



AAΔE

Independent Authority
for Public Revenue (IAPR)

SERVING PUBLIC INTEREST
AND SOCIETY AT LARGE

Utilising AI to Close the Tax Gap

**30th General Assembly of IOTA
Budapest, June 2026**

**Apostolos Boutos
Senior IT Advisor, IAPR**

Towards an AI-Augmented Audit Framework at IAPR

Embedding AI across the entire audit lifecycle



Data Collection & Cloud

LIVE

FOUNDATION

Cloud migration, web scraping, new data sources, real-time feeds from financial institutions & VAT systems (DRR/myDATA)



Data Engineering

LIVE

FOUNDATION

Scalable pipelines, unified taxpayer data lake, automated quality checks, structured + unstructured fusion



ML Case Selection

LIVE

DETECTION

Risk-scoring models, anomaly detection, supervised & unsupervised ML, continuous re-training loops



AI-Assisted Audits

NEXT

EXECUTION

Real-time AI co-pilot for auditors, automated document analysis, smart checklists, interview guidance



Model Explainability

NEXT

TRANSPARENCY

Interpretable AI outputs, auditor-facing explanations, SHAP-based attribution, regulatory audit trail



Legal Framework Support

NEXT

COMPLIANCE

AI-powered legal reference, case law retrieval, penalty calculation assistance, disputes resolutions and court-ready documentation

Currently Active

Next Phase




AAΔE


Independent Authority
for Public Revenue (IAPR)


Case Selection through Advanced Data Analytics

VAT Carousel fraud & fictitious trading — multi-layer B2B transaction network modelling + ML + visualization

DATA INPUTS

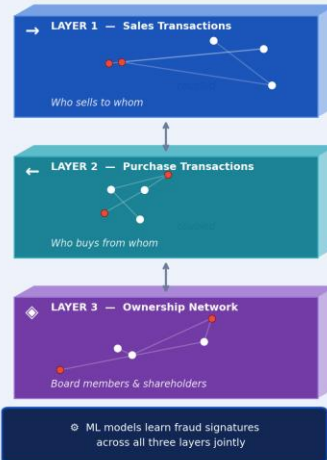
 **myDATA Platform**
~**35M** B2B transactions/year
Novel e invoicing and e books platform

 **Entity-Level Data**
~**1.5M** registered entities
VAT returns, facilities, employees

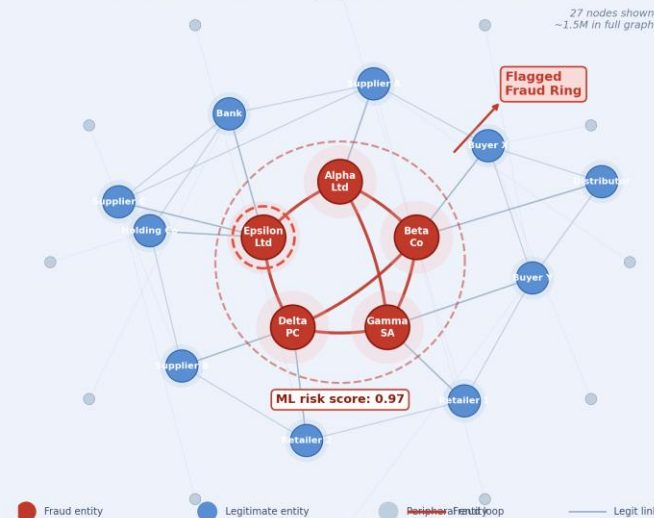
 **Relationship Data**
Board member cross-links
Ownership & director networks

MULTI-LAYER NETWORK MODEL · ML FRAUD DETECTION


Multi-Layer Network Model





B2B Transaction Network — Identifying Fraud Clusters via ML



ML APPROACH

 **Graph Analytics**
Network centrality & community detection on the multilayer graph

 **Supervised ML**
Gradient boosting on labelled fraud cases (graph node) from prior audits

 **Anomaly Detection**
Unsupervised clustering of unusual transaction patterns



AAAE

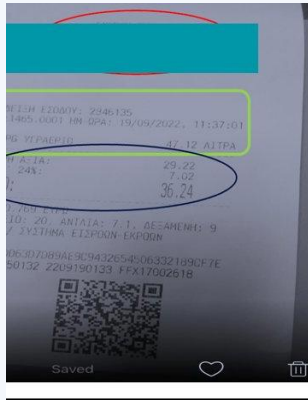
Independent Authority
for Public Revenue (IAPR)

Case Selection through Advanced Data Analytics

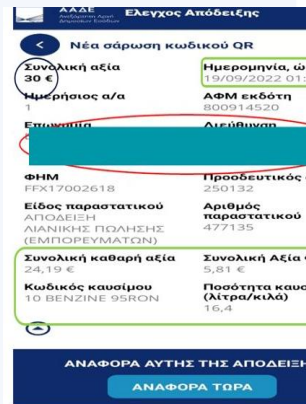
Fuel smuggling → Dealing with fake data → identifying organised crime networks

THE FRAUD: CORRUPTED DATA

① Real Receipt



② IAPR System



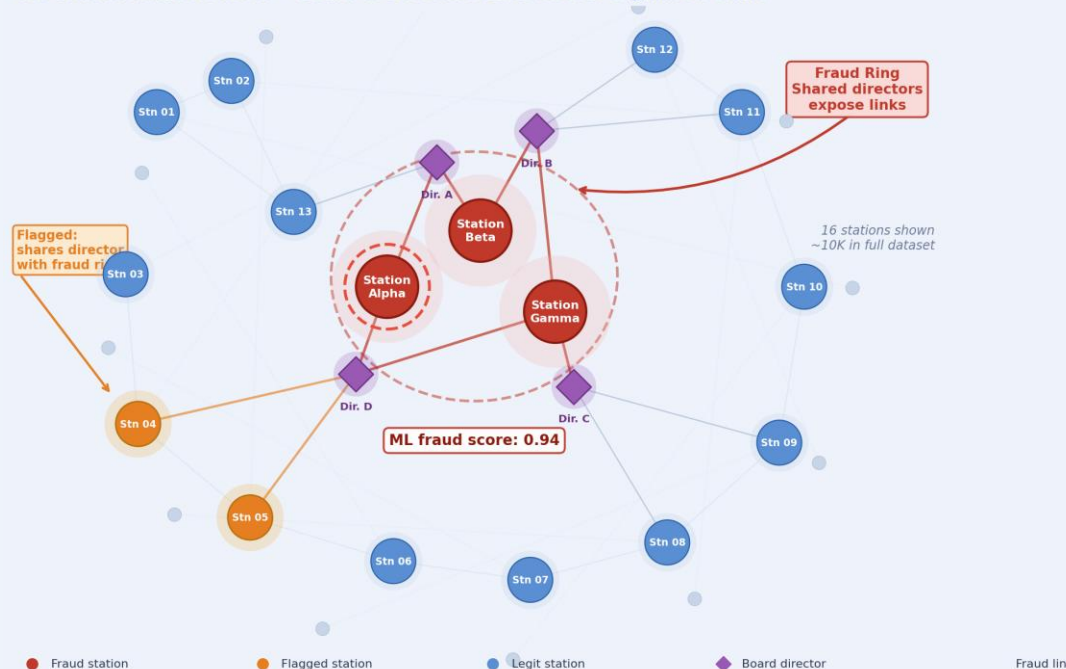
⚠ DATA SUPPRESSION DETECTED

Pump: **42.12 L LPG · €36.24**
Actual reading — never reported to IAPR

Reported: **16.4 L Benzine · €30**
-61% volume · wrong fuel type · undervalued

FRAUD NETWORK · BOARD-OF-DIRECTORS LINKS

Gas Station Fraud Network — Board-of-Directors Links Reveal Organised Crime



ML DETECTION

i-o-i Anomaly

Daily fuel-level discrepancies flagged: purchases \neq sales + fuel storage changes.

Network Features

Board-director graph injected into ML: shared directors, community scores, centrality.

PU Learning

Positive-Unlabelled method handles limited confirmed labels and noisy 0-labels from failed audits.

Fraud Score → Audit

Probabilistic 0→1 risk per station. Auditors prioritise high-score stations.

ML Case Selection: Results & Impact

From model output to confirmed fraud — detection rate, network audits & recovered revenue

DETECTION RATE UPLIFT FOR FUEL FRAUD

Before ML
7%
fraud detection rate

↓ ML Applied

After ML (last 3 years)
40–42%
fraud detection rate

× 6
improvement

63.2%
of identified fraud = major
tax & customs cases

Better allocation of audit
resources

REAL CASE — AMOUNTS RECOVERED

€1,986,356
Completed audits

Concealed revenue · 5 entities

Lost revenue recovered
€1,008,198
Evaded income · 5 entities

Ongoing audits
€12,015,421
Est. concealed revenue · 8 entities

Est. revenue at stake
€5,527,093
Estimated evaded income · 8 entities

Total exposure: **€13.5M+** across 13
entities



AADE

Independent Authority
for Public Revenue (IAPR)

AI Governance & Safeguards

Ensuring fairness, accountability and legal compliance in AI-driven tax enforcement at IAPR

MODEL INTEGRITY

Explainability

SHAP-based attribution explains every score. Auditors see exactly why each taxpayer was flagged.

Continuous Validation

Periodic re-training and back-testing. Precision, recall and AUC tracked and reviewed before each audit cycle.

Data Quality Controls

Automated checks for completeness and integrity before data enters the model. Corrupted records flagged, not silently used.

HUMAN OVERSIGHT

Human-in-the-Loop

ML produces a ranked list — auditors approve every case before any action. No automated decisions.

Multi-Level Review

Three independent sign-offs: data analytics team → senior auditors → audit planning unit.

Audit Trail

Full immutable log of every model run, score and reviewer decision. Supports internal and external inspection.

LEGAL FRAMEWORK

Legal Basis for Selection

Selection criteria grounded in Greek tax law. ML scores are analytical input — formal mandates follow established procedure.

GDPR & Data Protection

Processed under Art. 6(1)(e) GDPR (public task). Data minimisation and purpose limitation applied. DPA coordination in place.

Taxpayer Rights

Taxpayers retain full right to challenge findings. AI selection does not affect procedural rights — all appeals apply.

ACCOUNTABILITY

Open Documentation

Full documentation of model architecture, features and validation — available for regulatory review.

Bias & Fairness Checks

Outputs tested for bias across taxpayer segments (size, sector, region). Fundamentally different impact analysis before each deployment.

Independent Oversight

Annual review by IAPR internal audit unit. Results shared with Academia in peer-reviewed researches.

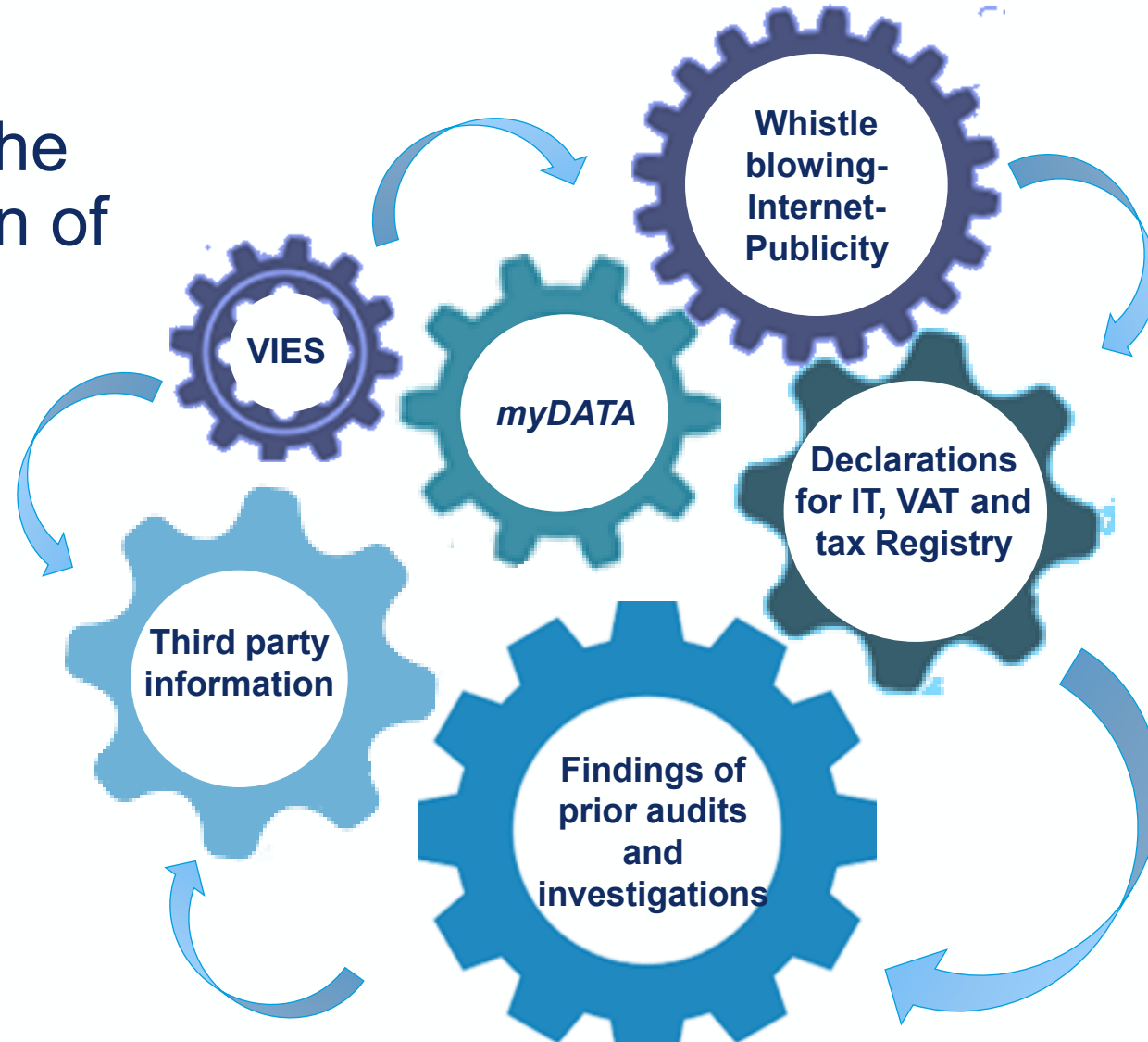


ΑΑΔΕ

Independent Authority
for Public Revenue (IAPR)

A new unit for tax and customs investigations

Management of information for the whole population of Companies/
Freelancers



ΑΑΔΕ

Independent Authority
for Public Revenue (IAPR)

Debt Management: Prevent, Assist, Recover and Enforce (PARE)

From Out-of-Court Workout to PARE system — prediction tools, heterogeneous approach, improved collection

Out-of-Court Workout (OCW) Debt Restructuring

- OCW is Greece's primary framework for debt restructuring. In place since 2017(v.2 2020) as part of the economic stability program
- Covers debts to tax, social security, banks and servicers, ensuring holistic financial solutions.
- **End-to-end Centralized Digital Solution**
- Aggregates debt, assets and financial data and uses algorithms to create fair restructuring proposals.
- Algorithm based approach, determines ability to pay and calculates installments (up to 240) and haircuts
- Holistic view, coordination and streamlined processes, tailored approach



ΑΑΔΕ

Independent Authority
for Public Revenue (IAPR)

PARE Segmentation Framework

The PARE framework categorizes debtors based on behavior, willingness, and capacity to comply, enabling targeted interventions

- Shift from “one-size-fits-all enforcement”
- Toward:
 - Behavior-based segmentation
 - Targeted interventions
 - Balanced use of enforcement and support

“PARE enables a tailored, risk-based debt management strategy—from enforcement to assistance—based on debtor behavior and capacity.”



AADE

Independent Authority
for Public Revenue (IAPR)

PARE Segmentation Framework

The PARE framework categorizes debtors based on behavior, willingness, and capacity to comply, enabling targeted interventions

1. Non-compliant by choice (Enforce)

- Debtors who deliberately choose not to comply
- Tax Administration applies: Immediate and systematic enforcement measures. Focus on rapid recovery

2. Unwilling to comply (Prevent / Enforce)

- Debtors who avoid compliance despite capacity
- Tax Administration:
Notifies obligations clearly
Issues warnings on consequences of non-compliance. Escalates actions where necessary



ΑΑΔΕ

Independent Authority
for Public Revenue (IAPR)

PARE Segmentation Framework

Supportive & Compliance-Oriented Segments

3. Willing but unable to comply (Assist / Recover)

- Debtors who want to comply but face financial or operational constraints
- Tax Administration response: Supportive approach
- Provision of: Payment arrangements, Targeted guidance, Digital support tools (e.g. reminders for payments and instalments)

Goal: **facilitate sustainable compliance**

4. Consistently compliant debtors (Prevent / Reward)

- Debtors with a strong history of compliance
- Approach: No need for intensive monitoring or scoring
- Consideration of incentives or recognition mechanisms

Objective: **maintain positive compliance behaviour**



ΑΑΔΕ

Independent Authority
for Public Revenue (IAPR)

ML for Prediction Uplift and Recovery Rates

OECD pilot project to predict repayment rates after interventions

Measuring heterogeneous reminder responses after different intervention letters

- Behavioral approach to identify top variables that were associated with response heterogeneity

Total Income / Pre Recovery Rate / Athens-based? / Total Debt Load / Age / Marital Status

- Causal Forest Method was used
- the model looks for “**statistical siblings**” to predict individual recovery rates
- recovery rate = (amount paid / amount owed) for a given period

Building a Predictive Tool

- We trained a new ML model on the trial data, this time only using the top 6 variables
- **The Result:** A dashboard where you can find the expected repayment rates across all conditions (i.e. the unique combinations of values across the above six variables)



ΑΑΔΕ

Independent Authority
for Public Revenue (IAPR)

PARE Segmentation Framework

Towards an AI augmented debt recovery framework

- Keep improving segmentation and uplift prediction with ML algorithms
- **Future steps include**
 - exploring AI agents for suggested interventions per individual
 - Assistance of the debt recovery officers with AI-powered legal reference, documentation preparation etc.



ΑΑΔΕ

Independent Authority
for Public Revenue (IAPR)

**Thank
you!**



AAΔE

Independent Authority
for Public Revenue (IAPR)

SERVING PUBLIC INTEREST
AND SOCIETY AT LARGE