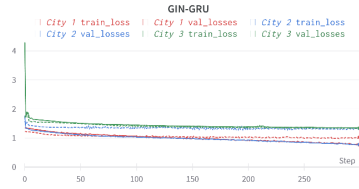
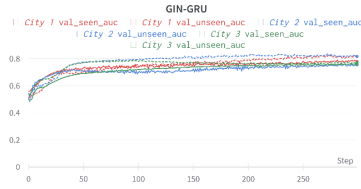


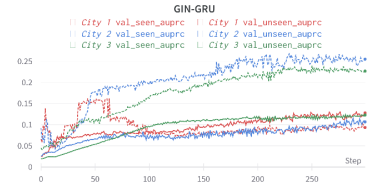
## Appendix A Convergence plots



(a) City 1



(b) City 2

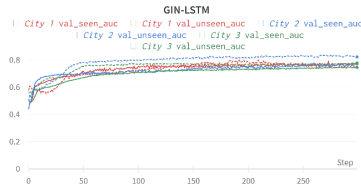


(c) City 3

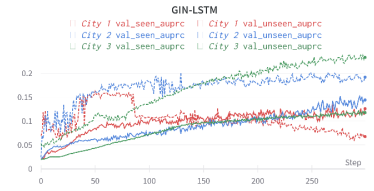
Fig. 1: GIN-GRU



(a) City 1

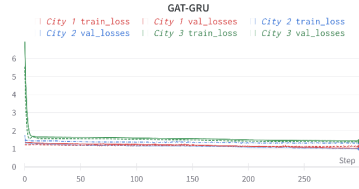


(b) City 2

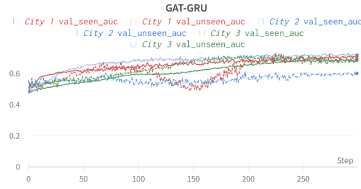


(c) City 3

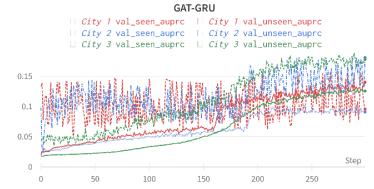
Fig. 2: GIN-LSTM



(a) City 1



(b) City 2



(c) City 3

Fig. 3: GAT-GRU

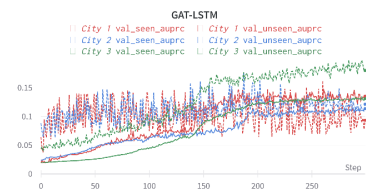
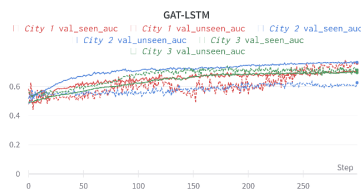


Fig. 4: GAT-LSTM

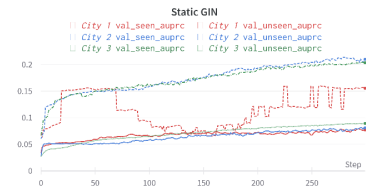
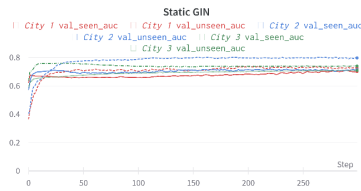


Fig. 5: Static GIN

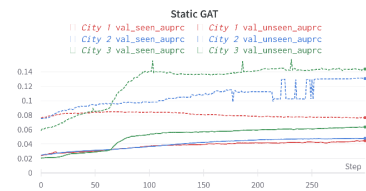
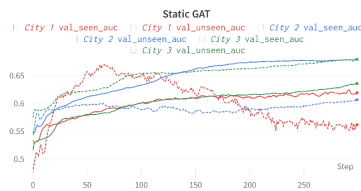


Fig. 6: Static GAT

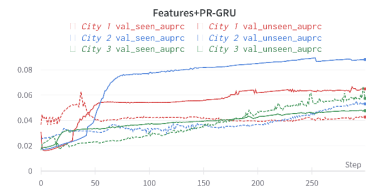
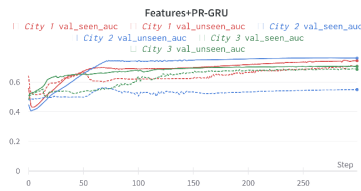


Fig. 7: Features+PR-GRU

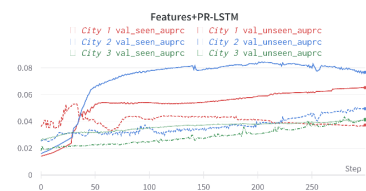
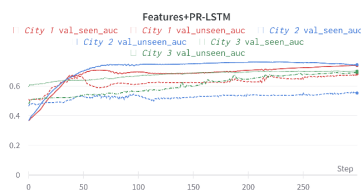


Fig. 8: Features+PR-LSTM

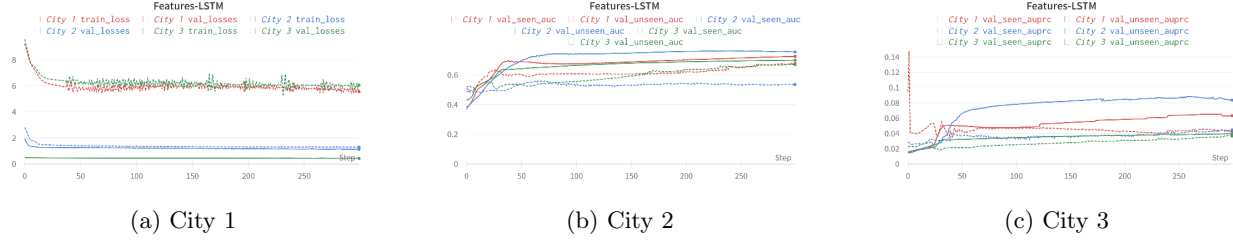


Fig. 9: Features-LSTM



Fig. 10: Features-GRU

## Appendix B Best model configurations

Best model configurations are presented below <sup>1</sup>.

Table 1: Model configurations

| Model            | #layers GNN | #emb. GNN | #hid.dim. GNN | SMOTE rate | #layers RNN | #hid.dim. RNN | Loss  |
|------------------|-------------|-----------|---------------|------------|-------------|---------------|-------|
| GIN-LSTM         | 2           | 512       | 512           | 0          | 1           | 256           | Focal |
| GIN-GRU          | 2           | 512       | 512           | 0          | 1           | 512           | Focal |
| GAT-LSTM         | 2           | 256       | 256           | 0          | 1           | 512           | Focal |
| GAT-GRU          | 2           | 256       | 256           | 0          | 2           | 256           | Focal |
| Features+PR-LSTM | /           | /         | /             | 0          | 1           | 512           | BCE   |
| Features+PR-GRU  | /           | /         | /             | 0.5        | 1           | 512           | Focal |
| Features-LSTM    | /           | /         | /             | 0.5        | 1           | 256           | Focal |
| Features-GRU     | /           | /         | /             | 0          | 1           | 512           | BCE   |
| Static GAT       | 4           | 256       | 512           | 0.5        | /           | /             | Focal |
| Static GIN       | 2           | 512       | 512           | 0.5        | /           | /             | BCE   |

<sup>1</sup> Due to the limited computing power, some configurations for City 3 are not feasible. In particular, the configuration with four layers in the GAT encoder of the GAT-GNN models as well as configurations with GNN hidden dimensions = Number of generated GNN embeddings = RNN hidden dimensions = 512 are not feasible.

## Appendix C Node features

Table 2: Node features description

| Feature group description  | Type        | #features |
|--|-------------|-----------|
| # no payments from the contract creation date to the payment date  | Numerical   | 1         |
| Outstanding balance of a credit card at a cut-off date   | Numerical   | 1         |
| Payments between:<br>1) start date of the billing period and cut-off date (a final date of the billing period);<br>2) cut-off date to payment date (the date when a customer is supposed to pay) | Numerical   | 2         |
| Credit card consumption in delivery app (total, average and standard deviation) between:<br>1) start date to cut-off date;<br>2) cut-off date to payment date                                    | Numerical   | 6         |
| Credit card consumption in other commercials (total, average and standard deviation) between:<br>1) start date to cut-off date;<br>2) cut-off date to payment date                               | Numerical   | 6         |
| Number of transactions between:<br>1) start date to cut-off date;<br>2) cut-off date to payment date   | Numerical   | 2         |
| Credit limit   | Numerical   | 1         |
| Number of no payments between the contract creation date and the payment date  | Numerical   | 1         |
| Bureau score of the user at an application date  | Numerical   | 1         |
| Estimated income at an application date  | Numerical   | 1         |
| Amount of increase in the credit limit   | Numerical   | 1         |
| User's operative state at the payment date   | Categorical | 1         |
| Credit limit increase indicator  | Categorical | 1         |
| Counter of past referrals  | Numerical   | 1         |