Towards Efficient and Explainable Automated Machine Learning Pipelines Design

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Contexte

- **Automated selection** & **parametrization** of machine learning algorithms.
- **Guided** Hyperparameters optimization.
- Optimal **performance** of ML models for a given classification task.
- **Explainability** of the **recommended** models.
- Application to the **Industry 4.0**.
- **Empirical study** on manufacturing data for **validation** and **usability** purposes.

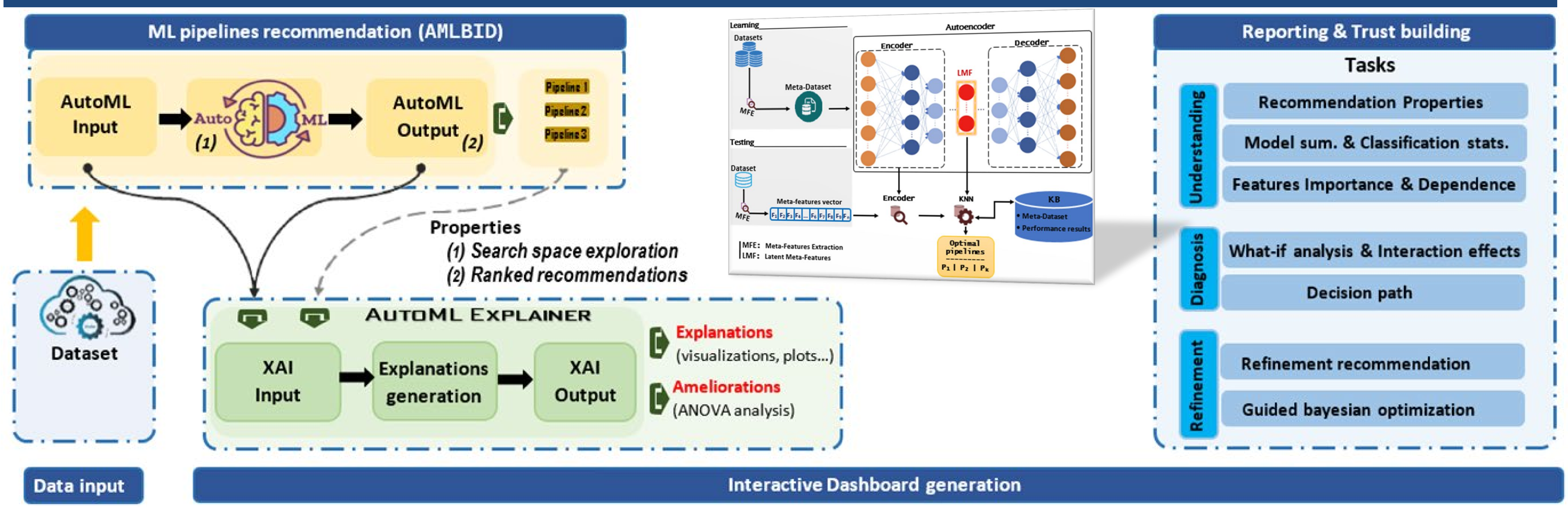
Key concepts

Automated Machine Learning (AutoML) Auto ML is often used to help domain experts, who typically have limited ML expertise, in order to generate and build high quality models to better meet their specific business needs.

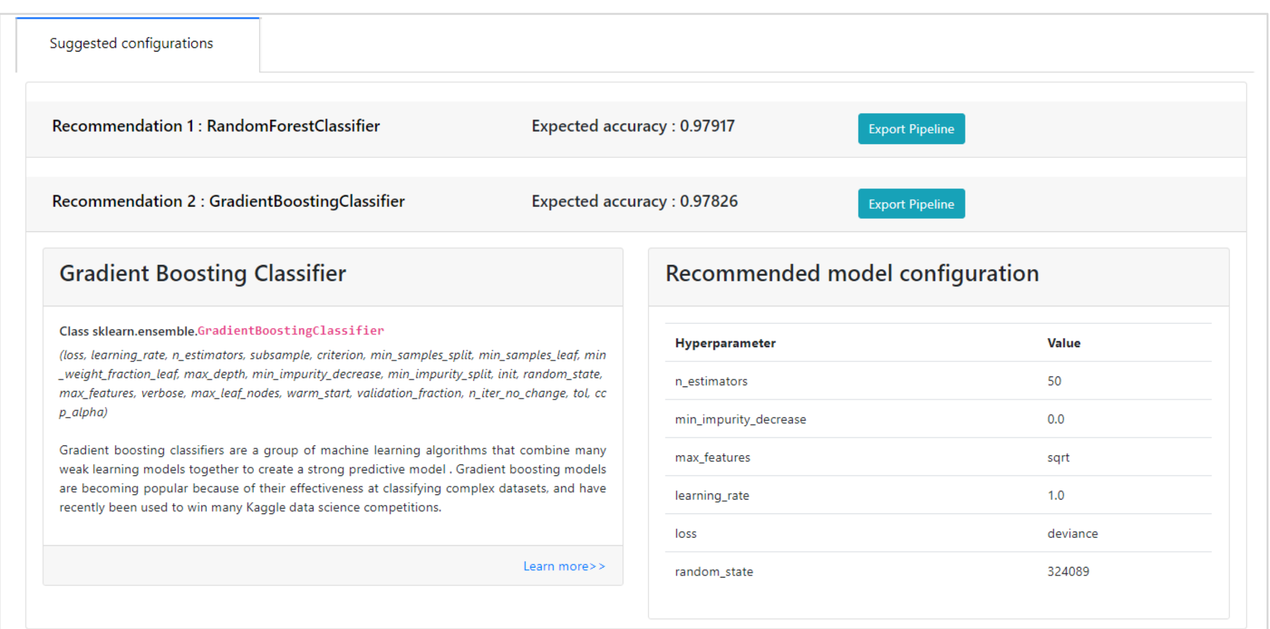
Meta-learning refers to the algorithms that are concerned with their own learning process as well as learning across a series of related prediction tasks.

Explainable AutoML (XAutoML) provide a set of tools and frameworks to better understand and interpret the predictions of a machine-learning model.

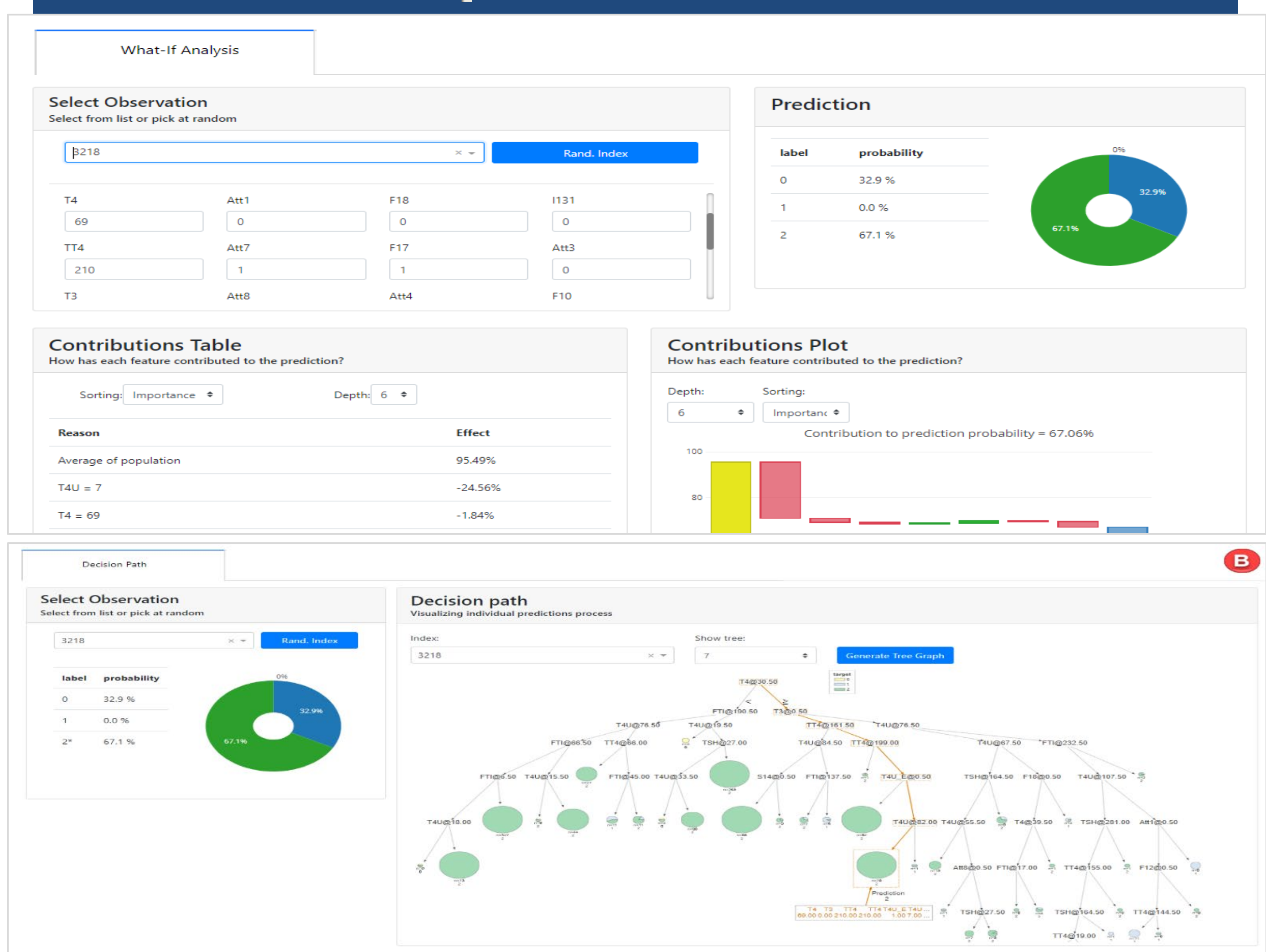
Proposed assistance system



Recommender module



Explainer module



AMLBID package

AMLBID is a self-explainable AutoML system in the form of a Python-package. The system proposes a transparent and justified analysis to discover the most suitable model for optimal performance among multiple ML models. It attempts to automate the process of the algorithms selection, the tunning of hyperparameters, and traceability in supervised ML.

```
from AMLBID.recommender import AMLBID_Recommender
from AMLBID.explainer import AMLBID_Explainer
from AMLBID.loader import *

#Load dataset
Data,X_train,Y_train,X_test,Y_test=load_data("Dataset.csv")

#Generate the optimal configurations
model,config=AMLBID_Recommender.recommend(Data,
                                metric="Accuracy",
                           mode="Recommender_Explainer")
model.fit(X_train, Y_train)

#Generate the interactive explanatory dash
Explainer = AMLBID_Explainer.explain(model, config,
                                     X_test, Y_test)
Explainer.dash()
```

Results

- **Garouani, M.**, Ahmad, A., Bouneffa., *et al*. Using meta-learning for automated algorithms selection and configuration: an experimental framework for big industrial data. *Journal of Big Data* 9, 57 (2022). https://doi.org/10.1186/s40537-022-00612-4
- **Garouani, M.**, Ahmad, A., Bouneffa, M, *et al*. Towards big industrial data mining through explainable automated machine learning. *The International Journal of Advanced Manufacturing Technology* (2022). https://doi.org/10.1007/s00170-022-08761-9
- **Garouani, M.**, Ahmad, A., Bouneffa, M., *et al*. AMLBID: An Automated Machine Learning tool for Big Industrial Data. *SoftwareX* (2021) 100919, https://doi.org/10.1016/j.softx.2021.100919

- Scan the QR Code to explore all results and publications

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