ML project formulation

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1 Definitions

- P_i is the probability of default of customer i, this is a parameter derived from previous models
- A_i is the amount asked by customer i, this is a parameter
- X_i is equal to 1 if the loan is approved, this is a variable
- T_i is between 0 and 1 and is the threshold to approve or not the loan based on the probability of default, this is a variable
- C_i is the probability that client i accepts the loan considering the interest rate proposed, this is a variable
- I_i is the interest rate proposed by the bank if the loan is approved, this is a variable
- Z_i is the probability that client i accepts the loan considering the interest rate proposed if the loan is approved and 0 otherwise, this is a variable greater than 1

2 Formulation

$$
\begin{aligned}
\min_{X,T,C,I,Z} \quad & \sum_i Z_i * (A_i * I_i * (1 - P_i) - A_i * P_i) \\
\text{s.t.} \quad & T_i - P_i \leq X_i \ \forall i \\
& P_i - T_i \leq 1 - X_i \ \forall i \\
& Z_i \leq A_i \ \forall i \\
& Z_i \leq C_i \ \forall i \\
& Z_i \geq C_i - (1 - A_i) * M \ \forall i \\
& Z_i \geq 0 \ \forall i \\
& C_i = (I_i - 0.01) * \frac{1}{0.05} \ \forall i \\
& 0.01 \leq I_i \leq 0.05 \ \forall i
\end{aligned}
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