

# BellaDati Advanced IoT Framework for Probabilistic Credit Score Prediction



It is key for the financial institution to predict risks that are related to their loan portfolio to keep related losses at the required level. It is key for the financial institution to be able based on the information about the applicant to predict what size of probable loss can be generated by the applicant. BellaDati Advanced IoT Framework performs probabilistic credit scoring for loan applicants using its machine learning studio.

In this case the global banking institution required to determine whether a loan will default, as well as the loss incurred if it does default. Unlike traditional finance-based approaches to this problem, where one distinguishes between good or bad counterparties in a binary way, we seek to anticipate and incorporate both the default and the severity of the losses that result. In doing so, we are building a bridge between traditional banking, where we are looking at reducing the consumption of economic capital, to an asset-management perspective, where we optimize on the risk to the financial investor.



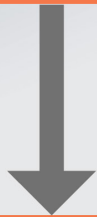
# BellaDati Advanced IoT Framework for Probabilistic Credit Score Prediction

The algorithm that is used for credit scoring was developed by CGI and BellaDati Analytics IoT Framework and its studio was used as end-to-end solution. Algorithm use Boosted Decision Tree Method.

## Gradient Boosted Trees

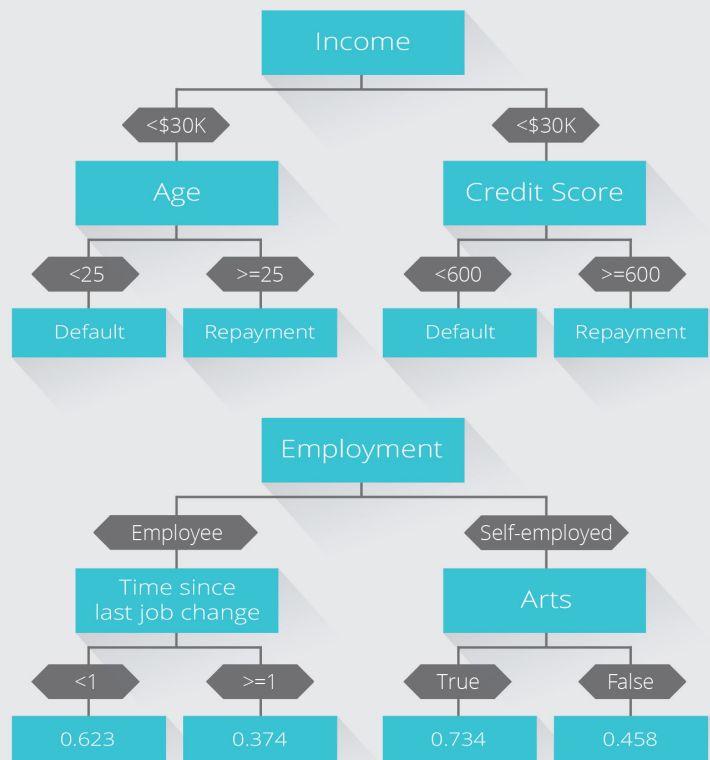
### Classification:

Solution to the original binary problem



### Regression

Predicts the part of the loan that will not be repayed



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The bank use standardized forms. The applicant can fill in the application on line or in the paper form using for example this form. BellaDati Analytics IoT Framework can create any customized form that is used for on-line data submission. The data about each applicant are recorded in Belladati database. The applicant can submit the application in the paper form, the application form is scanned and data about applicant are transferred to BellaDati database.

## Application

### 1 NOTE AND COMPLETE

Married Applicants may apply for a separate account. Check the appropriate box to indicate Individual Credit or Joint Credit.  
 **Individual Credit:** Complete **Applicant** section. Complete **Co-Applicant, Spouse, Guarantor** (referred to as "Other") section: (1) about your spouse if you live in a community property state (AZ, CA, ID, LA, NM, NV, TX, WA, WI), or (2) if your spouse will use the Account, or (3) if there is a guarantor on this account. Please check box to indicate whom the information is about.  
 **Joint Credit:** Provide information about both of you by completing **Applicant and Other** section.

**Amount Requested \$** \_\_\_\_\_ **Purpose:** \_\_\_\_\_

**Collateral:** \_\_\_\_\_

**Repayment:**  Payroll Deduction  Cash  Automatic Payment  Military Allotment  \_\_\_\_\_

### STATEMENT OF INTENT *Check if desired.*

Credit Disability Insurance  
 Single Credit Life Insurance  
 Joint Credit Life Insurance

Check coverage(s) desired. The credit union will disclose the cost of this voluntary insurance to you. A separate insurance election which discloses the terms and conditions must be signed for coverage to become effective.

### 2 APPLICANT INFORMATION

#### APPLICANT

*Please print in ink or type.*

NAME (Last - First - Initial) \_\_\_\_\_

DRIVER'S LICENSE NUMBER/STATE \_\_\_\_\_

ACCOUNT NUMBER \_\_\_\_\_ SOCIAL SECURITY NUMBER \_\_\_\_\_

BIRTH DATE \_\_\_\_\_ HOME PHONE \_\_\_\_\_ BUSINESS PHONE / EXT. \_\_\_\_\_

PRESENT ADDRESS (Street - City - State - Zip) \_\_\_\_\_  OWN  RENT  
 YEARS AT THIS ADDRESS \_\_\_\_\_

PREVIOUS ADDRESS (Street - City - State - Zip) \_\_\_\_\_  OWN  RENT  
 YEARS AT THIS ADDRESS \_\_\_\_\_

COMPLETE FOR JOINT CREDIT, SECURED CREDIT OR IF YOU LIVE IN A COMMUNITY PROPERTY STATE:  
 MARRIED  SEPARATED  UNMARRIED (Single - Divorced - Widowed)

LIST AGES OF DEPENDENTS NOT LISTED BY OTHER APPLICANT  
 (Exclude Self)

#### CO-APPLICANT SPOUSE GUARANTOR

*Use "SAA" if information is "Same As Applicant".*

NAME (Last - First - Initial) \_\_\_\_\_

DRIVER'S LICENSE NUMBER/STATE \_\_\_\_\_

ACCOUNT NUMBER \_\_\_\_\_ SOCIAL SECURITY NUMBER \_\_\_\_\_

BIRTH DATE \_\_\_\_\_ HOME PHONE \_\_\_\_\_ BUSINESS PHONE / EXT. \_\_\_\_\_

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LIST AGES OF DEPENDENTS NOT LISTED BY APPLICANT  
 (Exclude Self)

### 3 EMPLOYMENT INFORMATION

NAME AND ADDRESS OF EMPLOYER \_\_\_\_\_

YOUR TITLE / GRADE \_\_\_\_\_ SUPERVISOR'S NAME \_\_\_\_\_

START DATE \_\_\_\_\_ HOURS AT WORK \_\_\_\_\_ IF SELF EMPLOYED, TYPE OF BUSINESS \_\_\_\_\_

IF EMPLOYED IN CURRENT POSITION LESS THAN FIVE YEARS, COMPLETE PREVIOUS EMPLOYER NAME AND ADDRESS \_\_\_\_\_ STARTING DATE \_\_\_\_\_  
 \_\_\_\_\_ ENDING DATE \_\_\_\_\_

MILITARY IS DUTY STATION TRANSFER EXPECTED DURING NEXT YEAR  YES  NO  
 WHERE \_\_\_\_\_ ENDING / SEPARATION DATE \_\_\_\_\_

NAME AND ADDRESS OF EMPLOYER \_\_\_\_\_

YOUR TITLE / GRADE \_\_\_\_\_ SUPERVISOR'S NAME \_\_\_\_\_

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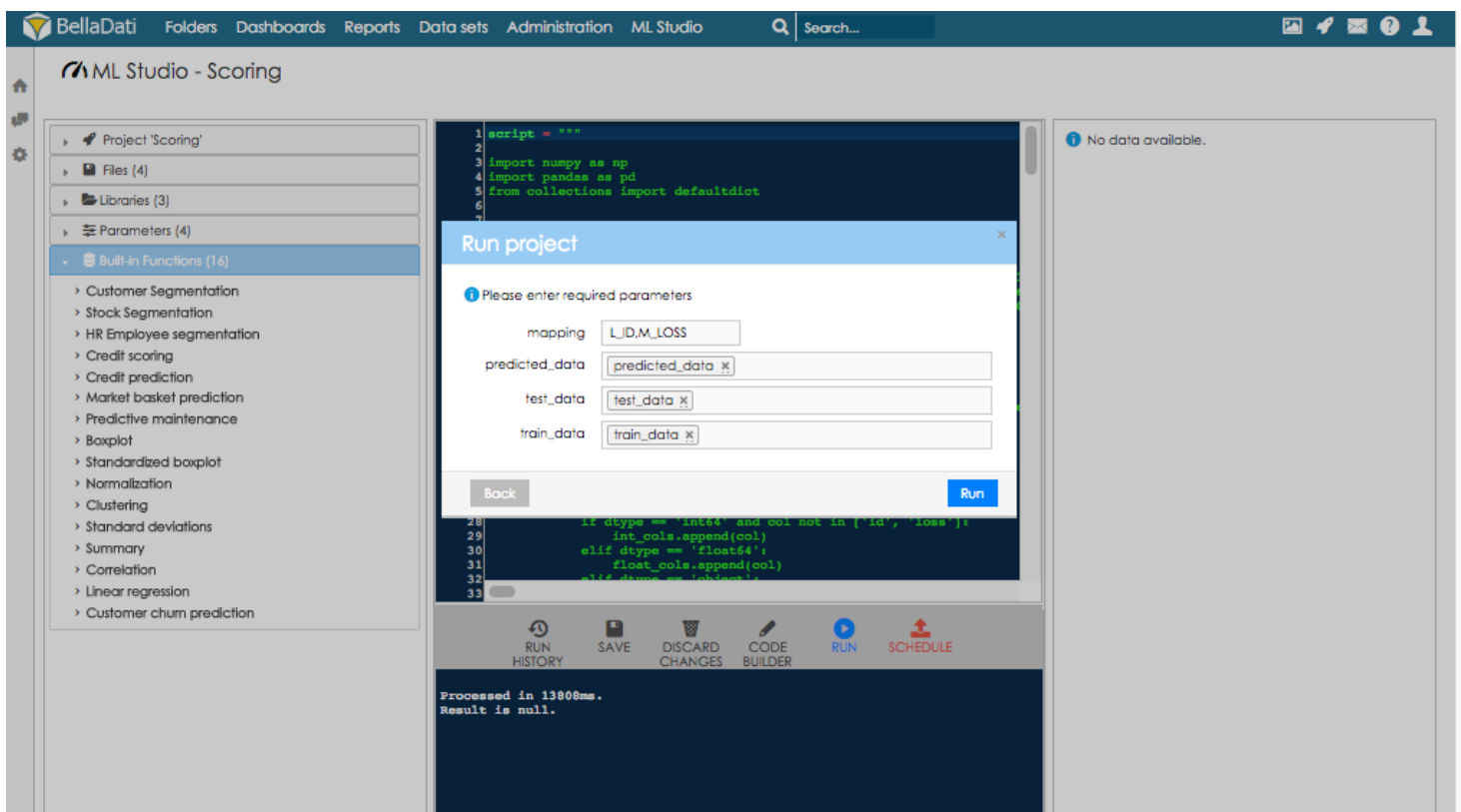
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Belladati machine learning studio is used to create the model, to test the model and to predict probability of losses for each new applicant or for the entire portfolio as the output. Based on calculated probability of losses the bank can predict and manage the credit risk of loan portfolio, the bank as well as the leasing company can use such credit scoring prediction to provide or reject the loan.

Using Belladati Framework Packaging and import function Credit score algorithm package can be easily transferred between independent instances or domains. The algorithm was written by CGI in Python with the usage of Anaconda Python libraries. Such functionality is available in Belladati Machine Learning Studio.



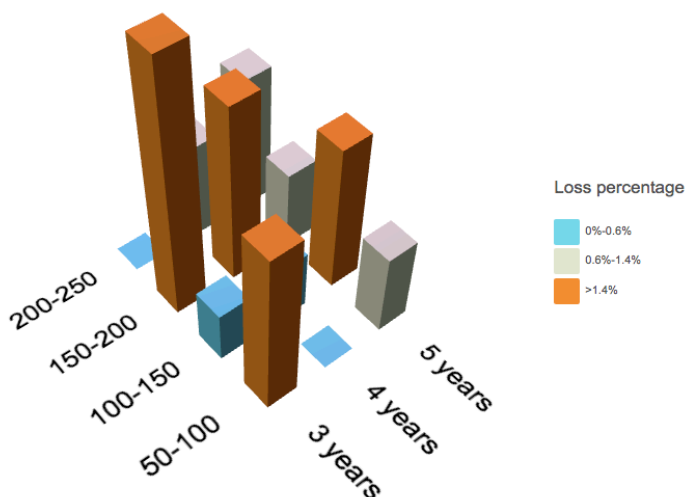
Users can use BellaDati Credit Scoring Package from GUI interface without any knowledge of the programming or from the programming console. Individual and aggregated results are searched and immediately used for the visualization and analysis, e.g. by loan size, duration, risk category and any other parameters.

# BellaDati Advanced IoT Framework for Probabilistic Credit Score Prediction

For more comprehensive analysis and visualization 3D charts are used that better visualise correlations between loan maturity, size of loan and loss from unpaid loans. 3D charts can be rotated and zoomed to get more detail insight. Thanks to Belladati custom content function any charts can be created and not only charts, but also any other visualizations as for example cars, profiles of warehouses, profiles of dams, constructions, etc. Such visualizations can be consumed by users in BellaDati or from other systems using BellaDati Client API, rest API and SDK.

## Pareto Analysis

### Loan Duration



BellaDati ML Credit Scoring provide ready made What-If scenarios for modeling, for example what is the percentage of loss versus interest income, if interest rate is changed or if risk level of accepted loans is increased or decreased. Such scenarios can be easily adjusted by end users thanks to BellaDati IoT Framework Agility.

# BellaDati Advanced IoT Framework for Probabilistic Credit Score Prediction

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## Income & Loss Modelling

More...

Define Interest 📄 ⚙️

Interest  Loss Probability Below

Results ⚙️ ↗️ 📄

Results	
Income	<b>6,014.18</b>
Estimated Loss	27.06
Loss Percentage of Interest	0.45 %

## Additional resources:

- [ML Credit Scoring - Use case \(YouTube\)](#)
- [ML Credit Scoring - Use case \(Youku\)](#)
- [ML Credit Scoring - Demo Script](#)
- Demo BellaApp can be accessed on [BellaDati cloud](#). For login should be used following user credentials: creditV / password: BellaDati01

# BellaDati is Agile BI, Pure Web Application, Complete BI Solution for Manufacturing



## Cloud or On-Premise

Deploy in the cloud or install On-Premise. All you need is web-browser or mobile device.

## Analytics Platform

with API and SDK for creating Embedded Data Solutions. Deliver BellaDati as Your Brand.

## Mobile BI

Pull reports out of your pocket on- or off-line with BellaDati Mobile for iOS and Android. Filter, share and comment or harvest new data on the go.

## Predefined BellaApps

Take the fastest paths. Leverage pre-built dashboards, reports and measures to cut down costs and time.

## BIG Data and Predictions

In Memory Real time Statistics and Prediction with SAP HANA.

## NO-SQL/SQL biz data integration and analysis

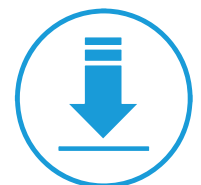
from more than 100 databases, APIs, Cloud Solutions and Social Networks.

## Social network for Data Discovery

Realtime collaboration on the insights. Search, share, copy, export, get notified on data changes.



BellaDati Cloud



BellaDati On-Premise



# Ask for more use cases...

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