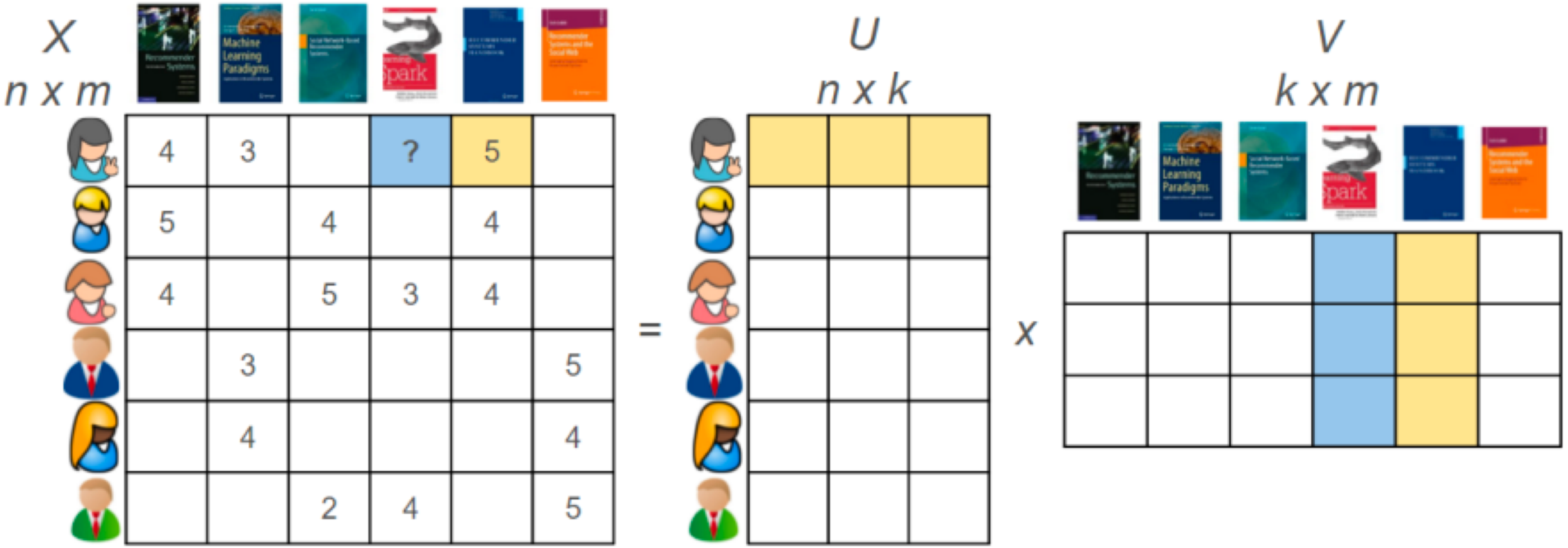
Implicit feedback Recommender System

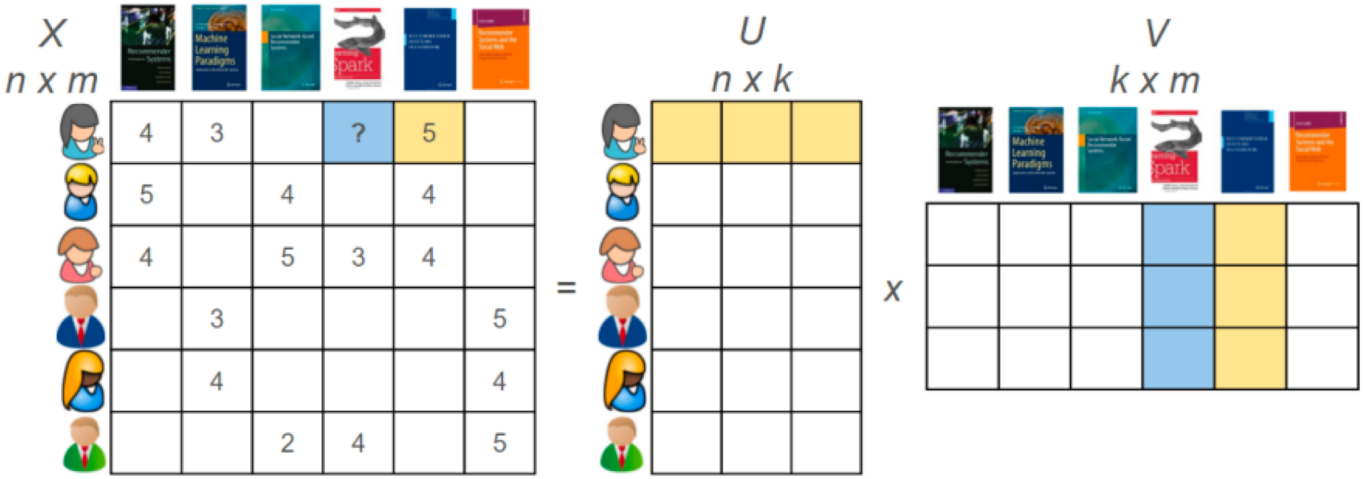
Thibault ALLART

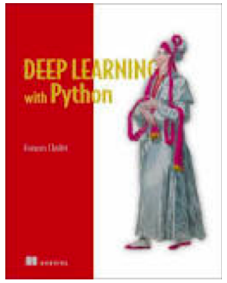
Collaborative filtering



https://buildingrecommenders.wordpress.com/2015/11/18/overview-of-recommender-algorithms-part-2/

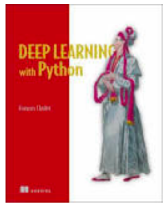
Issue 1: item set is not static (new products every days)





What is the prediction for a new product ?

Solution 1: content based recommendation

	Pure Colaborative filtering	Content based
 Tom	u5342761	Male, 35, living in Barcelona, has bought 1 book on deep learning last month, …
	i87239	A book, python, deep learning, 40 €, released in 2017, …

Issue 2: hard to add new features

What if we want to add more information into this model?

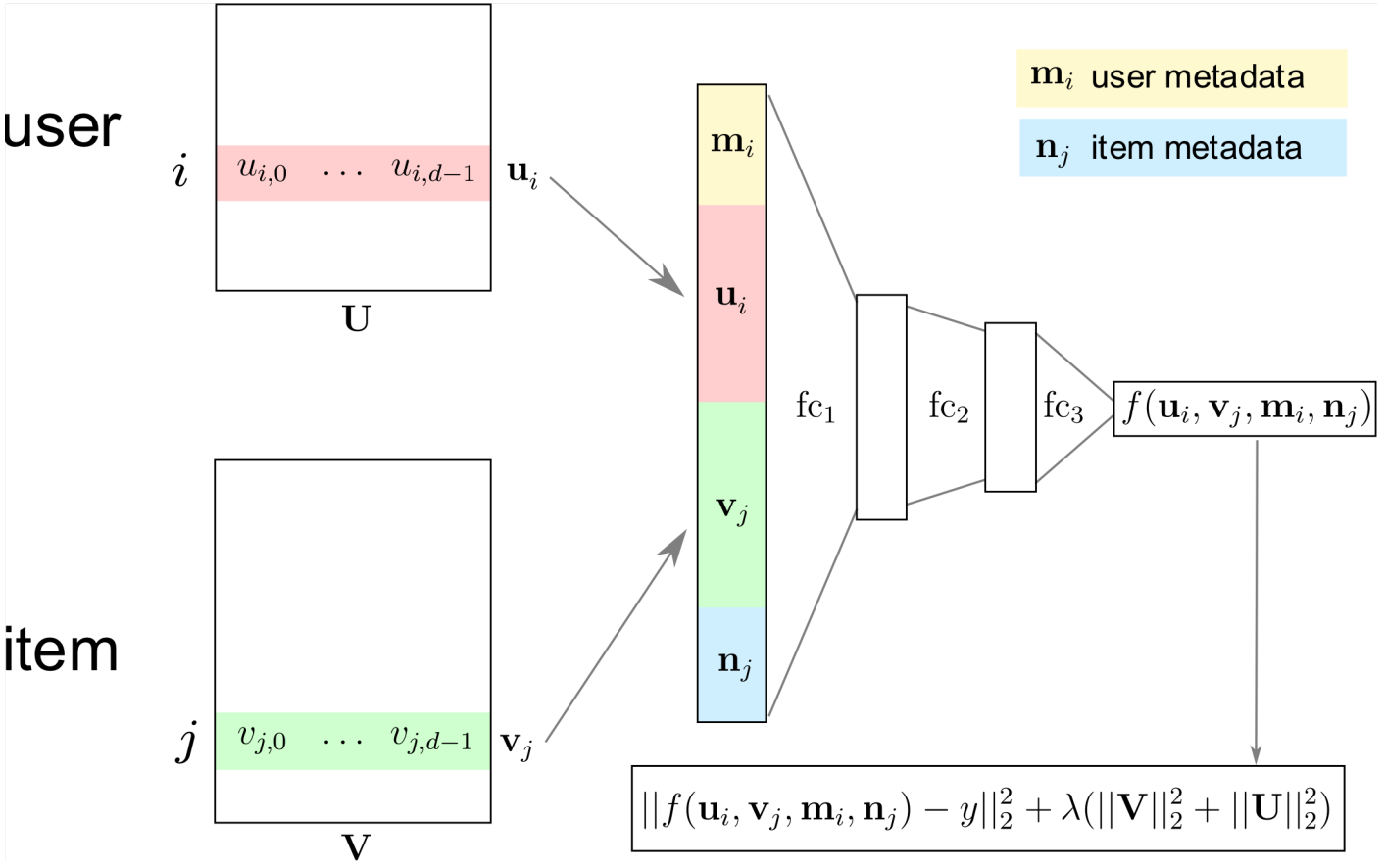
You can add categorical data but the matrix increase exponentially.

Even worse for continuous data.

Examples:

- How to include brand similarity?
- How to include temporality?
- How to add contextual information?

Solution 2 : Easier with the regression (DL) point of view



img: https://github.com/m2dsupsdlclass/lectures-labs

Issue 3: Time matters

- Real data is not a rating matrix but an ordered list of events.

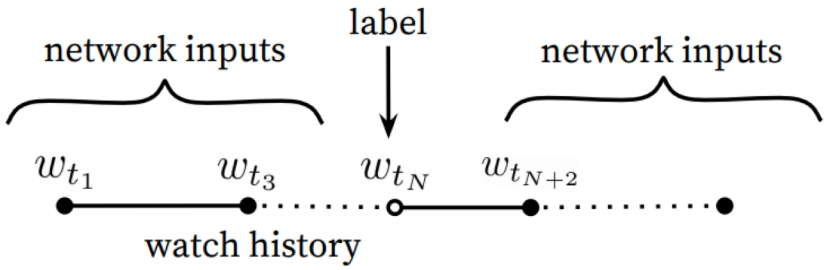
user_id	item_id	rating	timestamp
196	242	3	881250949
186	302	3	891717742
22	377	1	878887116
244	51	2	880606923
166	346	1	886397596

Time is lost

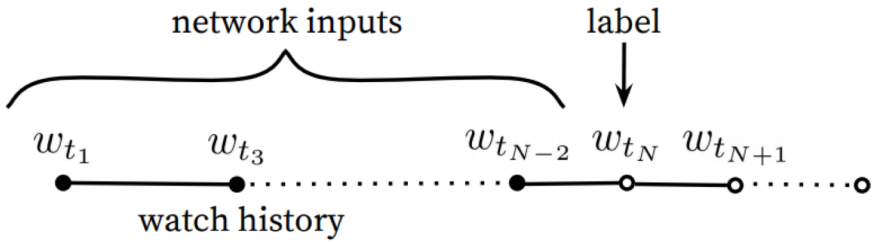
4	3			5	
5		4		4	
4		5	3	4	
	3				5
	4				4
		2	4		5

Solution 3: Time matters

Bad way



Good way



Issue 4: we don’t have scores

User doesn’t give us a score for each product.
We don’t have explicit feedback but only implicit ones.

What value should we put into the matrices ?

50*purchase + 12*add_to_cart + 3.1*View_product_page

Why not 3.2 or Pi ?

Solution 4: Impose **rank** not value

Instead of forcing a model to fit a prior scalar value,

let the model free to assign any scalar value it want,

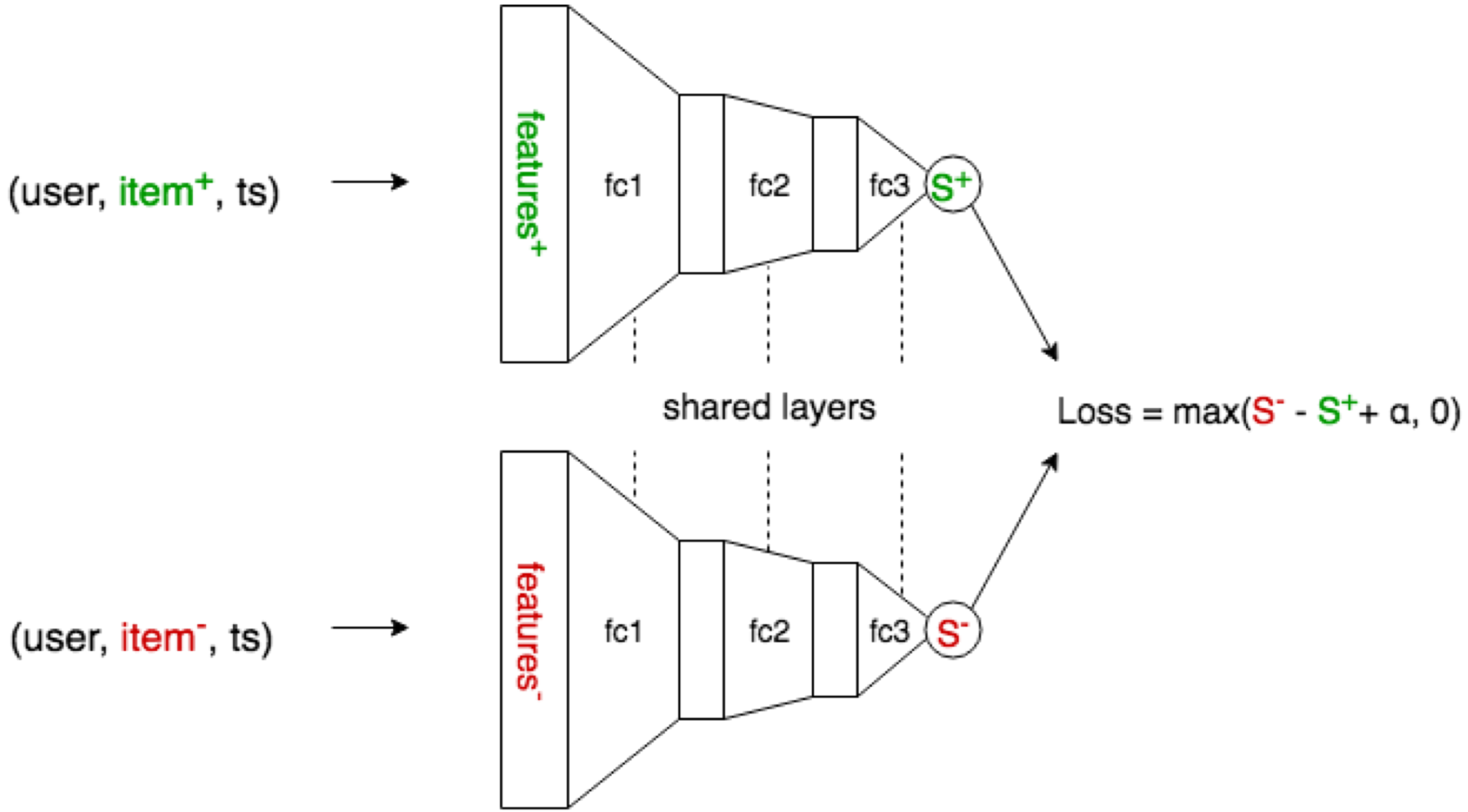
as far as it respect an order relationship.

For a given user, we want the score S with an item he will buy (item+) be higher than the score for an item he will not buy (item-).

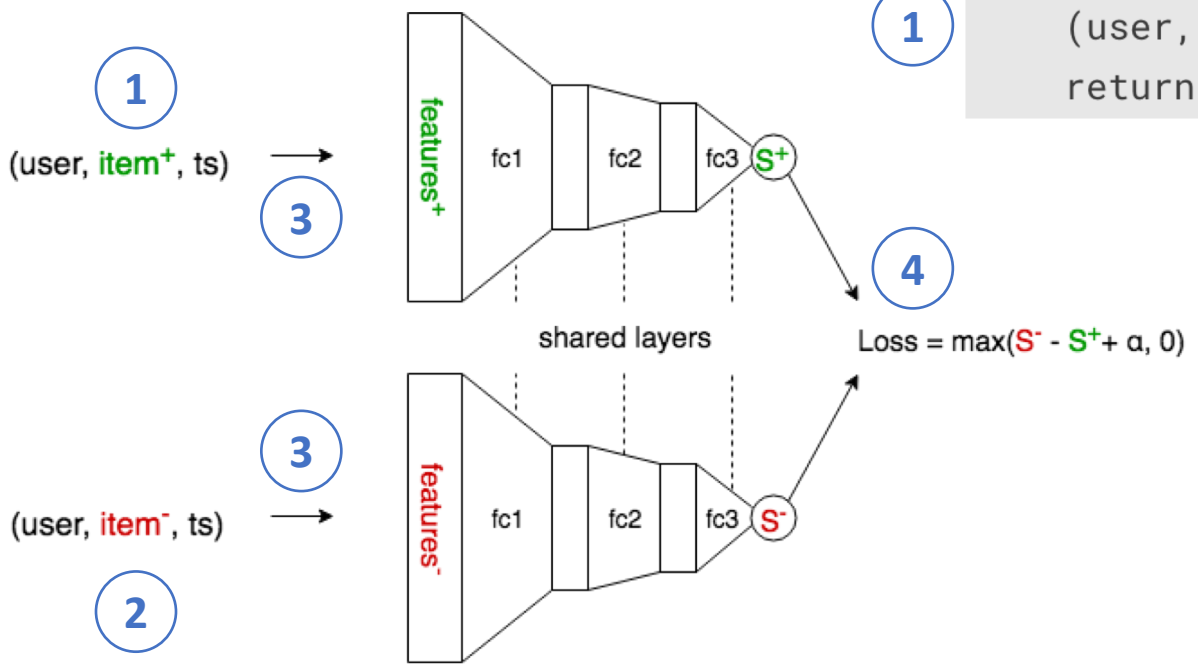
$$S(user, item+) > S(user, item-)$$

Model

Model : siamese network with triplet loss



Training



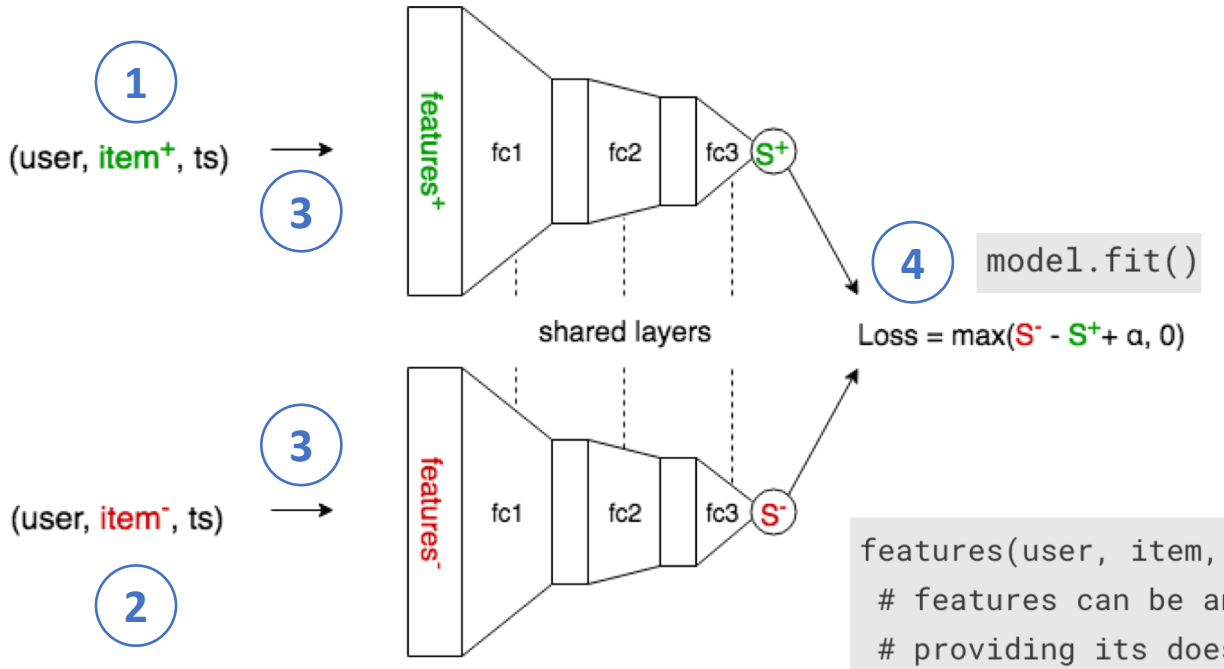
1

```
generate_positive_sample(purchase_table):
    (user, item+, timestamp) = select a random purchase
    return (user, item+, timestamp)
```

2

```
generate_negative_sample(timestamp, item+, item_table):
    candidates = items at sales at timestamp remove item+ from candidates
    item- = select a random candiate return item-
```

Training



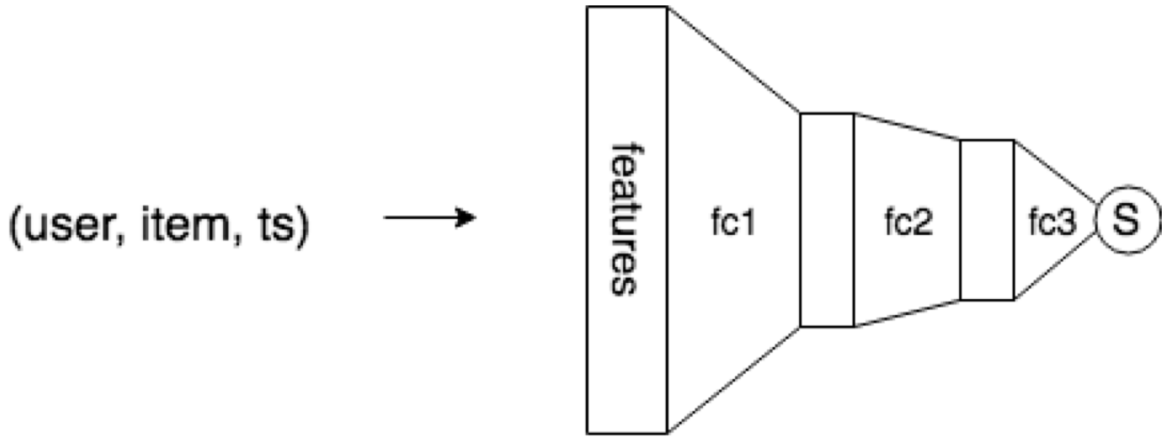
3

```
features(user, item, timestamp, tables)
 # features can be any function that depend on user, item and/or timestamp
 # providing its doesn't include information at time >= timestamp. i.e
    user_age
    item_brand
    item_ranking_in_the_last_hour
    number_of_time_user_bought_this_item_category

    return features
```

Prediction

1. For a given (user, timestamp) build a batch with all open operations (items).
2. Predict the score for the whole batch.



3. Return operations sorted by decreasing score.