

Risk Data Analyst Take-Home Assignment:

As a risk analyst, part of your tasks will include the task of reviewing, implementing and modifying Underwriting (UW) decision flows for automation. You will be working together with different stakeholders who provide you with additional domain knowledge and credit rules which will be integrated into the automated underwriting.

Scenario:

The management has placed a renewed focus on increasing the sales volumes in an existing market. Previously, the underwriting process was done manually in this market; however this is no longer sustainable with the expected increase in loan applications. You have been asked to develop a new UW service to automate the previous manual underwriting process. The following requirements have been provided to you by business stakeholders.

Requirements:

For all incoming applications, please return the UW **decision** (decline, accept, review) as well as any necessary **notifications**, a **dti ratio** (debt to income ratio) and an **audit trail**. The purpose of the audit trail is to enable anyone to review how the service came to its final decision; i.e. any intermediate variables created and path of conditions that were evaluated.

Rules

For all applications, all applicants below the age of 18 receive a *decline* decision.

For all applications, all applicants above the age of 80 receive a *review* decision with a notification "*Review birthdate and documents of Applicant*".

If product_name is "spl17":

- If credit score < 0 then *decline*
- If client is a repeat client:
 - If credit score $\in [0, 10]$ ¹
 - If loan application sum < 300 then *accept* decision else *review* decision with a notification "*Review Credit History Manually*"
 - If credit score > 10 then *decline*
- If client is not a repeat client:
 - If credit score $\in [0, 5]$
 - If outstanding debt in registry = 0 then *accept*
 - If outstanding debt in registry $\in (0, 50)$ then *review* with notification "*Review Bank statement*"
 - If outstanding debt in registry > 50 then *decline*
 - If credit score > 5 then *decline*

For other products:

¹ Interval notation: <https://brilliant.org/wiki/interval-notation/>

- If is top_up application:
 - If age above 80 then add notification “*Review birthdate and documents of Applicant*”
 - If credit score $\in [0, 20]$ then accept else *decline*
- If is not top_up application
 - If credit score $\in [0, 5]$
 - If outstanding debt in registry = 0 then accept
 - If outstanding debt in registry $\in (0,50)$ then review with notification “*Review Bank statement*”
 - If outstanding debt in registry > 50 then *decline*
 - If credit score > 5 then *decline*

Tasks

- 1) Visualize and document the decision flow using any flowcharting techniques you are familiar with.
- 2) Implement a function in Python which takes a dict of variables as an input and returns a dictionary with **decision**: str, **notifications**: list, **dti_ratio**: float and **audit_trail**: dict.
- 3) Explain De Morgan’s law using a simple and relatable example by creating a rule using any of the provided variables.

Consider you have following variables as key-value pairs in the request to the service:

loan_application_product_name (string) [not nullable]
loan_application_sum (int) [not nullable]
loan_application_timestamp (string) [not nullable] [YYYY-MM-DDTHH:mm:ss]
loan_application_duration_in_days (int) [not nullable]
loan_application_is_top_up (bool) [not nullable]
loan_applicant_fullname (string) [not nullable]
loan_applicant_birthdate (string) [not nullable] [YYYY-MM-DD]
loan_applicant_credit_score (float) [nullable]
loan_applicant_income (float) [nullable]
loan_applicant_liabilities (float) [nullable]
loan_applicant_outstanding_debt_in_debt_registry (float) [nullable]
loan_applicant_is_repeat_client (bool) [not nullable]

For testing your python function, use the pseudo schema above to create your own dicts like in the following example Python Input.

Python Dict example Input:

```
{
  "loan_application_product_name": "spl17",
  "loan_application_sum": 600,
  "loan_application_timestamp" : "2020-10-18T10:20:30",
  "loan_application_duration_in_days": 90,
  "loan_application_is_top_up": False,
  "loan_applicant_fullname": "Alice Smith",
  "loan_applicant_birthdate": "1988-01-05",
  "loan_applicant_credit_score": 2.3,
  "loan_applicant_income": 1241.0,
  "loan_applicant_liabilities": 312.6,
  "loan_applicant_outstanding_debt_in_debt_registry": None,
  "loan_applicant_is_repeat_client": False
}
```

NB:

- The requirements and rules in this exercise are fictitious.
- Feel free to make any assumptions you need to help you with the implementation of the assignment. Provide all assumptions you made in your final submission.