

Group Assignment 2

Tuning Deep Neural Networks on real-life Business Data

Background and Goal:

The industry is Direct TV Shopping / Livestreaming. To sell products, shopping networks plan shows with hosts. When the host and show time is set, show planners fill in the details of shows a couple of days before the show happens. They choose products that go into the show, the price of the product, display duration, and the ordering of the products.

Goal:

The goal is to predict – a couple of days before it happens - the gross margin, per unit of time shown, of a given product in a given show and to tune the learning procedure.

Data:

All data is contained in *pricing.csv* and is from a Direct Shopping TV Network. The data is copyrighted and confidential.

The file contains showings of products in a show. A show is typically 1 hour long, and a showing typically takes 2 to 4 minutes.

- `master_id`: product identifier
- `show_batch`: show identifier
- `unit_offer_price`: the price that was offered on the screen
- `quantity`: total quantity sold
- `unit_cost`: the cost of the product
- `gross_margin_product`: the gross margin taking into account costs related to the product
- `gross_margin`: the gross margin taking into account all costs
- `gross_margin_new_customers`: same as `gross_margin` but only for new customers
- `gross_margin_product_new_customers`: same as `gross_margin_product` but only for new customers
- `host_full_name_1_array`: name of the hosts doing the show
- `show_brand_label_1_array`: show classification: the brand attached to the show
- `show_type_array`: show classification: the type of the show
- `showing_start_date_time_min`: when product was first shown in the show (seconds since an origin)
- `showing_end_date_time_max`: when the product was last shown in the show (seconds since origin)
- `adjusted_duration_seconds_sum`: how long the product was shown
- `merch_department`: product classification: merchandising department

- merch_class_name: product classification: merchandising class name
- country_of_origin: product classification: country of origin of the product

Note 1: All categorical variables are integer encoded. All numeric variables are divided by a constant.

~~Note 2: All debut products (i.e., products shown only once) should be deleted.~~

Variables

Input variables

- master_id
- unit_cost
- host_full_name_1_array
- show_brand_label_1_array
- show_type_array
- showing_start_date_time_min
- merch_department
- merch_class_name
- country_of_origin
- unit_offer_price

Response variable:

$$y = \frac{\text{gross_margin}}{\text{adjusted_duration_seconds_sum}}$$

Tuning parameters

The goal of this assignment is to gather experience on the sensitivity of the algorithm to different kinds of tuning parameters: batch size, number of hidden layers, number hidden neurons, hidden activation functions (sigmoid, tanh, relu, leaky relu, prelu, elu), optimizers (plain SGD, momentum, nesterov, adagrad, rmsprop, adam, learning rate scheduling), ...

The first step in this exercise is to make a grid of all possible combinations of parameter values.

Deliverables:

Code (.py file)

- A deep neural network implemented in TensorFlow and a function to tune parameter
- All Python code to prepare the presentation

Presentation (pdf or PowerPoint)

- Useful insights on the sensitivity to tuning parameters
- Details on training