

# Towards An Efficient Real-time Approach To Banking Decision making Using Deep Learning

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## BACKGROUND

"Salary, propensity to spend or on the contrary to save, favorite businesses, ... **Financial institutions** know everything about their customers, or almost. A **gold mine** that is better than ever to exploit." *Christine Lejoux, a finance journalist in Les Echos*

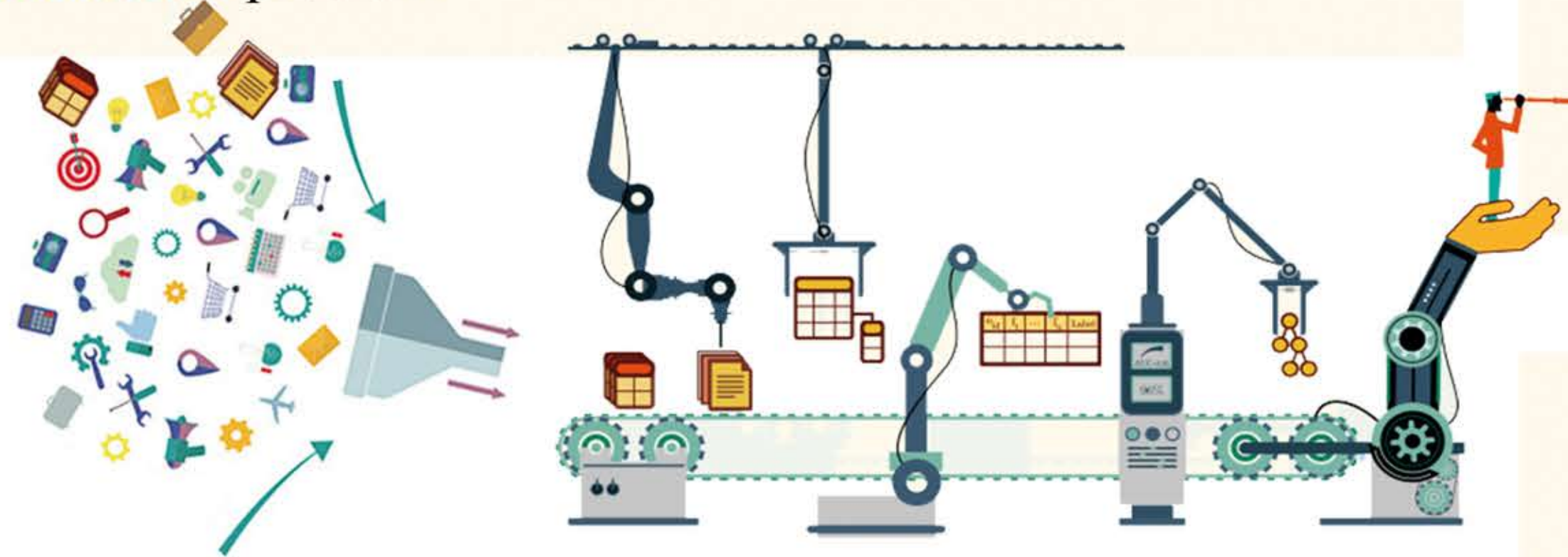
By 2020, business transactions on the internet—business-to-business and business-to-consumer—will reach **450 billions** per day *International Data Corporation report*

Lenders need the right **automated decision** platform to store, collect, **quickly process** and **analyze** the volumes of consumer data to gain **accurate** consumer stories and **decisions**

**78 %** of all organizations experimented payments **fraud** last year, a total of **700** treasury and finance professionals. *Association for Financial Professionals Payments Fraud*

## MOTIVATIONS

- **Machine Learning** a state of the art tool for **decision making**
- **Deep Learning** a new way in machine learning
- **Real-time** data processing an important field of research
- **Credit Card Fraud** and **Loan approval** as a **Binary Classification** problem



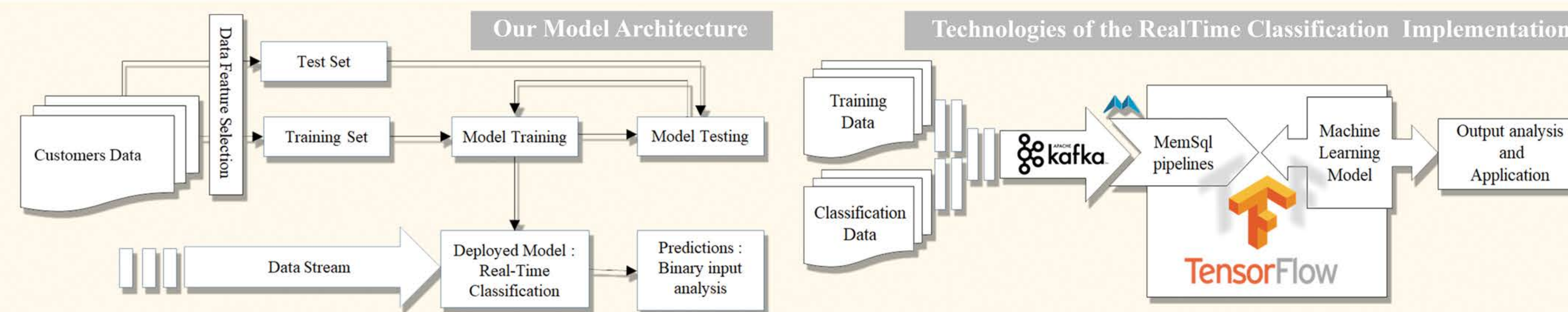
## PURPOSE

Build an **effective** and **proactive** system for **decision making** using state of the art **Machine Learning** technologies

## NOVELTY

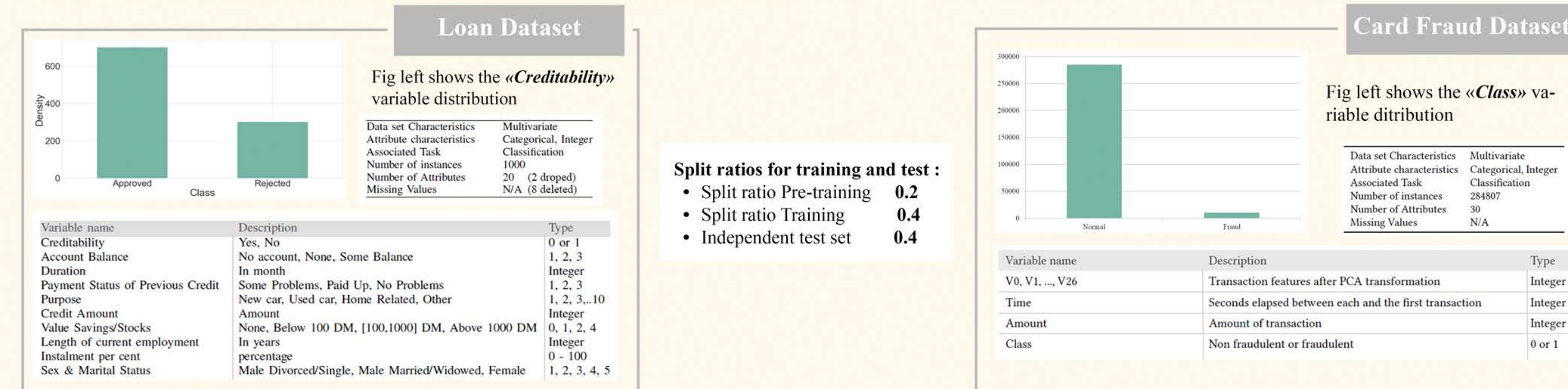
1. A **Real Time** approach to **loan approval** procedure and **credit card fraud**
2. Model build on a **Deep Neural Network** based on an **Auto Encoder**
3. Using different Binary Classification models for **benchmark** :
  - *Linear SVM Regression*
  - *Logistic Regression*
  - *Non Linear autoregression*
  - *Simple Feedforward NN based Classification*

## METHOD AND TOOLS



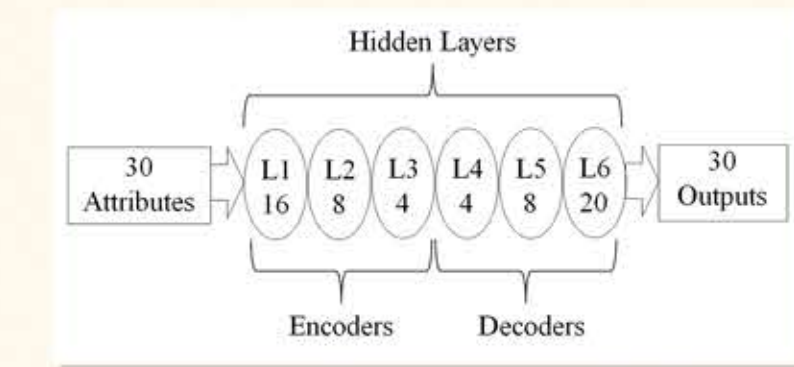
Classification method based on two stages: First, a periodical offline training of the historical data, by which we build our machine learning models. Second, the models are used for prediction on a live stream of new data.

Figure above shows the methodology followed and the technologies[10][9] used to produce the results.



- Split ratios for training and test :
- Split ratio Pre-training **0.2**
  - Split ratio Training **0.4**
  - Independent test set **0.4**

## Auto Encoder



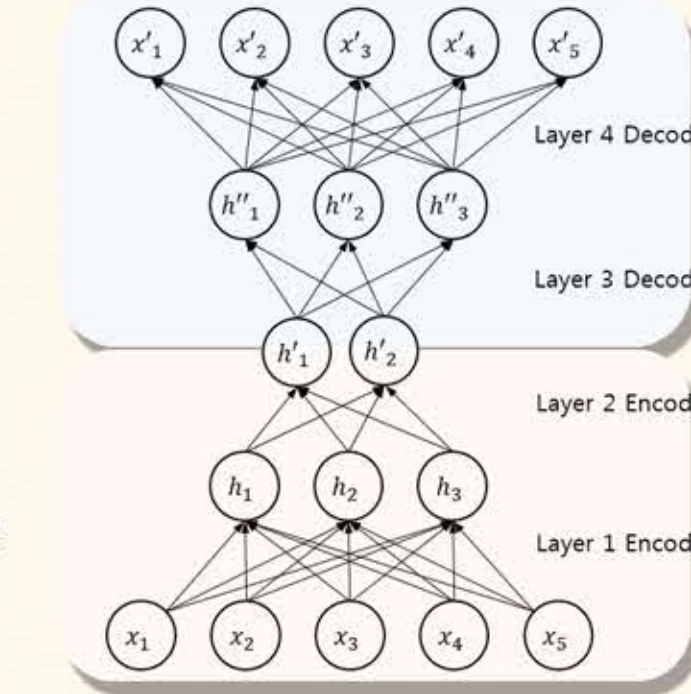
Each hidden layer is noted by L1, L2... followed by the number of neurons in each layers ( example of the network used for fraud detection)

- **Activation function** : Tanh
- **Loss** : mean\_squared\_error
- **Optimizer** : adam

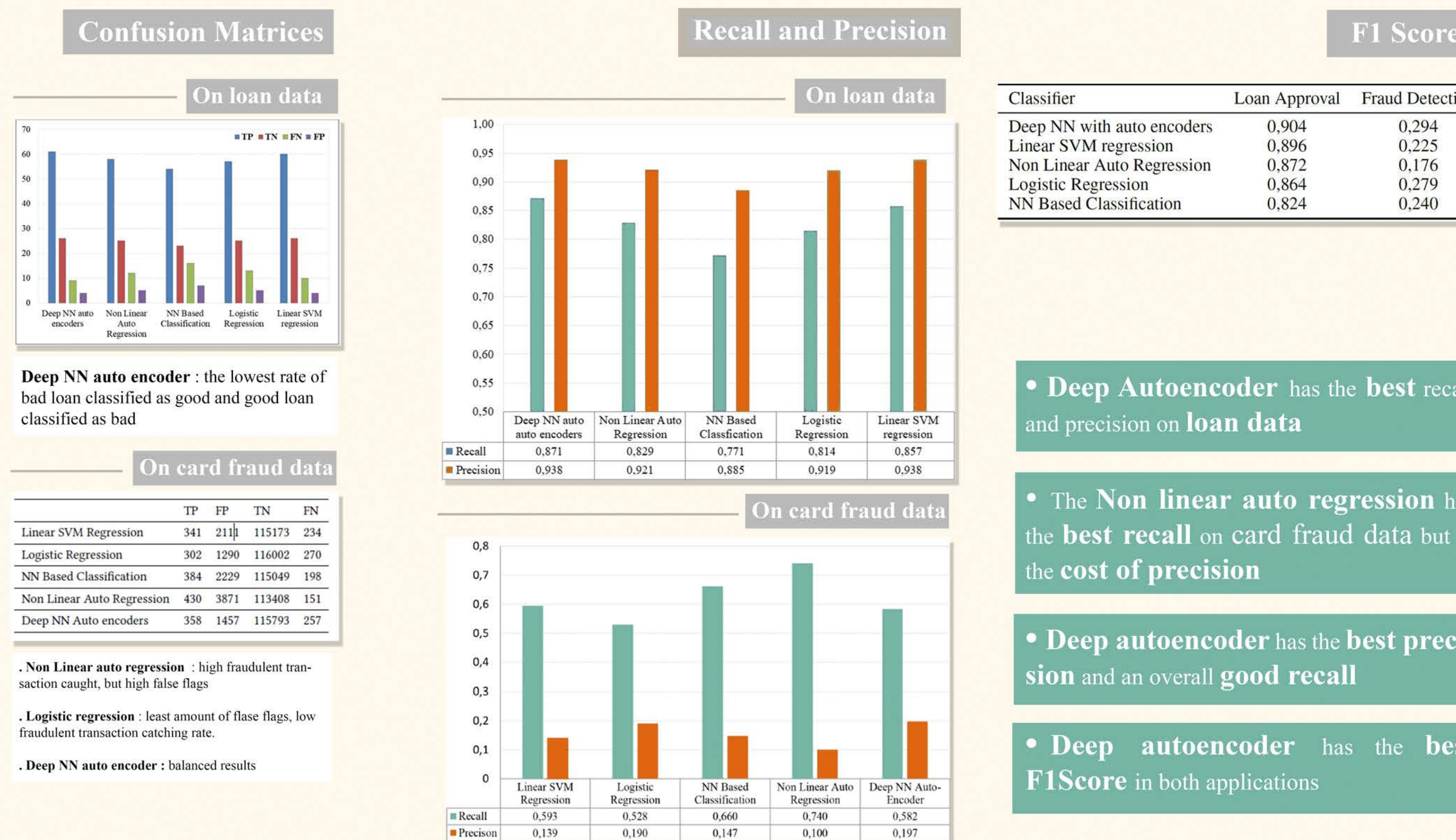
- An Auto Encoder is :
  - A **Deep Neural Network**
  - An **unsupervised** learning algorithm
  - **Data-specific**. No explicit labels to train on, the labels are self generated within the model.
- The neural network's **target output** is its **input**

**Encoder** : compressing of the input into a fewer number of neurones .

**Decoder** : the input is re-constructed using the encoding of the input .



## RESULTS



- **Deep Autoencoder** has the **best recall** and **precision on loan data**
- The **Non linear auto regression** has the **best recall on card fraud data** but at the **cost of precision**
- **Deep autoencoder** has the **best precision** and an **overall good recall**
- **Deep autoencoder** has the **best F1Score** in both applications

## CONCLUSION

- **Deep Neural network** with **Auto Encoder** **best** for this case of study
- The benchmarks show that our model gives **better results** than the **baseline models**
- By **Improving the models** hyperparametres we can get **better results**
- Future studies will be focusing on :
  - Applications of this model on the **financial sphere**
  - **Deep Learning** for **Real-time** binary classification problems
  - **Risks management** in the banking sector



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