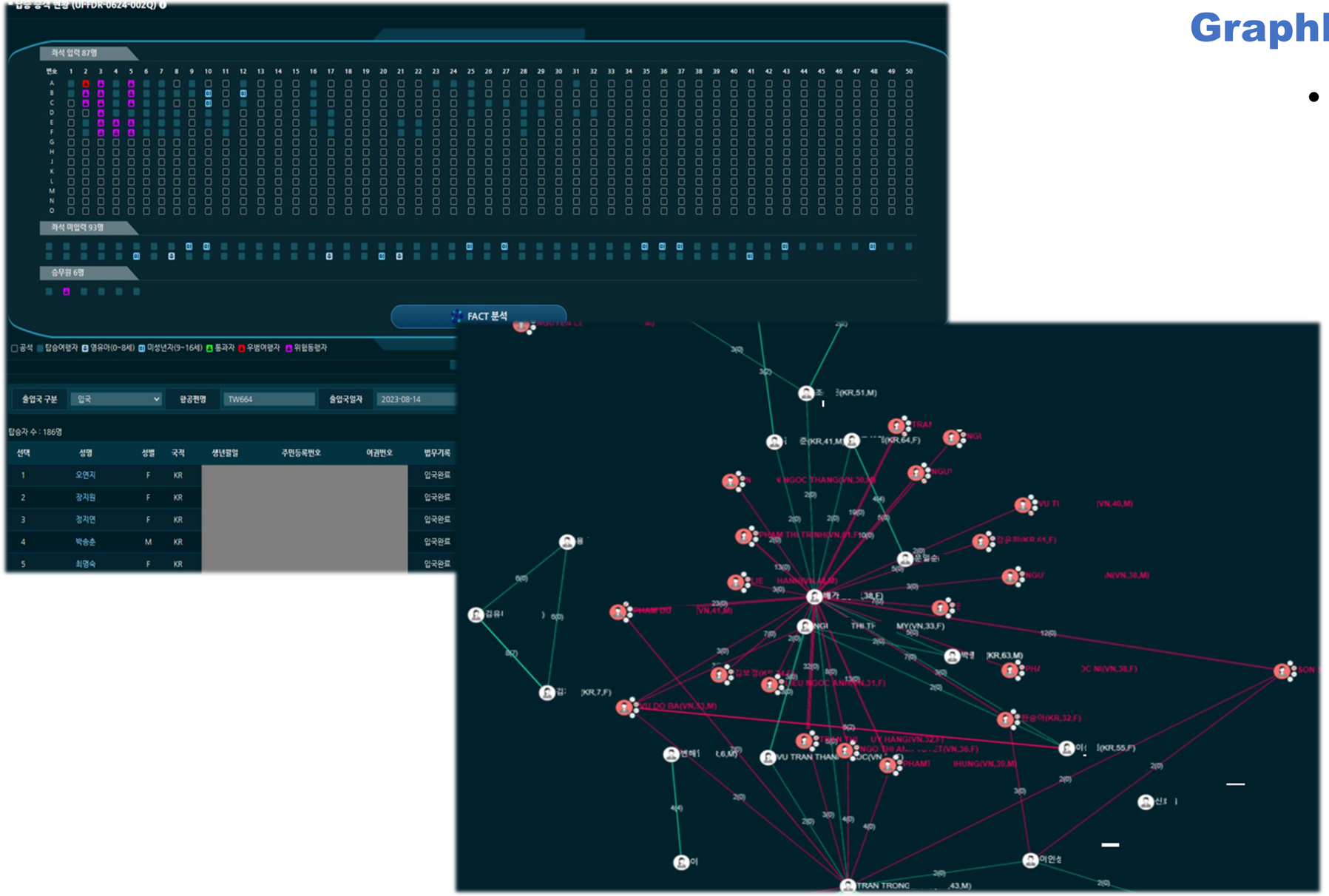
AI HS(Commodity Classification Code) Prediction Model

Recommending possible Commodity Code



- Random forest, SVM, Logistic regression
- Suggesting possible HS code based on the trained model from the declared item names, descriptions and their HS codes

Cases III: Advance Analytics(Network Analysis)



GraphDB, Network Analysis

- Discovering high-risk travelers, cargo, and delinquent taxpayers by analyzing their potential risk and identifying related factors based on network analysis.

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Thank you

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