AISYM4MED

Synthetic and scalable data platform for medical-empowered AI

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UK Research and Innovation

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Federal Department of Economic Affairs, Education and Research EAER
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Aim: streamline the development of robust medical AI solutions and their integration in clinical settings

Consortium

- Strong network of partners
- Interdisciplinary
- Different backgrounds
- Complementary knowledge, skills and resources.

15 partners	8 countries	4 years	+6M€ Total budget

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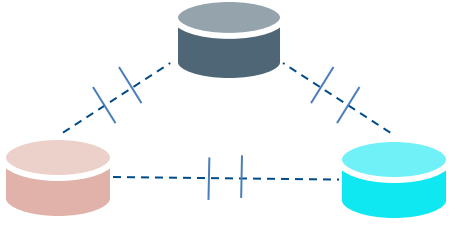
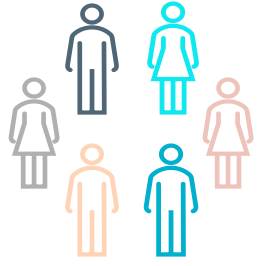
Motivation

The integration of medical AI algorithms faces several challenges, mostly arising from healthcare data.



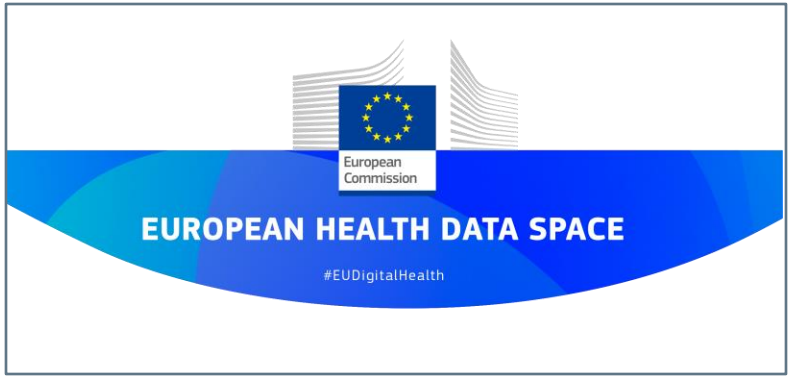
1 Datasets are scattered, disconnected, and of difficult access (privacy concerns)

2 Lack of pathological episodes



3 Data and models biased on different sociodemographic conditions

Regulatory transition in Digital Health



BRIEFING

EU Legislation in Progress

European Parliament

Artificial intelligence act

Medical Device Regulation: **Software as a medical device**

REGULATION (EU) 2017/745 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 5 April 2017

on medical devices, amending Directive 2001/83/EC, Regulation (EC) No 178/2002 and Regulation (EC) No 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC

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Needs

Healthcare Data

1

- Anonymisation
- Privacy-preservation
- Standardisation
- Centralisation
- Improved quality and completeness

AI-Based Solutions

2

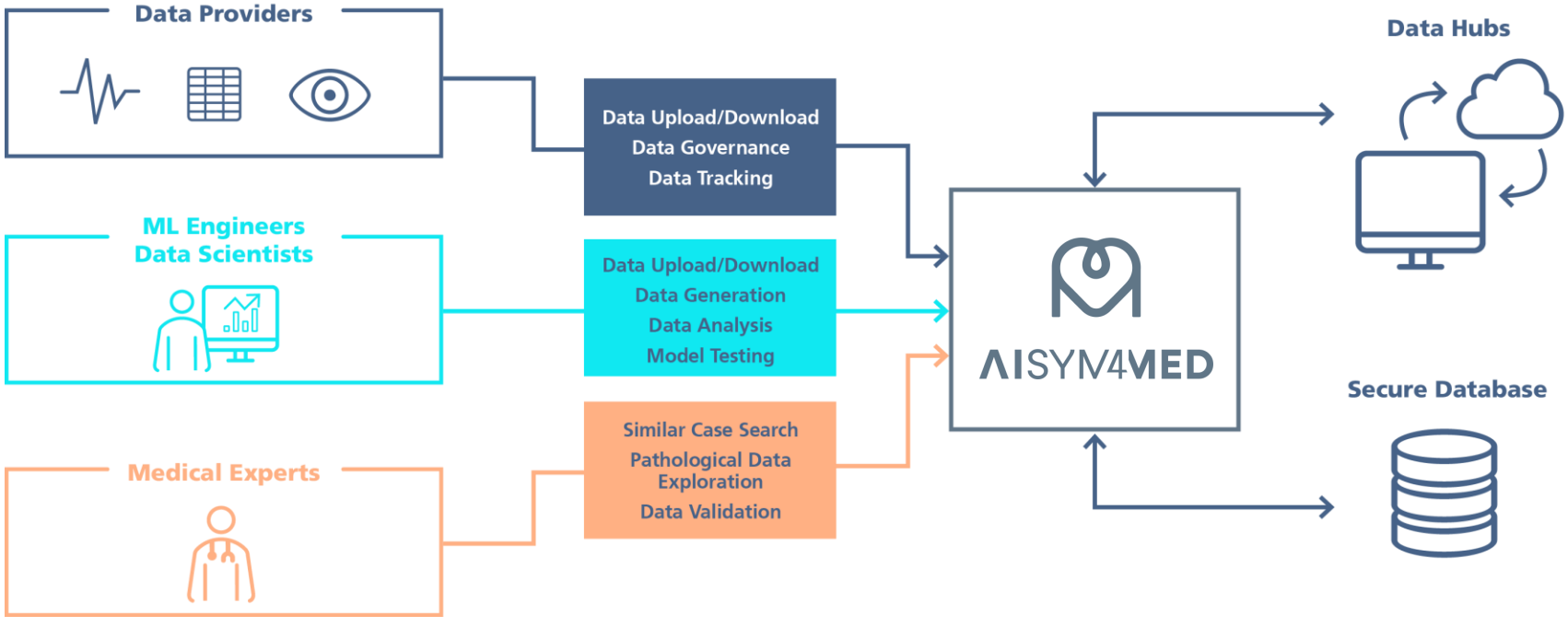
- Access to better data:
  - large amounts
  - high-quality
  - representative
- Real-world validation
- Continuous auditing

Improved Care

3

- Reduction of bias
- Increased efficiency
- Improved knowledge creation and sharing
- Better representation of rare pathologies

General Schema



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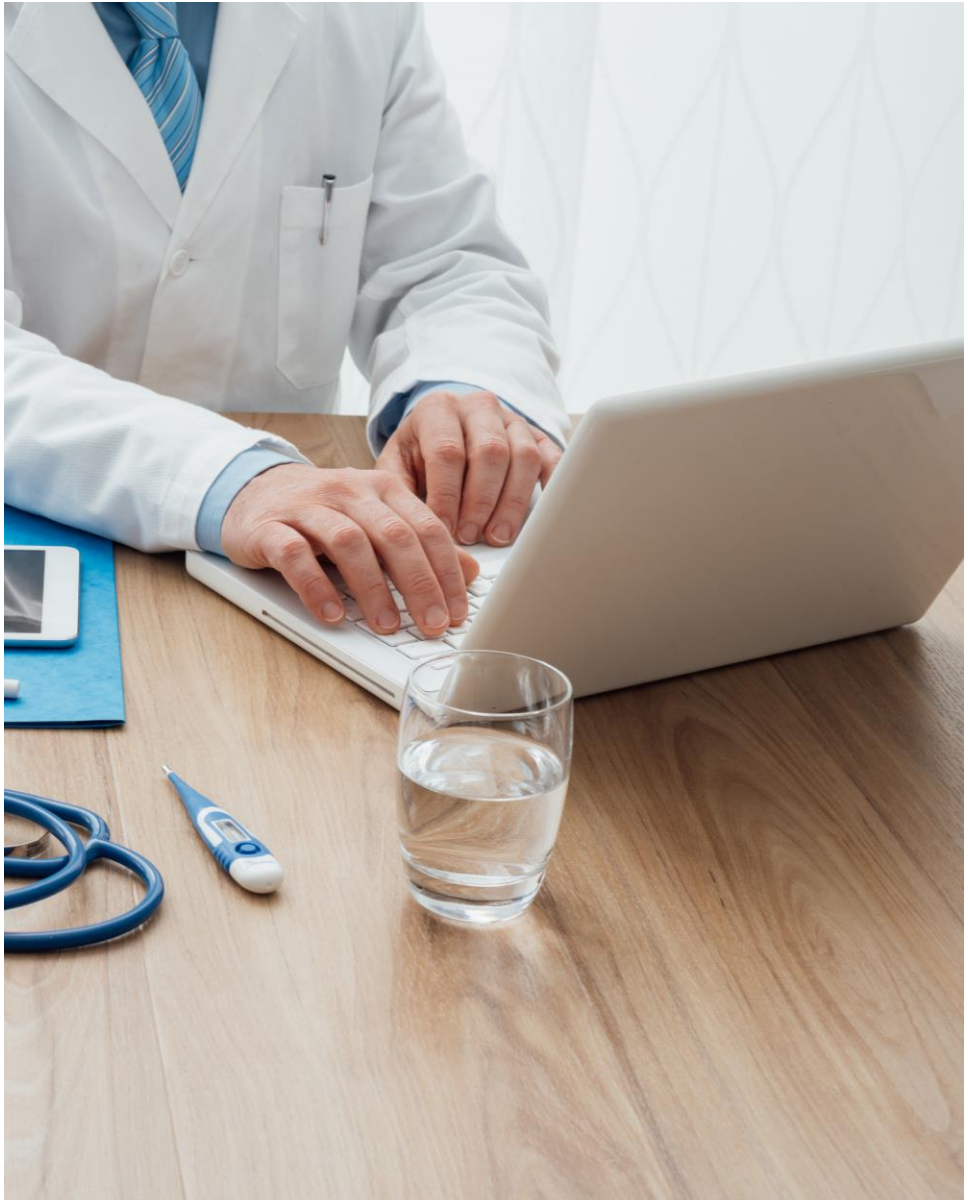
Data Auditing: goals

Main goal

- Ensure that the data included in the platform complies with the needed requirements for medical applications.

How?

- Design, develop and test methods for input validation;
- Design, develop and test methods for validation of synthetic data.



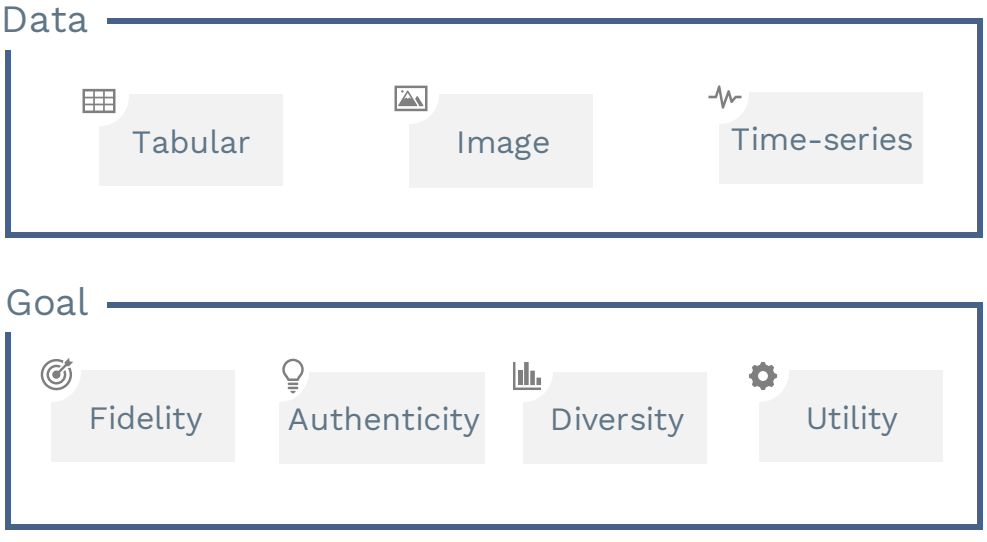
Data Auditing: analysis pillars

A data auditing repository that collects different metrics under four main pillars:

- Fidelity
- Authenticity
- Diversity
- Utility

Supported data modalities:

- Tabular
- Image
- Time-series



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Clinical Notes and Anonymization

Healthcare Data

- Highly Sensitive (Protected)

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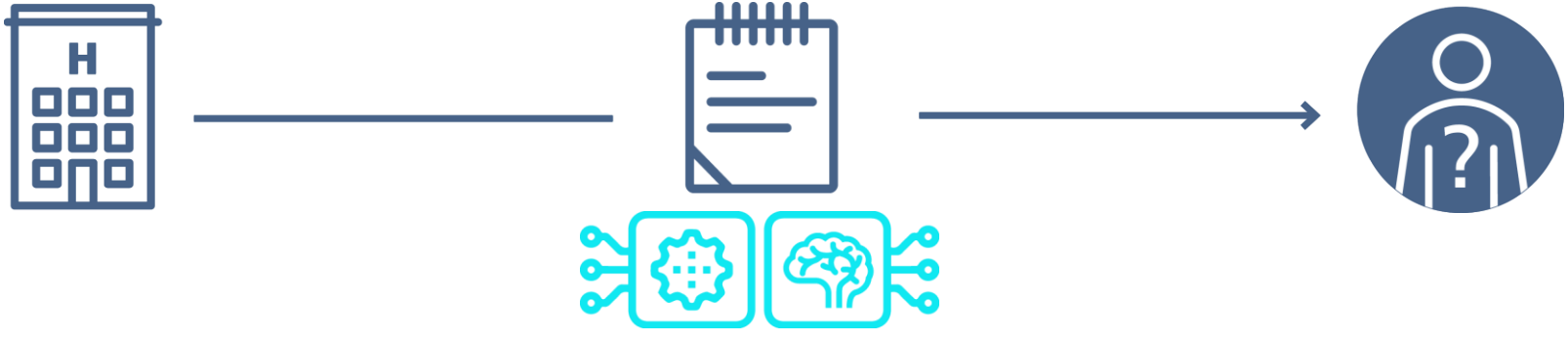
Clinical Notes and Anonymization

Healthcare Data

- Highly Sensitive (Protected)
- 80% Unstructured (Like Clinical Notes)



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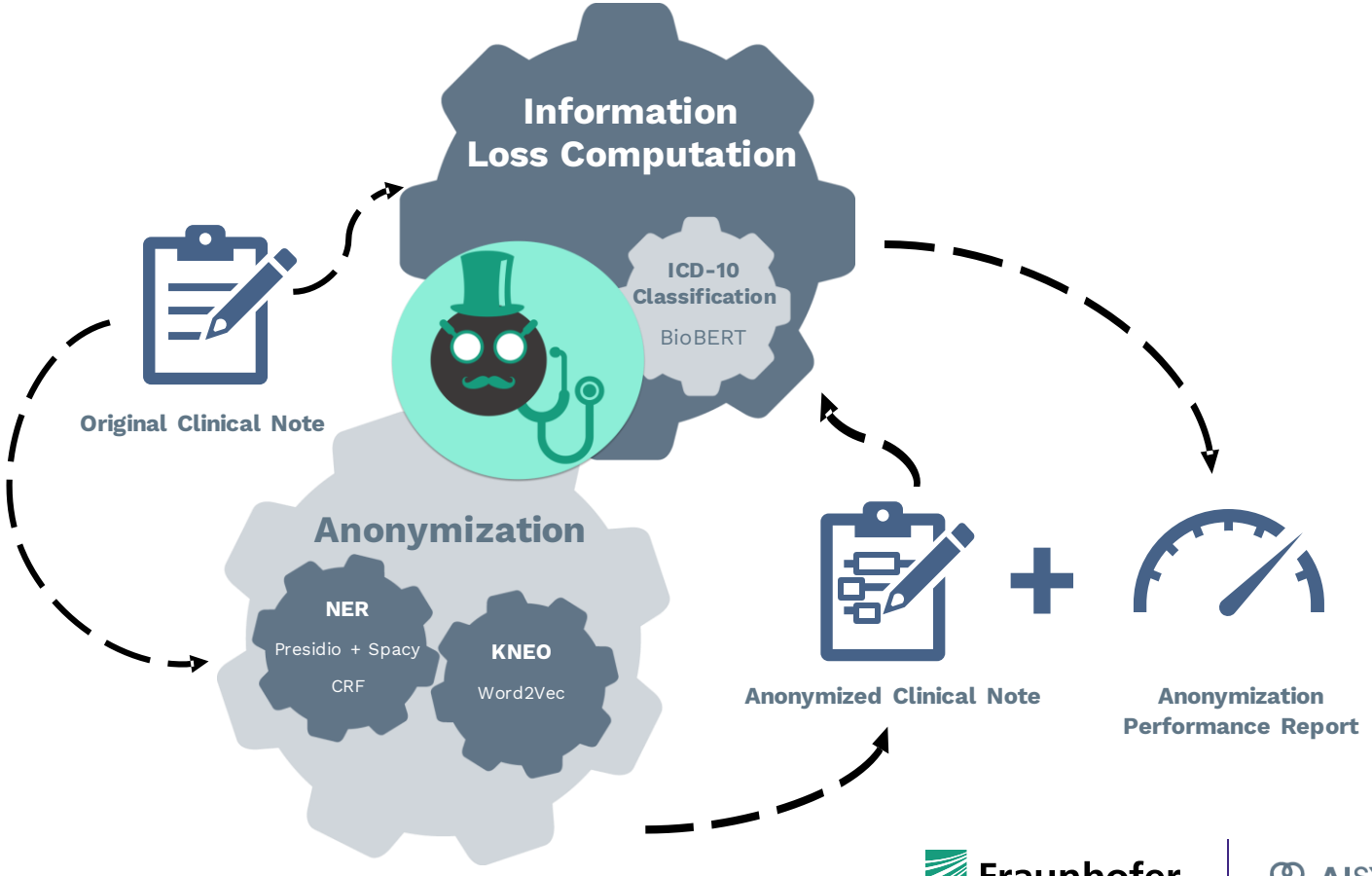
INCOGNITUS – Toolkit for Clinical Notes Anonymization



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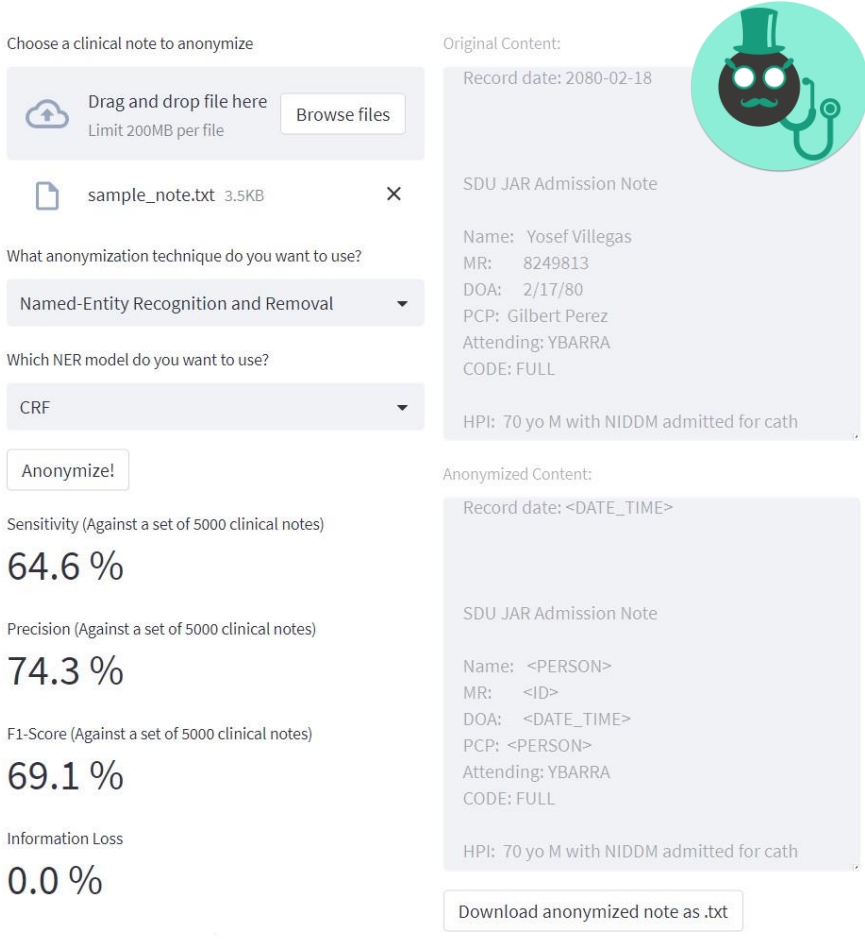
INCOGNITUS – Toolkit for Clinical Notes Anonymization

- **Conditional Random Fields**
- **Microsoft Presidio + Pre-trained Models**
- **Word Embeddings Substitution**
- Zero/Few – Shot Learning with LLMs
- Fine-tuned LLMs
- **New Evaluation Metrics**
  - Clinical Information Loss
  - “Levenshtein Recall”
  - “Embeddings Similarity Recall”



Ribeiro, B., Rolla, V.G., & Santos, R. (2023). **INCOGNITUS: A Toolbox for Automated Clinical Notes Anonymization**. Conference of the European Chapter of the Association for Computational Linguistics.

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Synthetic data generation

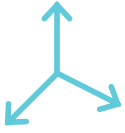
Electrocardiogram (ECG)

Arrythmia detectio n

Electroencephalogram (EEG)

Epilepsia detection

Accelerometer Data (ACC)



Parkinson detection

Retina Fundus Image

Glaucoma

Demographic and heath data

Stroke detection

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Model Auditing: goals

What?

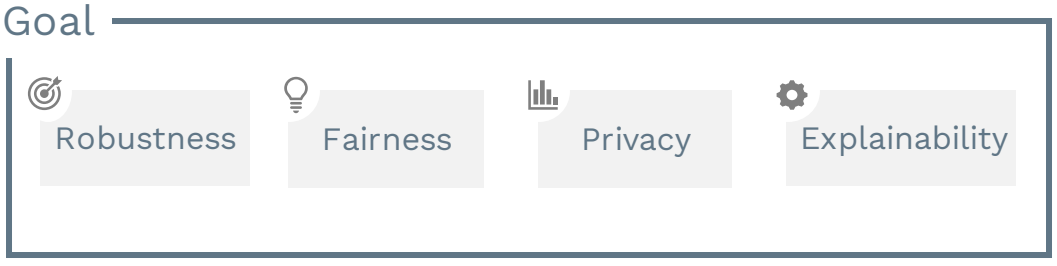
- Give the users insights about their models, ensuring responsible AI development.

How?

- Design, develop, and test methods for auditing machine learning models;
- Audit if models are GDPR compliant;
- Provide insights by filling model cards with relevant information about model robustness and limitations.

Model Auditing: analysis pillars

A model auditing repository that analyses different model properties under four main pillars



1 **Supported data modalities:**
- Tabular
- Image
- Time-series

2 **Supported models:**
- Deep Neural Networks
- Sci-kit learn ML models
- Boosting models

3 **Supported model tasks:**
- Classification
- Regression

(to be expanded for future versions of the platform)

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To improve the healthcare digital ecosystem

Thank you. Follow us and discover more.

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