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**NeuroDecision: fully explainable
AI to boost financial inclusion**

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Our motivation to use AI

For decades, creditors have used **analytical models** to help make lending decisions and assess creditworthiness. The models predict how likely is it someone will pay back a loan

Why start to use **Machine Learning**?

- Machine learning models make **more accurate** predictions
- That means consumers get better access to credit and better protection from overindebtedness (**UN Agenda 2030** - Post-Covid resilience)
- We want Europe to reduce the gap with main AI players: US and China



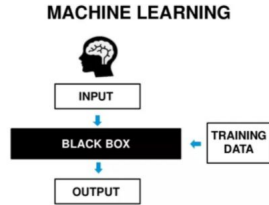
The challenge and solution?

- Credit scoring with machine learning that makes authorities and consumers happy
- **Fully explainable AI** - a machine learning model with no black box

NeuroDecision Technology. A differential approach

Challenge

- Machine learning models are more predictive than tradition models that tend to use simpler algorithms (eg logistic regression)
- But the more complicated the algorithm, the harder it is to explain
- This leads to a black box effect - you cannot explain how the model works or the decisions it makes. it is also harder to control so the model can do strange things - a consumer might pay their credit card bill and their credit score gets worse.



Partially explainable AI models

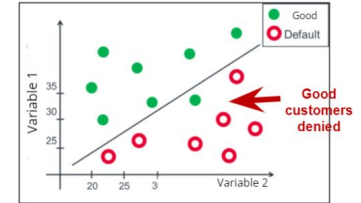
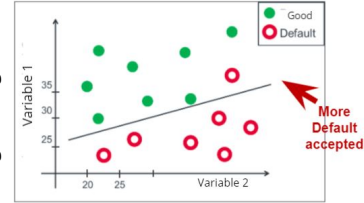
- Scientists have developed many ways to partially explain how AI models work
- But those techniques cannot explain every individual decision the model makes
- That means some consumers may get the wrong explanation when they are declined credit, and lenders cannot completely control the models

Our solution - a fully explainable model

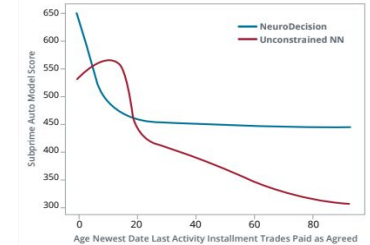
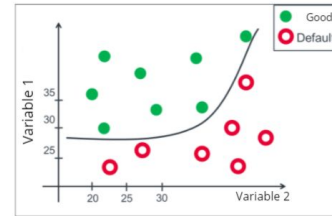
NEURODECISION TECHNOLOGY

- We adapt machine learning models so they are explainable
- Neurodecision Technology (NDT): a two layer neural network with a monotonic constraint.
- That constraint means every input in the model moves a credit score up or down in the right direction. Eg if you pay your credit card bill, your score will never get worse.

Logistic Regression



Machine Learning



NDT: A use case with a Tier I Bank

Context

We did two proofs of concept with a **Tier 1 European Bank** using data from Denmark and Austria

Objective

To develop credit scores using historic credit data from consumer credit models then **compare which was better at predicting if a consumer will default: a traditional model** (logistic regression), **partially explainable AI models** (including neural networks with no monotonic constraint) and **NDT** (our fully explainable model). **All models used the same data**

Results

NDT is **more predictive than traditional models** and broadly **as predictive as the less explainable AI models**, leading to improve financial inclusion while respecting regulatory needs

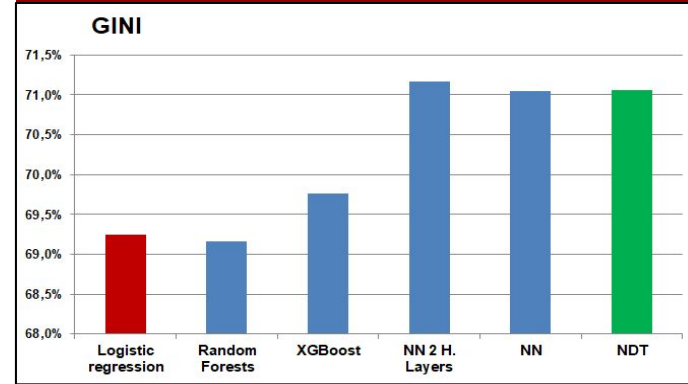
We also proved that **with NDT every decision is explainable** (as in the case of traditional models) where the other AI models can give counterintuitive explanations

Next Steps

NDT will be part of the first group of projects to participate in the **Spanish Regulatory Sandbox**.

A Regulatory Sandbox is a virtual space controlled and supervised by the Government, where tech companies working in the Financial Sector can develop innovative projects without the burden of following strict legal regulations

Ability to predict correctly if a consumer would repay credit: how accurate are traditional models (red), partially explainable AI models (blue) and NDT (green)?



What have we learnt?

Consumers and lenders will benefit if we can use the **power of AI** to make **creditworthiness models more accurate**

The **benefits** are:

- **Financial Inclusion:** More consumers and business get **affordable finance**
- **Borrowers are better protected from overindebtedness** (the rate of non-performing loans is lower)

If you cannot explain how a model makes every individual decision then some consumers may suffer harm. **NDT** is one way to do that: it combines the power of AI but is as **explainable** as the models we have used for decades

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