Optimizing Pre-Flight Communications to Enhanc Customer Experience

Mikołaj Rowicki | Igor Rudolf | Michał Pytel | Jakub Półtorak | Maciej Momot | Filip Langiewicz

WE'LL SEND EMAILS THAT GET CLICKS

USING MANY DISTINCT APPROACHES

EMAIL MARKETING

- According to prism research personalized email marketing can increase its revenue by 700%
- Forbes - transportation services have one of the highest click throught rate in business
- Forbes - 88% of people check their emails daily
- 61% of consumers spend a viewing time of eight seconds or more per email

FIRST STRATEGY

The considered approach involved mapping the target column to 10 unique values. We predict these columns based on apriori features, which by themselves do not explain the randomness of label selection. The ‘clicked’ column is not treated as a feature in the training data; however, we use it as information to optimize our custom loss function, enabling the model to more effectively predict the labels.

The results obtained with the considered approach are promising for future development. Fine-tuning the appropriate hyperparameters and exploring alternative network architectures will have a positive impact on classification performance.

CUSTOMIZED LOSS FUNCTION

The first approach is based on modifying the cross-entropy function by adding a penalty in the cases presented on the slide. In the future, the values of the penalty and reward parameters will be optimized.

$$\text{Loss function} = \text{Cross Entropy} + \text{Penalty}$$

$$\text{Penalty} = \begin{cases} \lambda, & \text{gdy } y_{\text{pred}} = y_{\text{real}} \text{ i clicked} = 0 \\ -\lambda, & \text{gdy } y_{\text{pred}} = y_{\text{real}} \text{ i clicked} = 1 \\ \alpha\lambda, & \text{gdy } y_{\text{pred}} \neq y_{\text{real}} \end{cases}$$

NEW IDEAS

In the second approach, we extend our initial solution. We propose not to treat the target column as a single entity but to break it down into individual components. It is important to examine the significance of each target component in predicting whether the user will click.

It is also worth noting that a prediction where only one component differs from the correct layout should not be considered as equally incorrect as a prediction where none of the components match.

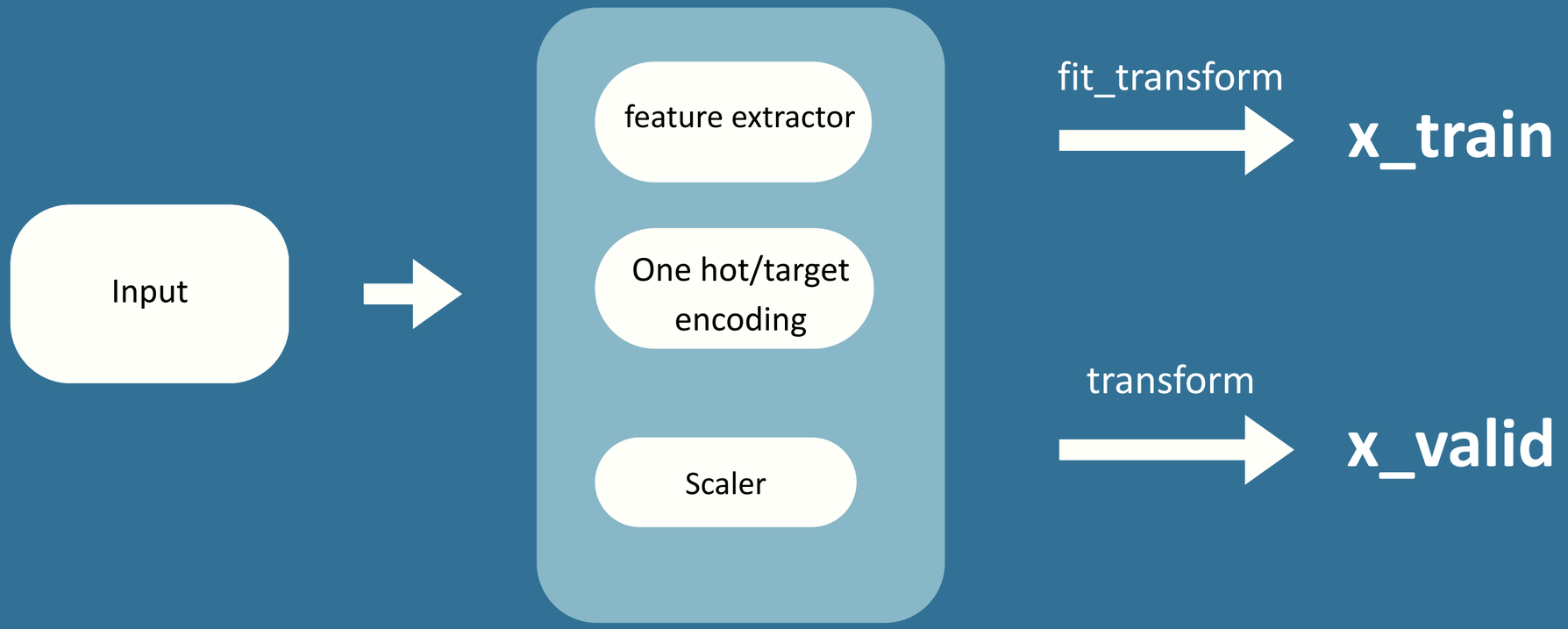
DYNAMIC LOSS FUNCTION

In this approach, based on the layout provided for the client, we predict the probability of clicking on that layout. If such probability is small, the loss function is equal to the classic cross entropy, but additionally the model is penalized with an error inversely proportional to the obtained probability. The exact formula for the loss function is presented below.

$$\text{Loss function} = \text{Cross Entropy} + \text{Penalty}$$

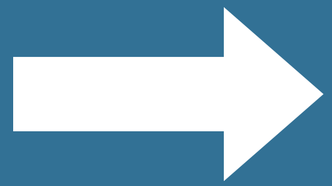
$$\text{Penalty} = \begin{cases} 1, & \text{gdy } y_{\text{pred}} = y_{\text{real}} \text{ i clicked} = 0 \\ 0, & \text{gdy } y_{\text{pred}} = y_{\text{real}} \text{ i clicked} = 1 \\ \frac{1}{\text{P}}, & \text{gdy } y_{\text{pred}} \neq y_{\text{real}} \end{cases}$$

FEATURE ENGINEERING



ENCODING OF THE TARGET VALUE

graphic_design	top_1_section	top_2_section	top_3_section
A	1	2	3
A	1	3	2
A	3	1	2
A	3	2	1
B	4	5	3
B	4	3	5
B	3	4	5
B	3	5	4
C	6	3	-1
C	3	6	-1



label
0
1
2
3
4
5
6
7
8
9

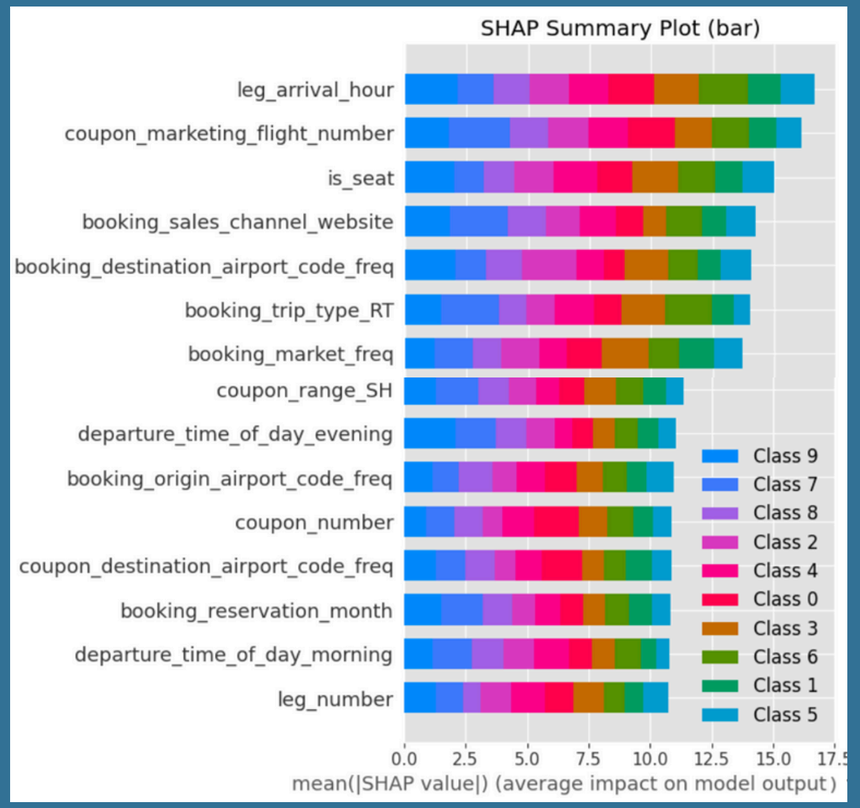
REVERSED APPROACH

This idea is based on having the model learn from previously sent layouts and the fact of whether the user clicked on the email or not. For every observation we create 9 records with every other layout possible.

The best model both here and in our entire project is the Random Forest using this approach!

INTERPRETABILITY

To ensure the interpretability of our model, we computed the Shapley values for each feature in our dataset. This approach allowed us to quantify the influence of each feature on the model's predictions in a systematic and reliable manner.



SUMMARY

The presented methods are based on modifying the loss function and analyzing individual components of the target column. Combined with hyperparameter optimization and the use of the Random Forest model, this approach yields promising results. However, there is a risk that the available data may be insufficient to produce high-quality predictions, which remains a key challenge for the future development of the project.

Thank you for your attention.

Feel free to ask any questions!

github.com/FilipLangiewicz/CombAIns_LOT