

# THE ANALYSIS OF MACHINE LEARNING METHODS FOR PREDICTING OUTFLOW OF CLIENTS

Vinnitsia National Technical University

## ***Abstract***

*The analysis of machine learning methods for predicting outflow of clients was carried out, the results of which proved the expediency and applicability of several methods in a real software product.*

**Keywords:** Web-server, Android OS, service.

## **Introduction**

Today we propose to meet the problems that exist in a program that develops a service to predict the number of clients in the company, the main work of which was obtained from the past and interested old clients, and apparently received certain services of the company. Using these issues, it was possible to create a system for using machine learning for the service that would be predictable for all clients, and it would be able to have two parts: a web server and a client on a smartphone using the mobile application. The method is to create web servers and applications for androids that use and provide information about their predictions to other potential customers who set up their business.

## **The concept of machine learning and its types**

Let's consider the concept of machine learning (ML) in more detail. ML is an artificial intelligence unit that considers algorithms that can be learnt from existing data. The mission of ML is to imagine that we have a certain set of objects - examples and a certain set of labels, those are answers. There are some hidden dependencies between examples / observations and answers. The task of ML is to find this hidden dependency to predict responses based on new data.

ML is divided into 3 types:

1) Teaching with a teacher

There is a set of examples, each example has the right answer. The task of the system is to learn from the examples to provide the correct answer given by the teacher. We are teachers.

2) Teaching without a teacher

There is a large data set. It has hidden patterns. The goal of the system is to find patterns, for example, by splitting data into specific groups or clusters.

3) Reinforcement training

There is a certain environment where there is a certain computer controlled agent. The agent may take some actions. Certain actions lead to positive or negative responses. The goal is to maximize positives and minimize negative responses. Example: a game where you have to maximize your points or win the whole game.

## **The tasks of machine learning**

The tasks of ML are classified into several types by the type of problem being solved:

- The problem of clustering

A well-known example is when a computer needs to learn how to recognize cats and dogs in a set of photos. The job of computer is to learn how to recognize a given photo - a photo of a cat or a dog. The clustering task

looks a lot like this, but it's a bit different. We have the same photos, but we don't tell the computer which photos these are. We need the algorithm to find patterns among the photos and break them into several clusters. Depending on how diverse the data is, the number of clusters may vary. We can specify the number of clusters ourselves and order the algorithm to split the data, for example, into 2 clusters. If the algorithm is effective enough, it will find two sets of photos.

- Regression task

There is a set of points through which it is necessary to draw a fairly straight line, which would pass fairly close to these points. It is quite a simple task for a person, but when we are dealing with multidimensional data, rather than two-dimensional, things are not so obvious.

- Dimension reduction task

There are data presented in a multidimensional representation, for example, the results of a poll on a thousand questions for thousands of respondents. Accordingly, every person is represented by a thousandth vector. We want to find hidden patterns in it. By applying an algorithm that solves the dimension reduction problem, we can reduce the dimension from 1000 dimensions to 3 dimensions. And we will see that some summaries are in one zone and others are in the other one. You can further analyze this data or construct the following ML algorithm to obtain more valuable data from our test sample. ML can be applied in so many areas that it is easier to list areas where ML is not applicable. ML can be used to identify objects in motion pictures, predict stock prices, screen cancer before the doctor has analyzed the image, find genetic abnormalities by DNA code, and more. In many areas, ML is used to better effect than humans do.

Moreover, it is possible to say that the most appropriate for the implementation of the software that will predict the outflow of customers will be to use a method of teaching with a teacher, based on the input and output data sets, and can be used by the method of clustering, for specific distribution users into categories.

### **Relevance of machine learning**

Updating the perfect product to forecast all customers is the highest priority to date, and a proprietor who works for clients and provides numerous service needs must be sure that this is the least, but possibly the most up-to-date. Test with the latest technology at your disposal for this equipment for the modern software you want to use, highlighting important issues.

### **Ways of implementation**

The server part of this service will be implemented using Python programming language. The Web API will also be used to handle basic protocols and formats such as HTTP, WebSockets, SSL, JSON and XML. Web API controllers use the REST (Representation State Transfer) style, which involves using the following types of HTTP requests to interact with the server: GET, POST, PUT, DELETE. Web API is ideal for developing RESTful applications.

The client part of this software will be implemented as an application for the Android operating system. The advantage of writing an application under this platform is that more than half of the smartphones have an operating system installed as standard [1].

The client part will be developed using the Android SDK, which is a universal mobile application development tool for Android OS, which in turn allows you to use all the available features and benefits of this OS to interact with the server through web requests using such additional libraries as Retrofit2 and Okhttp3, and to interact with the user through Graphical User Interface (GUI) using such additional libraries as ButterKnife and RxJava. Java will be used to write code for this OS, which, due to its dynamic development and convenience, has been chosen by Google as the primary language for developing android applications [2].

### **Conclusion**

The results obtained from the analysis of machine learning methods for predicting customer outflow show the feasibility and high prospect of using the chosen methods to create a real software product. Thus, due to feedback from the target user, this software product will have a high accuracy of pronunciation, which in turn

increases the usefulness of this software module. It is planned to use the obtained results in the further work to create the software for predicting the outflow of clients in the form of web-server and android-application.

#### REFERENCES

1. What is this Android? 2008 – 2014 / Android Ukraine. – Available online at: [http://android.com.ua/android\\_os.html](http://android.com.ua/android_os.html)
2. Getting started with Android. – Available online at: <http://resources.infosecinstitute.com/getting-started-android-forensics>

**Andrii A. Papa** — Student of Computer Science Department, Vinnytsia National Technical University, Vinnytsia, e-mail: [papa.andriy@gmail.com](mailto:papa.andriy@gmail.com).

**Supervisor: Iryna Stepanova** — Candidate of Philology, associate Profesor, Head of the Department of Foreign Languages, Vinnytsia National Technical University, e-mail: [Stepanova.fld@gmail.com](mailto:Stepanova.fld@gmail.com)