Skoltech

Self-supervised learning for Event Sequences on synthetic task of next item prediction

27 club:

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Outline

1. Self-supervised learning: motivation
2. Datasets
3. Methodology
4. Preliminary results

Self-supervised learning

- **Motivation:** learning the structure of the unlabeled data through supervised methods
- **Approach:**
  a) Features are learned using unlabeled data
  b) Object-target pairs are constructed from data points
  c) These pairs are used for learning the structure of the data

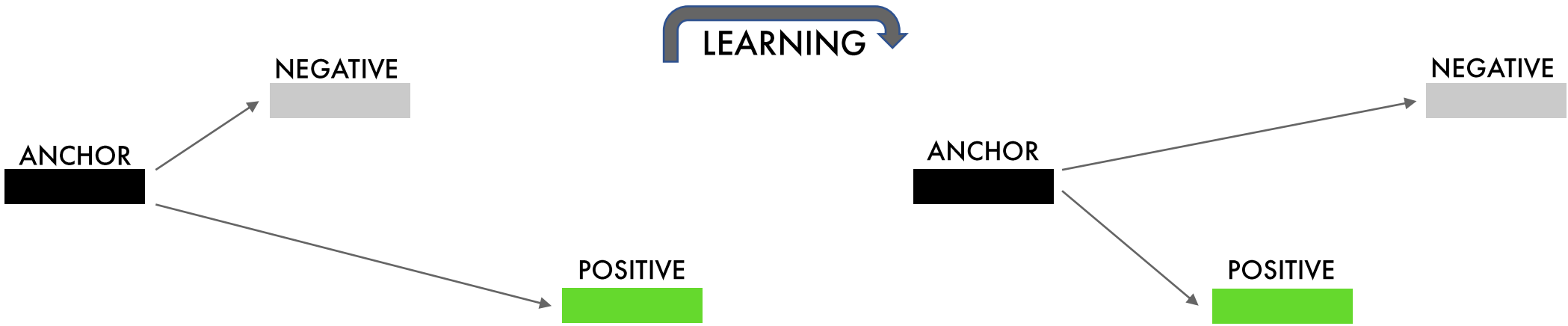
Can be used in various tasks, e.g. **representation learning**

Representation learning

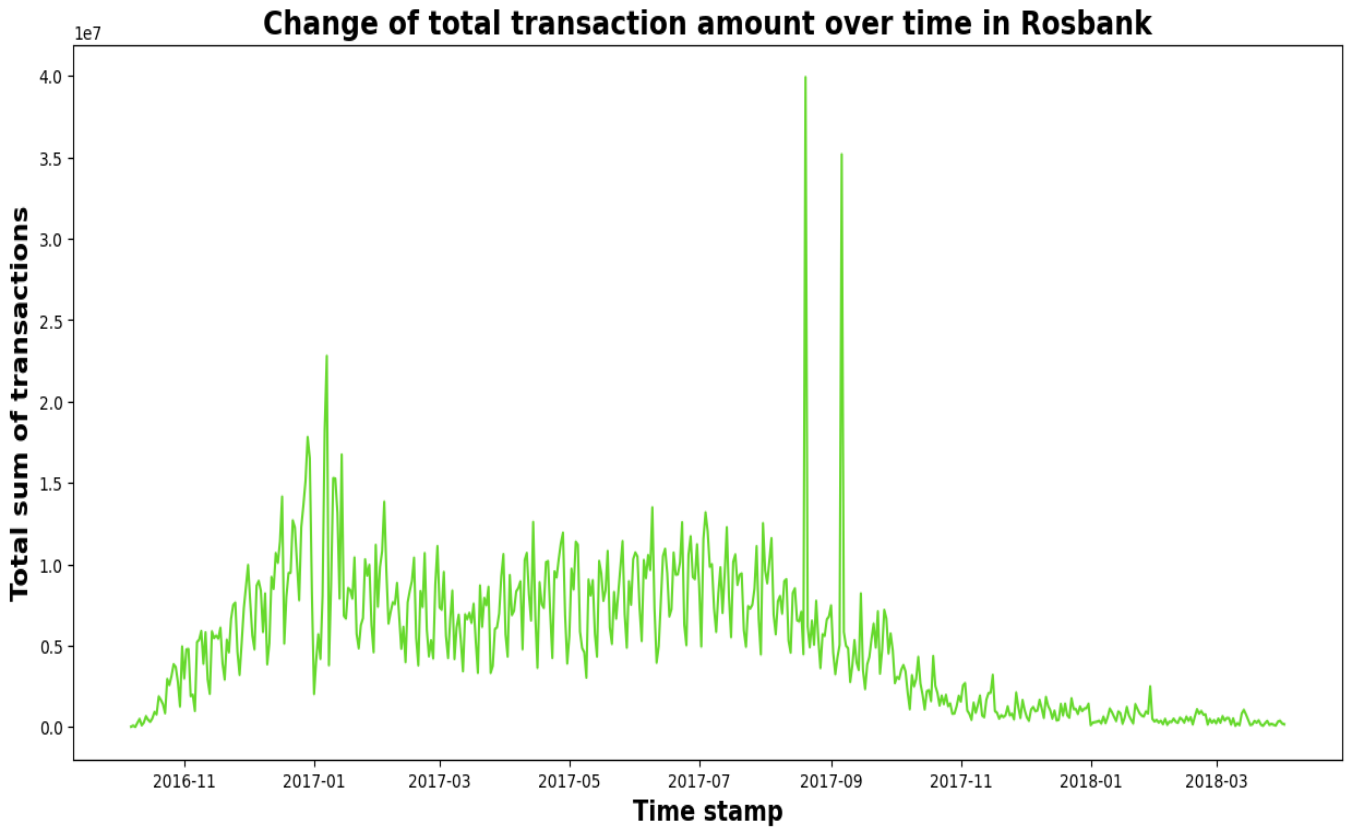
- **Motivation:** ML tasks often require input that is convenient to process
- **Obstacle**: for real-world data, e.g. transactions, specific features cannot be defined algorithmically
- **Solution:** representing unstructured data as the vectors of fixed-length
- **Usage:** embeddings of bank transactions for fraud detection, risk assessment, etc.

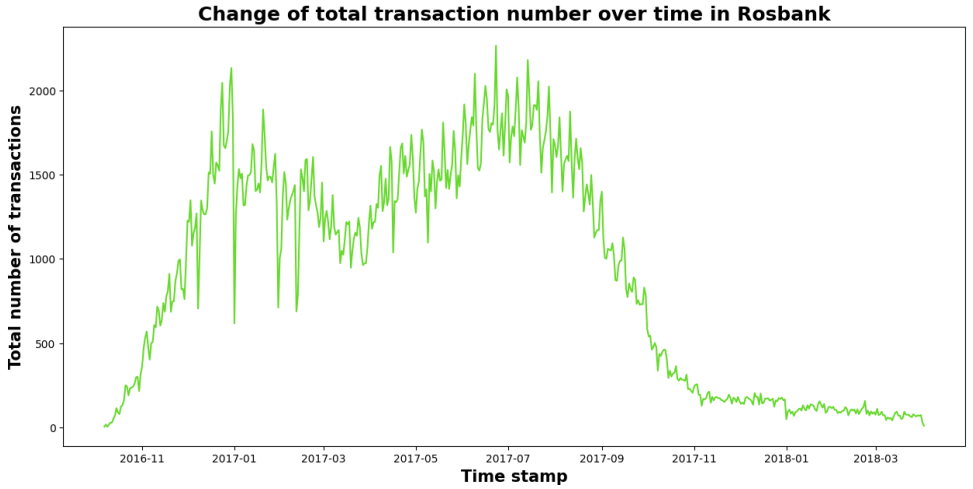
Contrastive learning

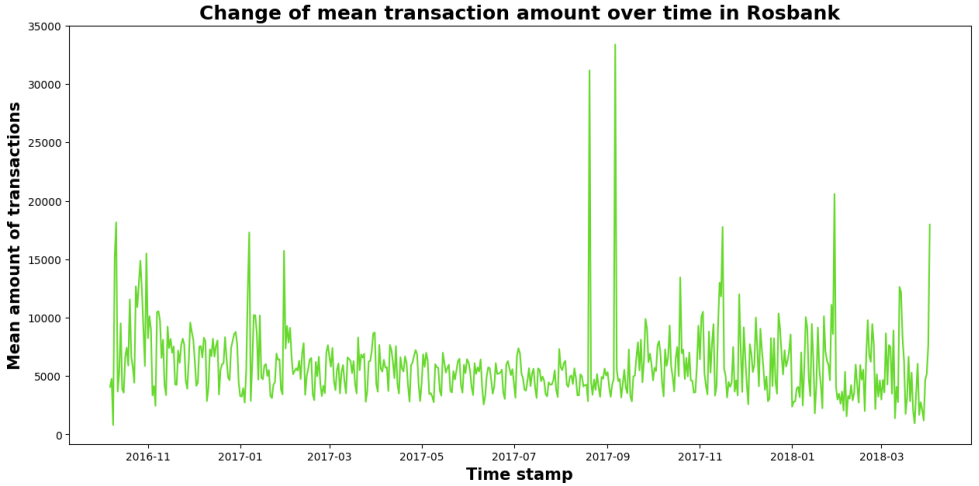
- **Motivation:** to prevent mapping the objects to the same representation
- **Approach:** involves training a model to differentiate between similar and dissimilar examples
- **Usage:** learn representations that differentiate between fraudulent and non-fraudulent transactions
- **Examples:** CoLES, CPC



Datasets: rosbank







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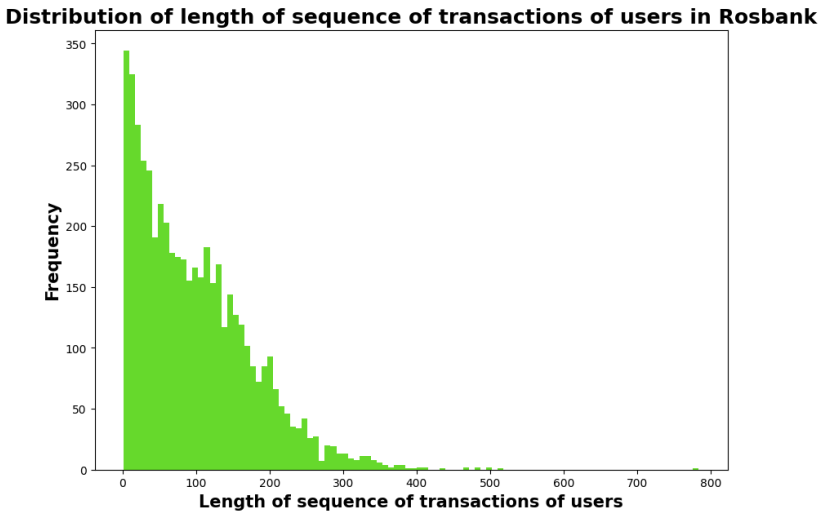
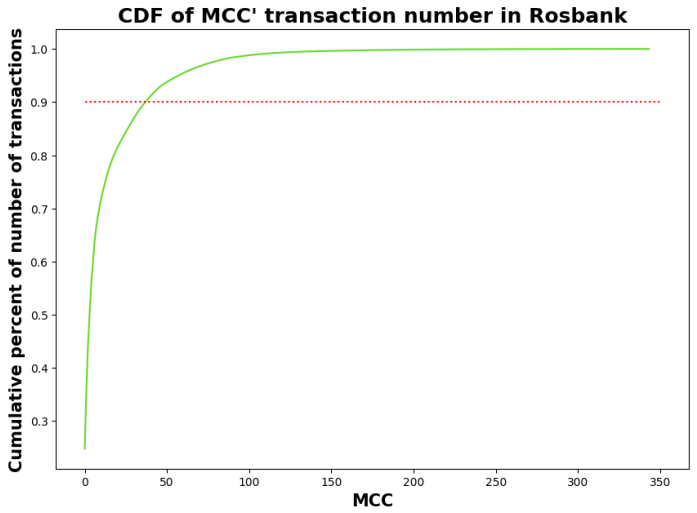
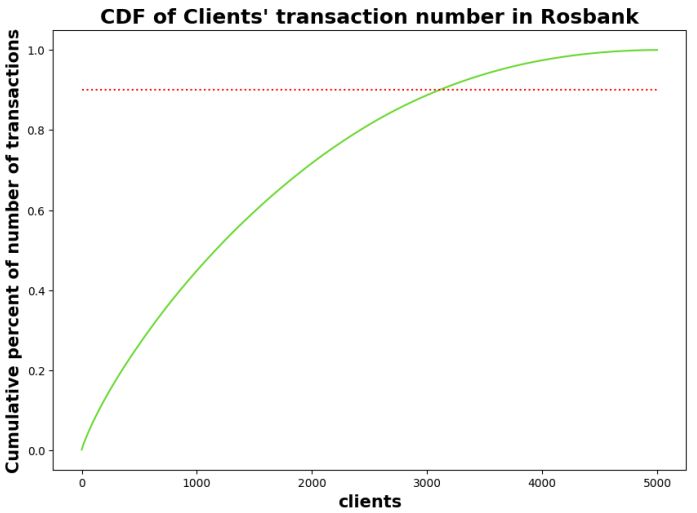
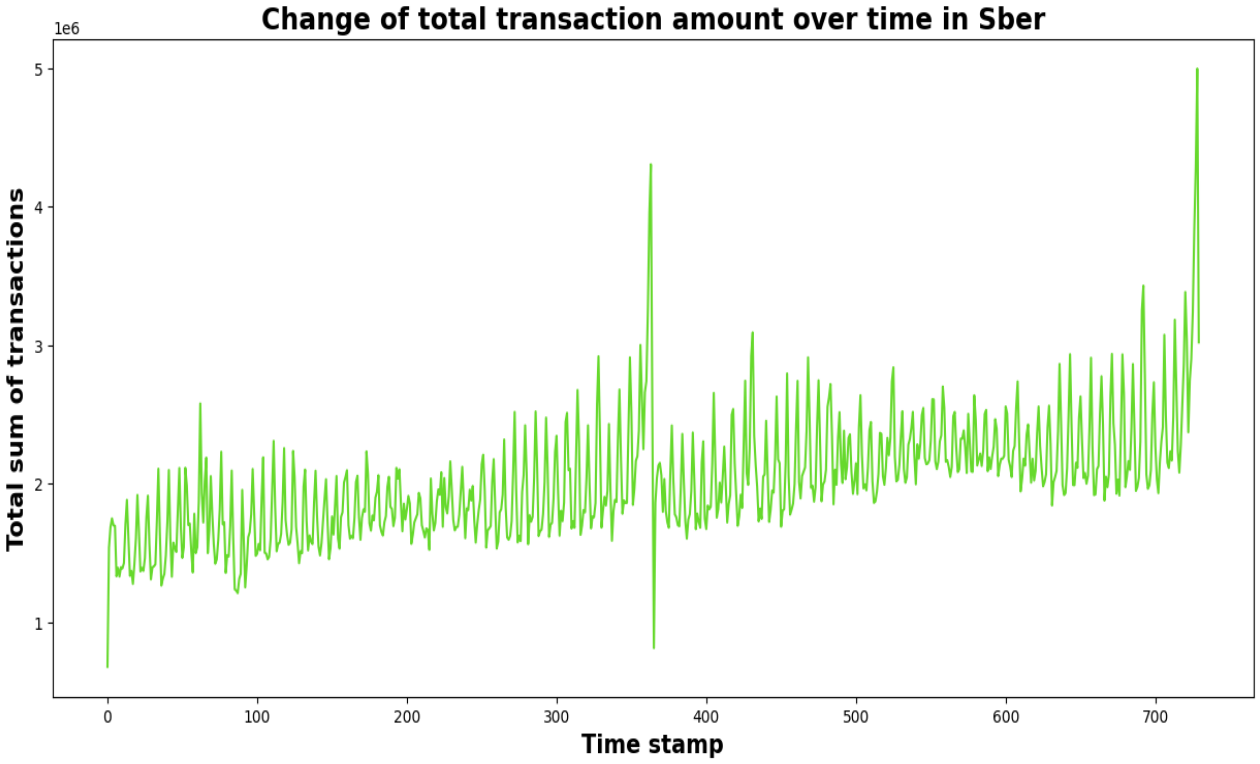


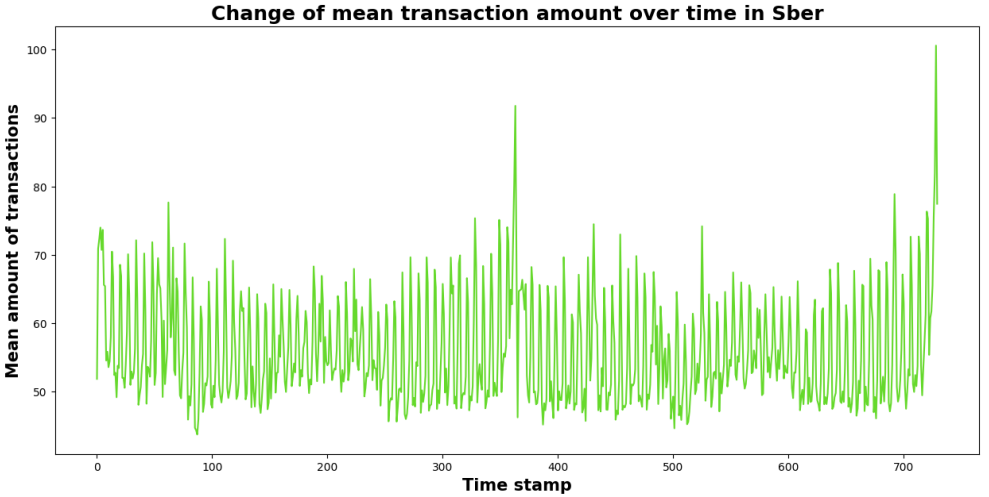


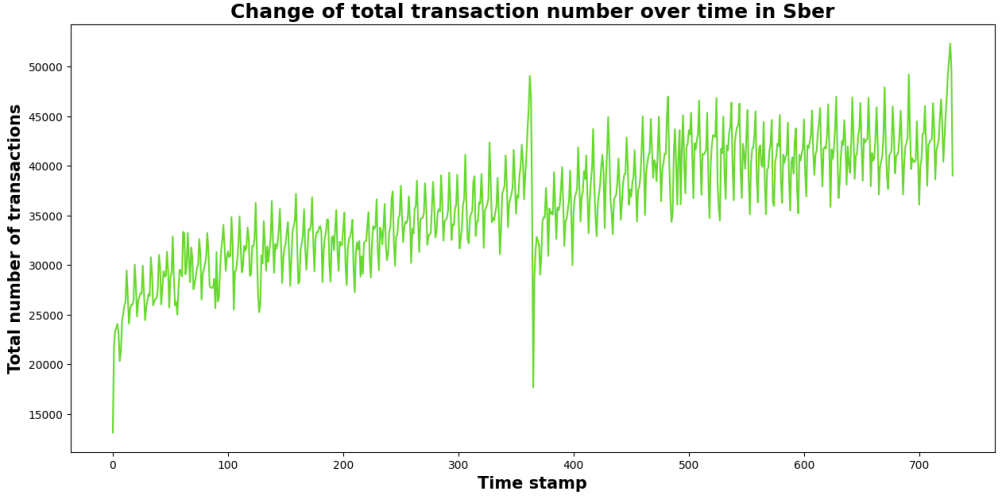


- **Problem:**
  - many clients with small number of transaction
  - many MCCs with small number of transactions
- **Possible solutions:** drop such clients and unite such MCCs in ‘other’ group

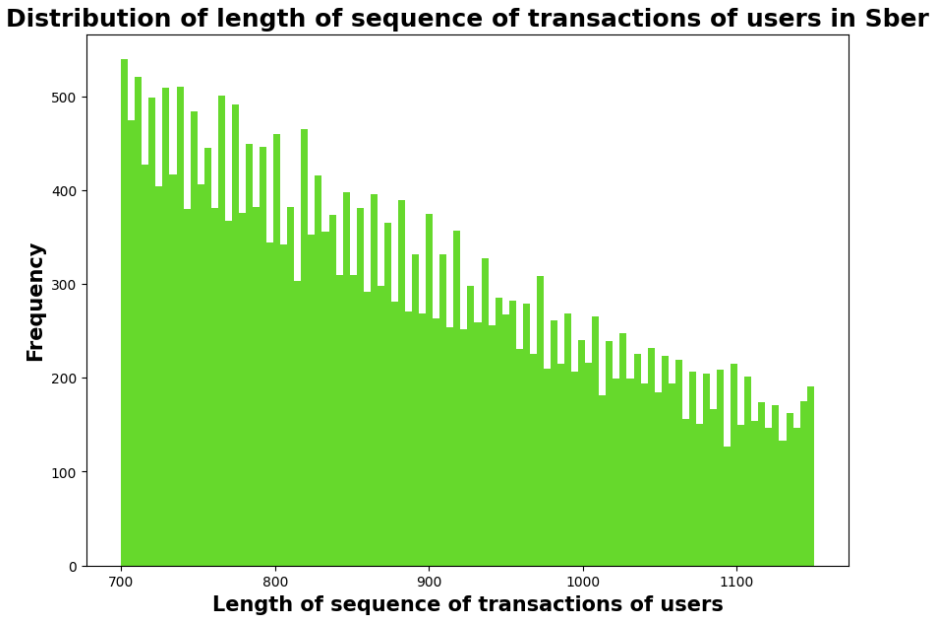
Datasets: sberbank

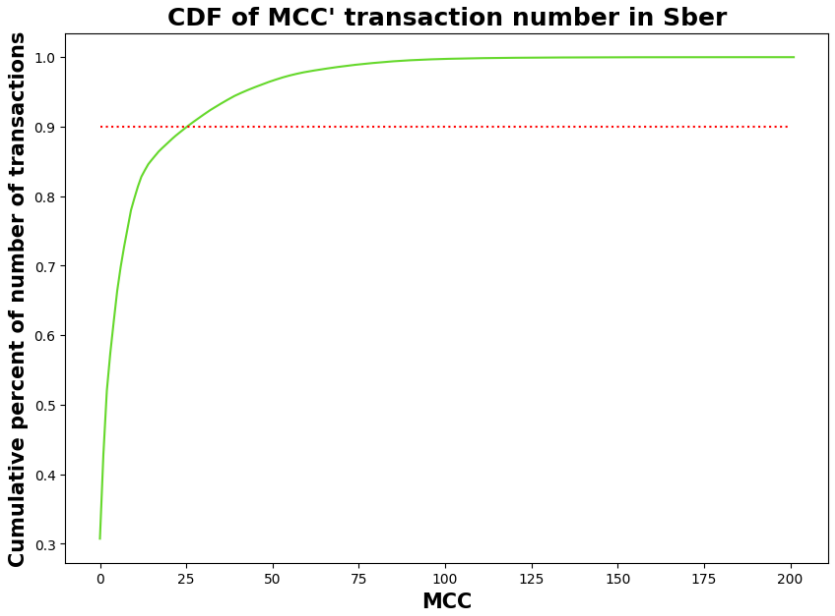






Datasets: sberbank

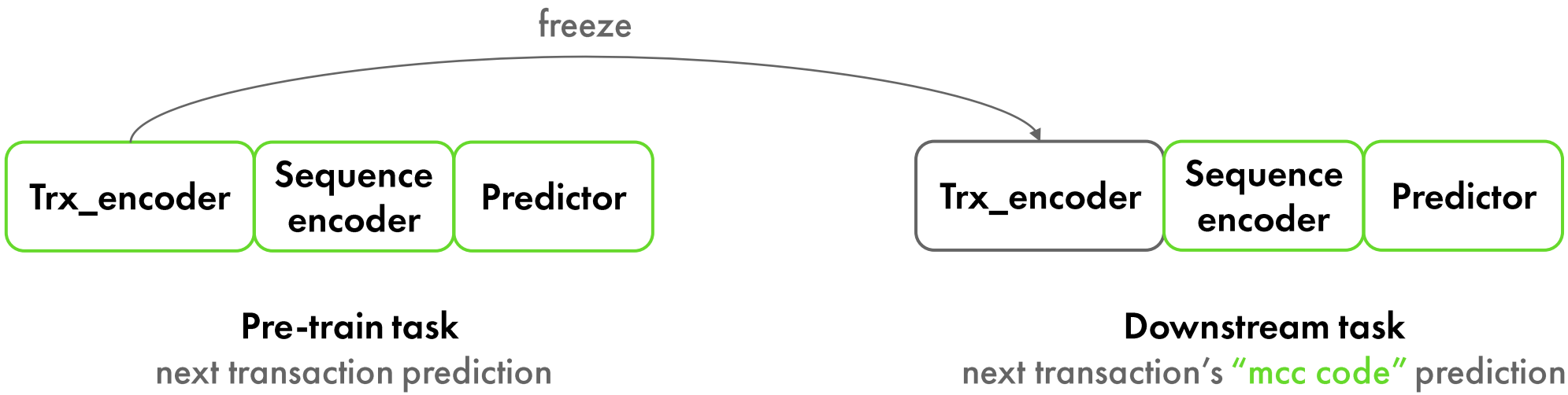




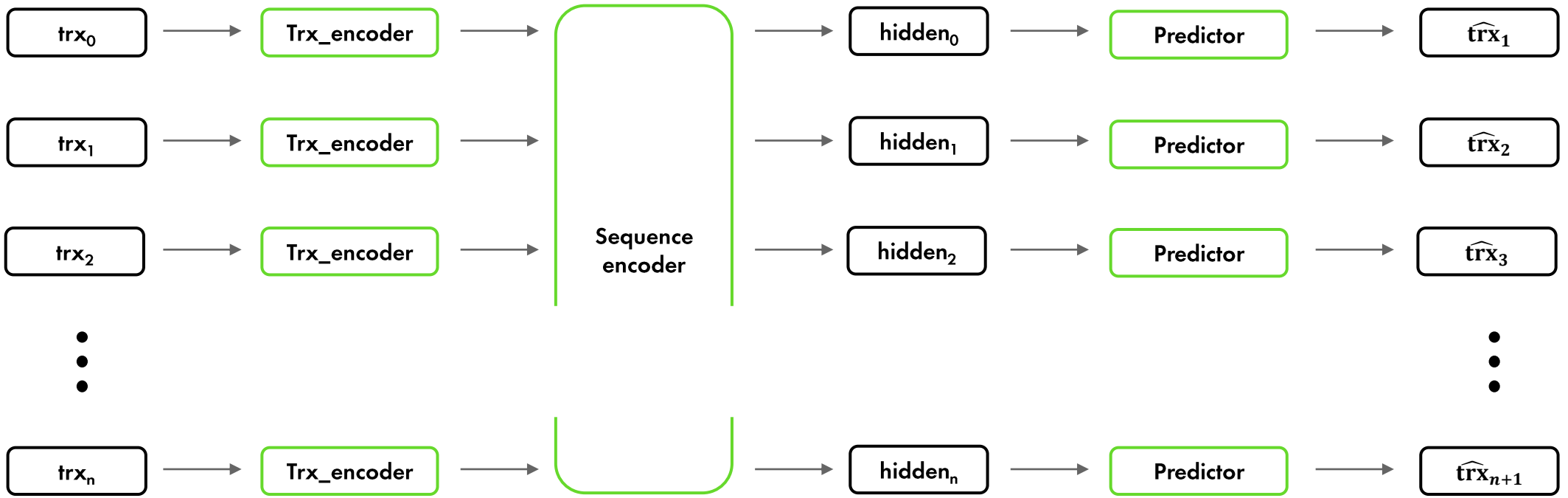
- **Problem:** many MCCs with small number of transactions
- **Solution:** drop such MCCs

Methodology

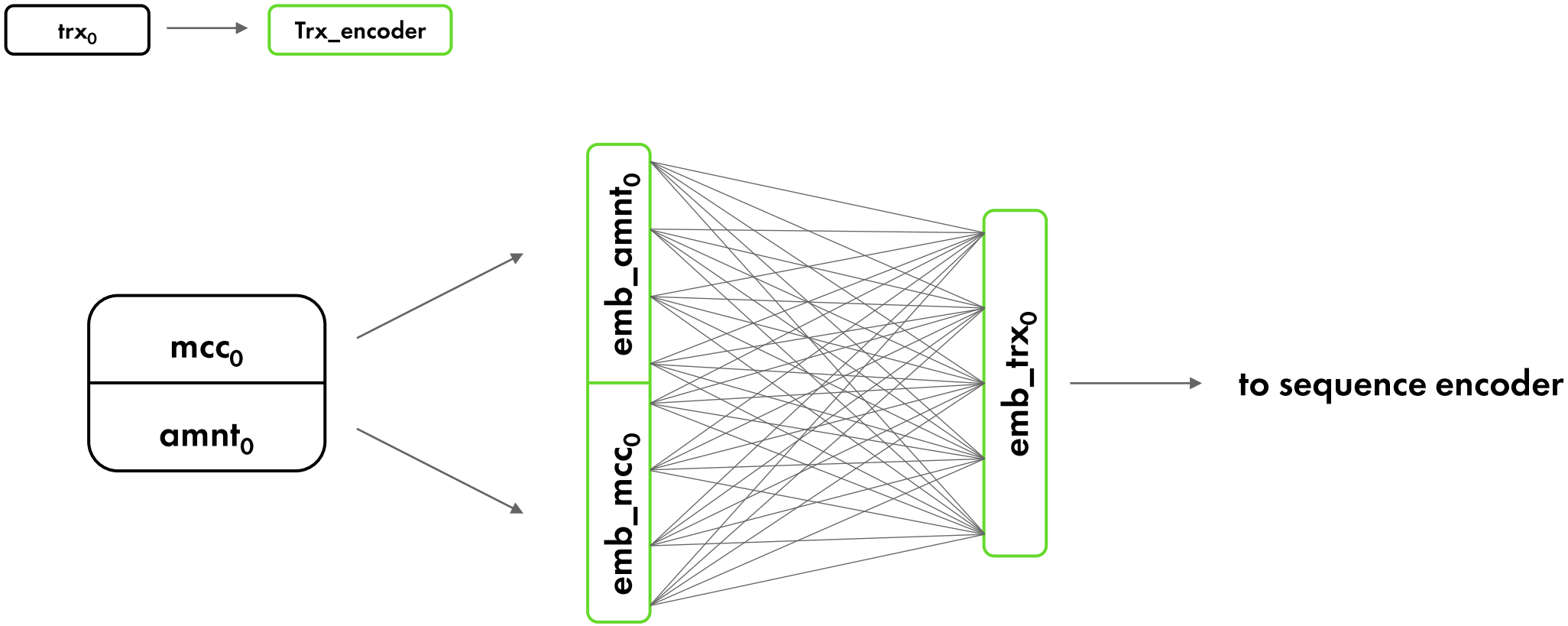
- **Features:** "mcc code" and "amount"
- **Data preprocessing:** discretization of "amount" feature (10 bins)
- **Train/validation/test split:** 80%/10%/10%
- **Metric**: f1-score weighted



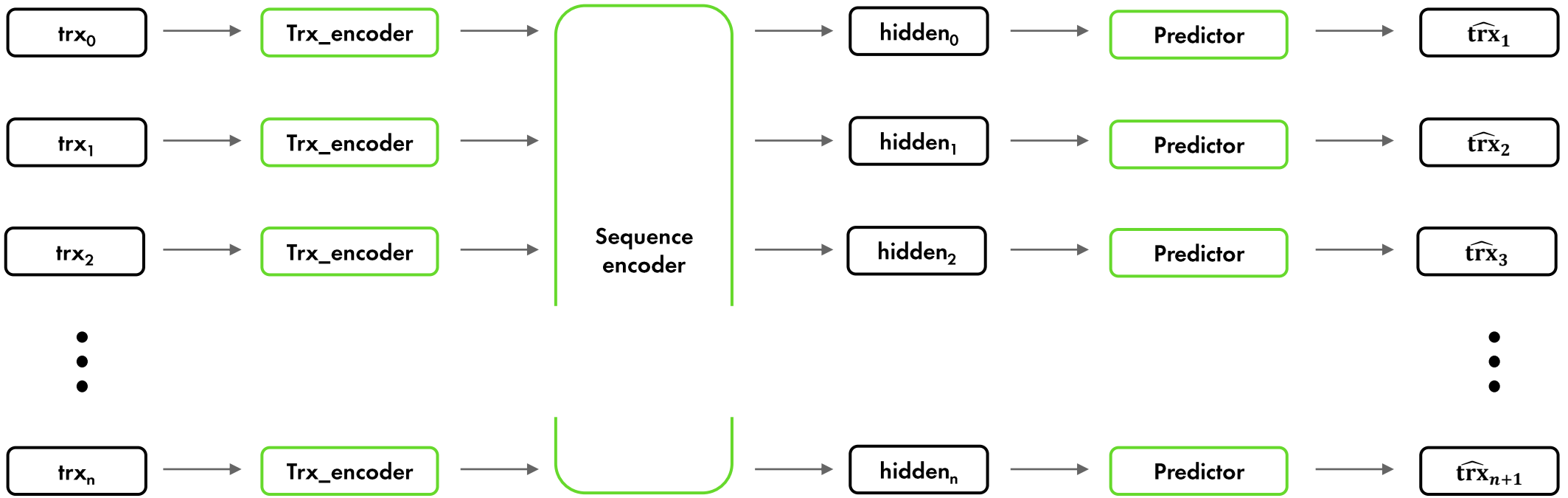
Representation (1)



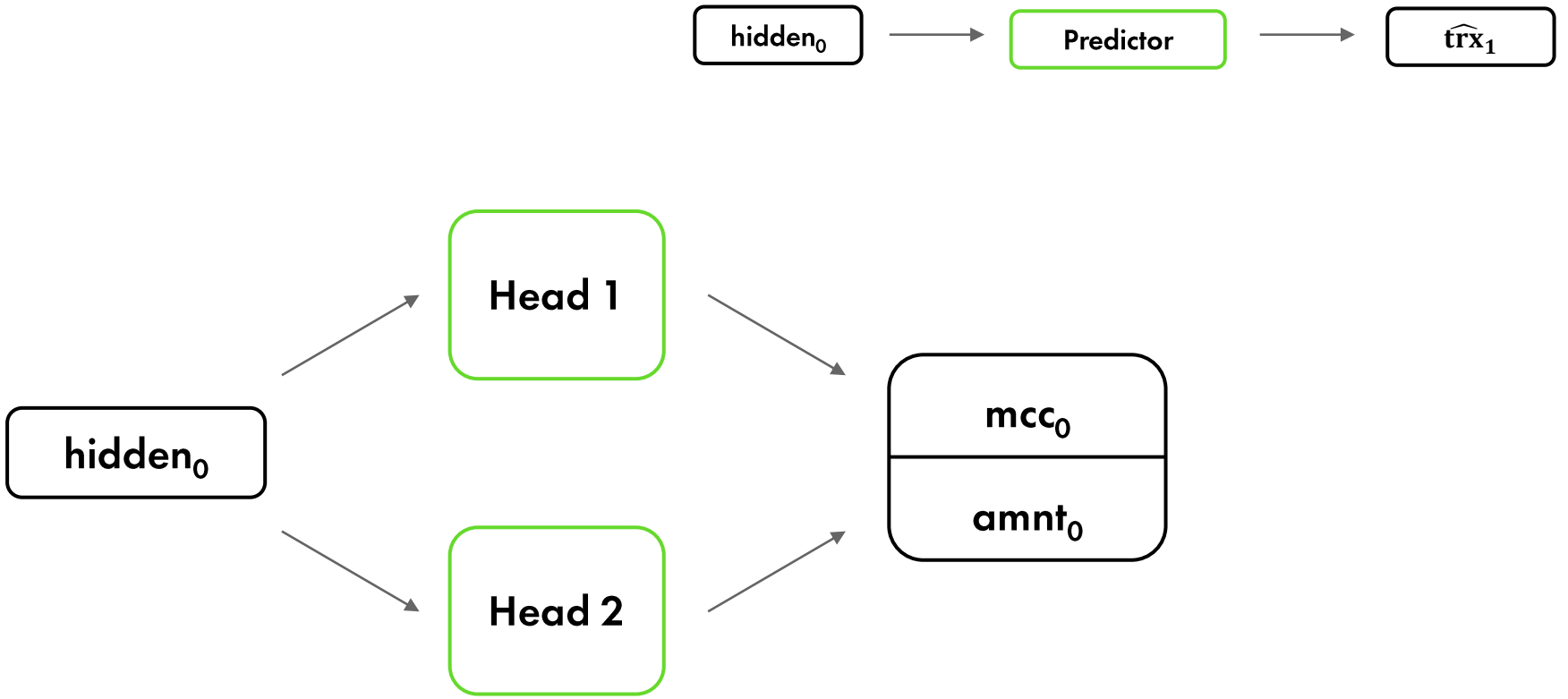
Representation (2)



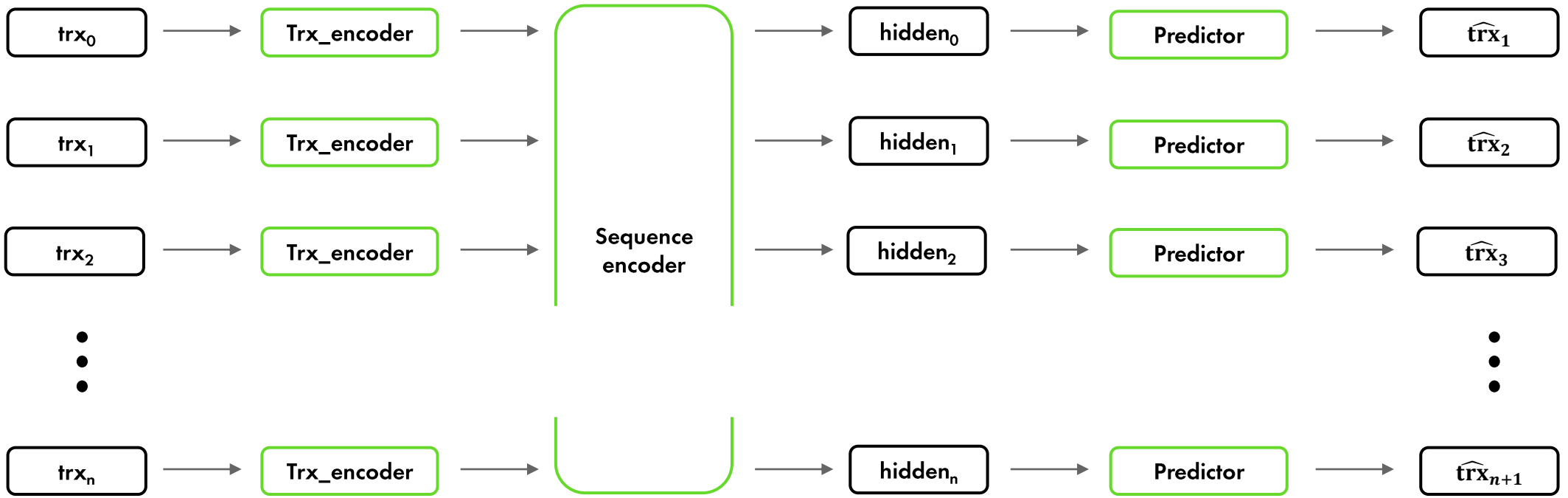
Representation (3)



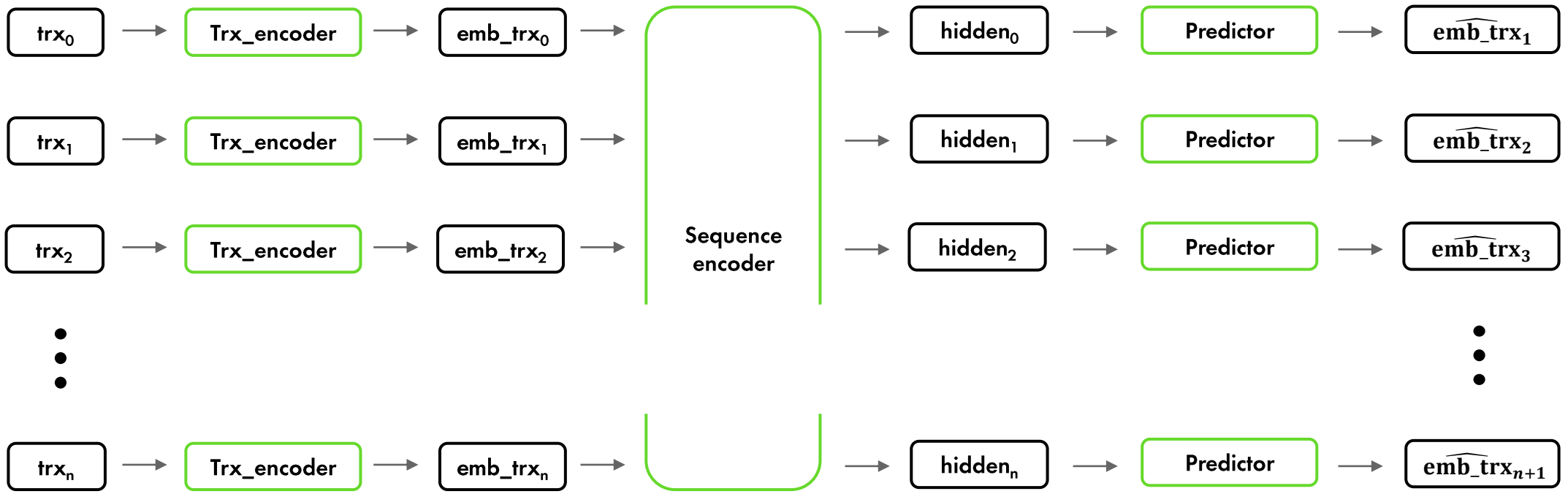
Representation (4)



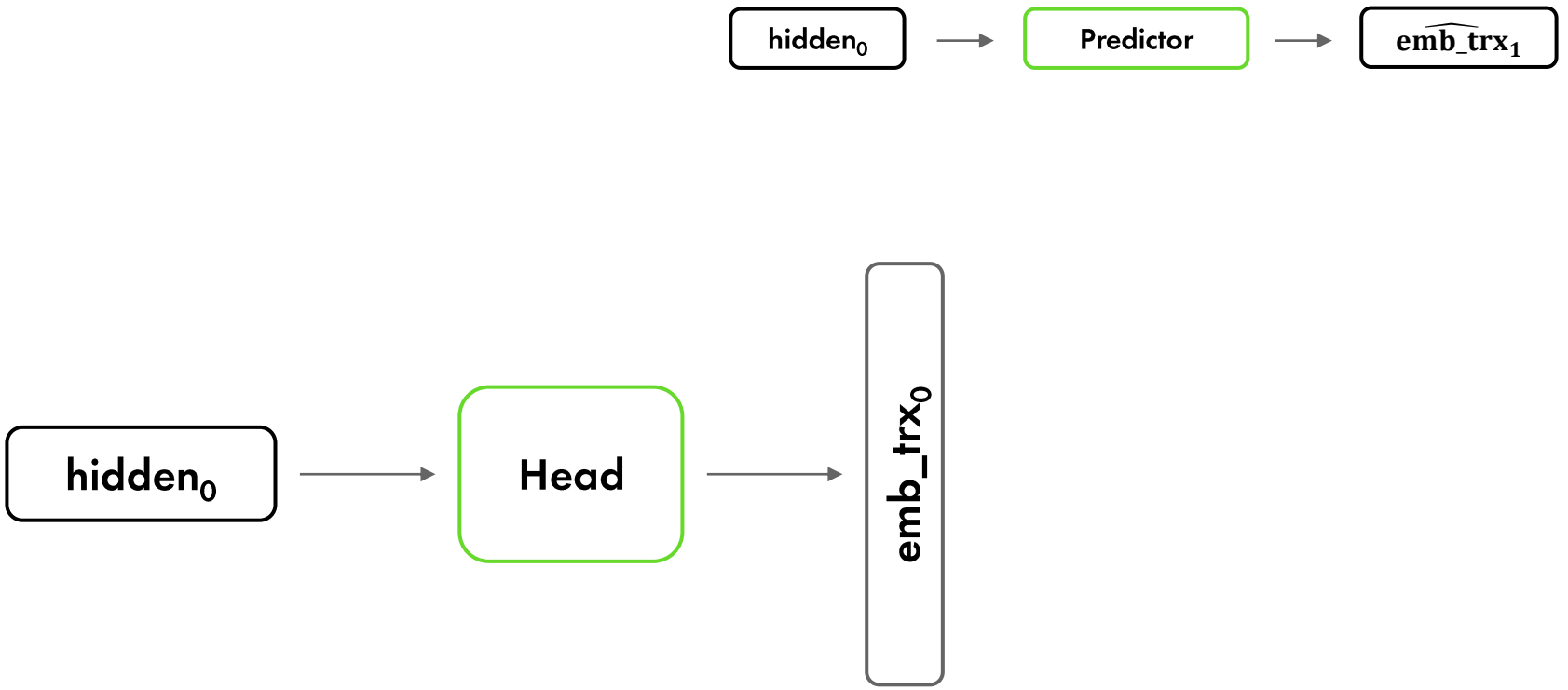
Representation (5)



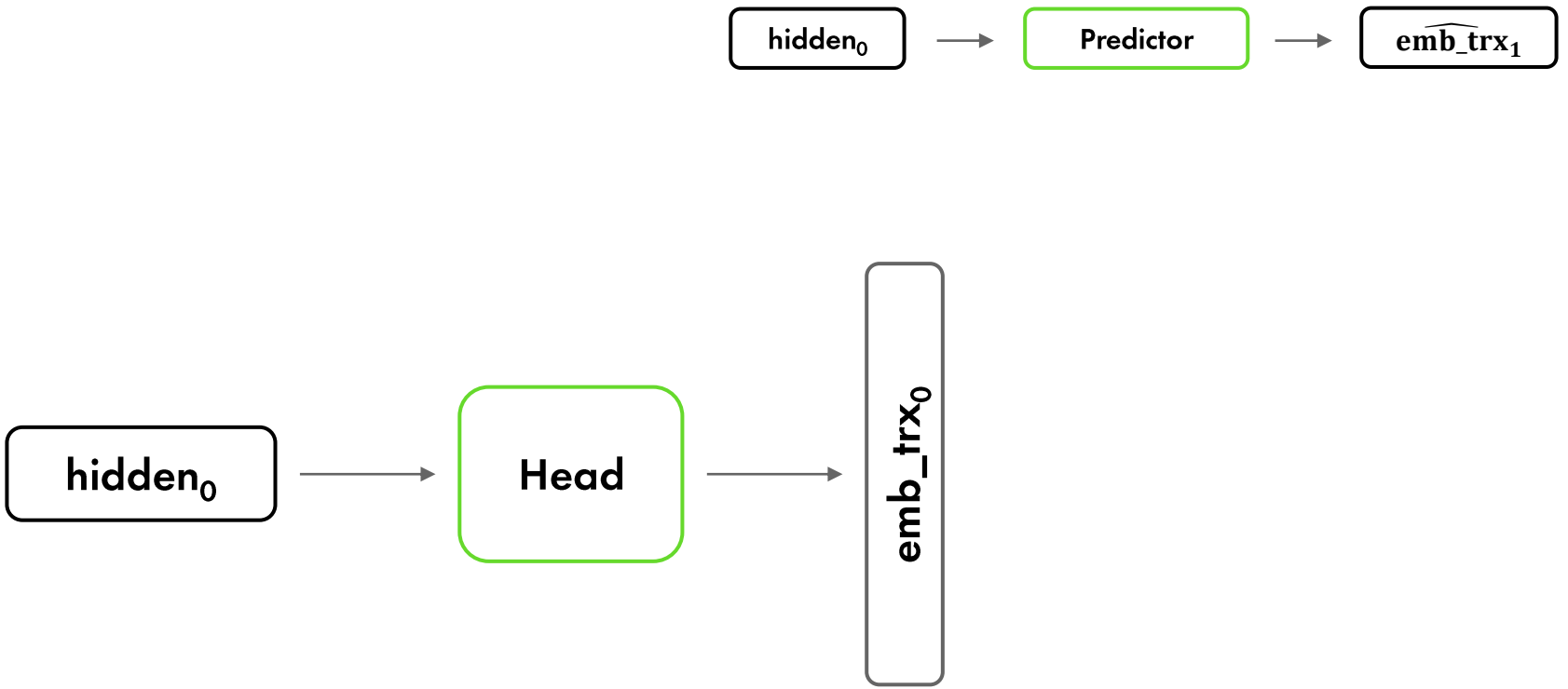
Contrastive (1)



Contrastive (2)

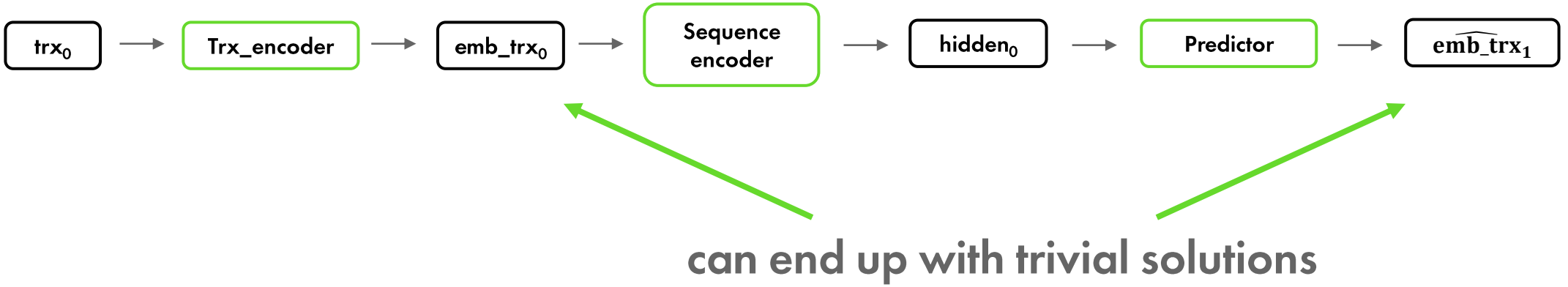


Contrastive (2)



Why is it called contrastive?

Contrastive (3)



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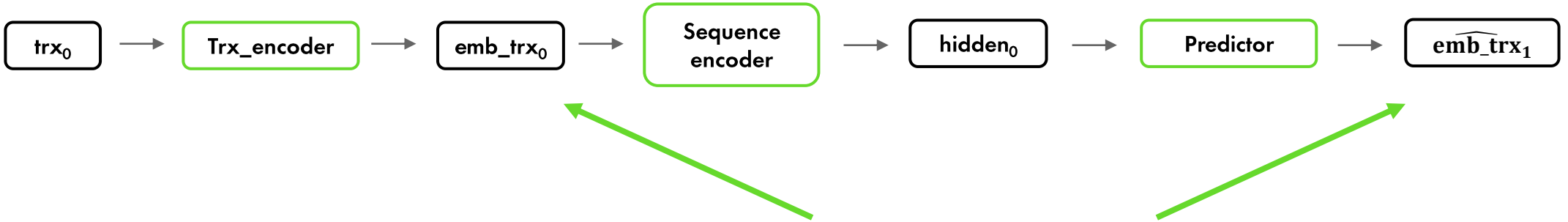

can end up with trivial solutions

QuerySoftmaxLoss

Preliminary results

- Tests with the same hyperparameters were ran
- No significance difference in Rosbank dataset for 20 runs

	Representation	Contrastive
Mean	0.23468	0.23238
Std	0.00614	0.00754
Sample size	20	20