STUDY MOTIVATOR

Information Technology, Computer Science, Lodz University of Technology, International Faculty of Engineering

ABSTRACT

Nowadays, technology is present in most of the actions of everyday life. Therefore the society must be very careful about the way it is used, since it can trigger different negative effects on people. Technology can affect both psychological and physical aspects of the person, especially in children. It is possible to find examples ranging from muscle pain due to poor postural hygiene, to addiction problems that cause isolation of the person.

And today, more than ever, this is a problem that affects us, as the whole world has been forced into digitalization due to the impact of the global Covid-19 pandemic. It is already evident that the younger generations are increasingly positioning themselves in favour of the use of technology as a method of learning and entertainment, which is why it's a must to take special care to provide the necessary tools so that the population can make good use of technology.

Therefore, through this project our goal is to contribute with our knowledge, to the development of a possible tool to help solve the problems that are emerging due to rapid digitization.

1. Introduction

New technologies are becoming more and more a part of our lives. From an early age, children are subjected to using these new technologies, preferring them in some cases to playing other kinds of offline games. Even now, with the pandemic situation, people have had to resort to remote work and study as the only way to stay connected to them.

This rapid rise of new technologies is causing some problems in society, both physical and mental, and it is the concern of people involved in new technologies: how to create a product, which people will use and like, but which will not be harmful to them.

1.1. Background information

The problem that was proposed was about ‘the digital disease of the 21st century’, that was related with how technology is affecting our lives every day more and more as it is becoming an essential part of our routine. The purpose of this work was to identify and solve (from an IT professional’s point of view) a specific problem related to dangers caused by rapid growth of information technology in recent years.

Firstly, a research about what problems the overused of technology was done.
The first research was based on finding information about the ‘fear of missing out’ or **FOMO**, which is the fear of thinking that others might be having some experiences that you are missing. There was an experiment conducted by the University of Pennsylvania in which143 subjects participated to see if the participants had this FOMO. The experiment was successful, and the responses were as following: "I get anxious when I don't know what my friends are up to.", "Sometimes, I wonder if I spend too much time keeping up with what it is going on." and "I fear others have more rewarding experiences than me.". The conclusion was that people got anxious when they did not know what is happening, what creates a dependency on mobile phones and on being connected all the time. [i]

There is a connection between FOMO and technology **addiction**, suggesting that some individuals may develop this additive behaviour due to the overused of the phone. The more time people spent on their phones, the more risk to became addict to them. And at it was explained, nowadays there is a growing need of being constantly with the phone. The addiction was also possibly caused because of the addictive pattern of mobile phone use, they are designed in a way so that you want to spend more time on the phone: specific applications, calls, instant messaging and social networks.

The research was also based on the health problems that can be caused by this misuse of technology. A division between physical problems and mental health problems can be done.

Regarding the **physical problems,** different approaches were found. Some articles were about how **obesity** was a problem related to this issue because of sedentary time and the association between screen time and snacking. Another problem concerning physical health was related to **musculoskeletal problems** because of working long hours with a computer, usually at home sitting on a chair, is associated with a static and constraining posture, repetitive movements, extreme positions of the forearm and wrist, and with long periods of continuous work.

Regarding the **mental health problems** due to the overused of technology**,** the following issues can be found: online harassment, depression/anxiety, stress, fatigue, loneliness, decline in intellectual abilities, cyber bullying, emotion suppression and lack of concentration. Furthermore, people may feel restlessness when they are not able to access their social networking sites. Some applications encourage these mental health problems because once you use them, it is difficult to disengage from them. For instance, with some features such as comments or likes, this addiction is encouraged as it creates a need to have more and more likes.

In students, it could result in a **lack of motivation** due to the expenditure of passive time on the phone without attending to other issues related to their studies. Students dedicated more time on social media rather than studying, what affected their academic yield.

From this research where it was found out the possible problems that could result as long-term effects, and the project was started. The hypothesis was stated as the following: <u>As a confronting population of the present era, younger generations are experiencing an emerging stage of life and a higher risk of serious mental health problems</u>. As nowadays, upcoming generations deal with technology since early ages, what could cause future problems.

1.2. Problem finding

Based on the research that was done about the possible problems caused by the overuse of social networks and with the distinction among them, an affinity map was done in order to classify these issues.

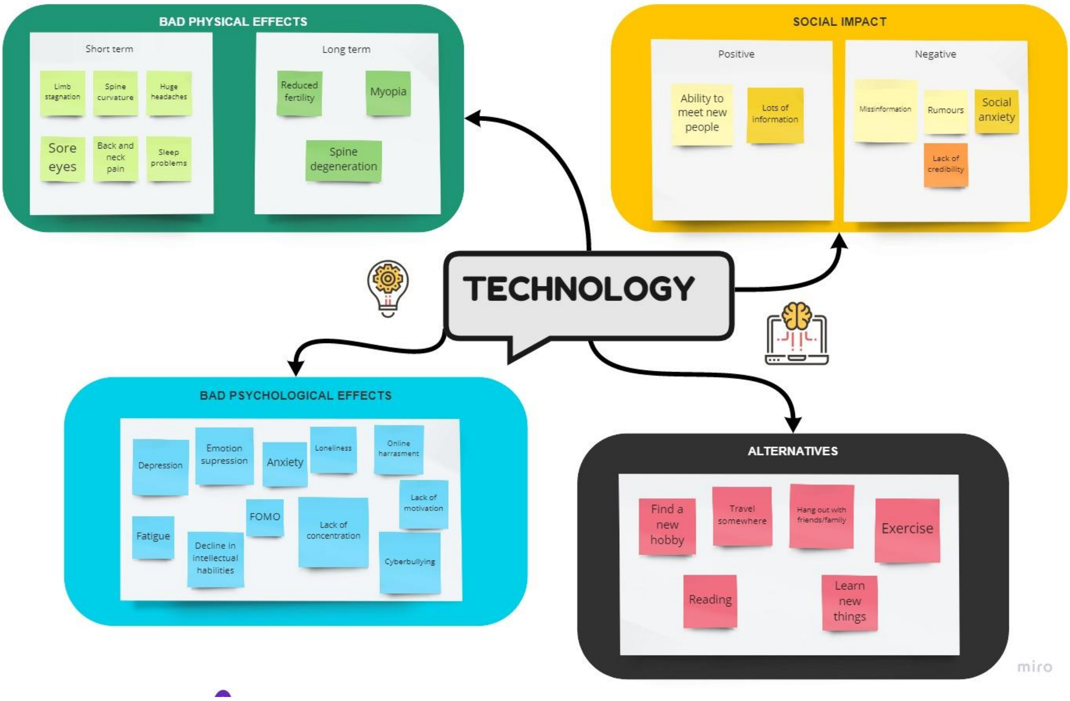


Fig 1. Affinity map.

From the **affinity map** above, which was created from the research, there can be the following classifications:

- Bad physical effects: How does the social media affect the physical health?
- Bad physiological effects: Are the side effects of the social media affecting the mental health?
- Social impact: What potential roles does social media play in society's well-being?
- Alternatives: What are the possible alternatives in order to reduce this overused of technology?

The answers to each of those questions can be seen on Fig. 1. At this point it was needed to start thinking about the possible alternatives to find a solution to the problems proposed.

To further research, **fishbone diagram** was created. The fishbone diagram provides the visual representation of all the possible causes for our problem to analyze and find out the root cause: a more detailed analysis of the problems can be seen.

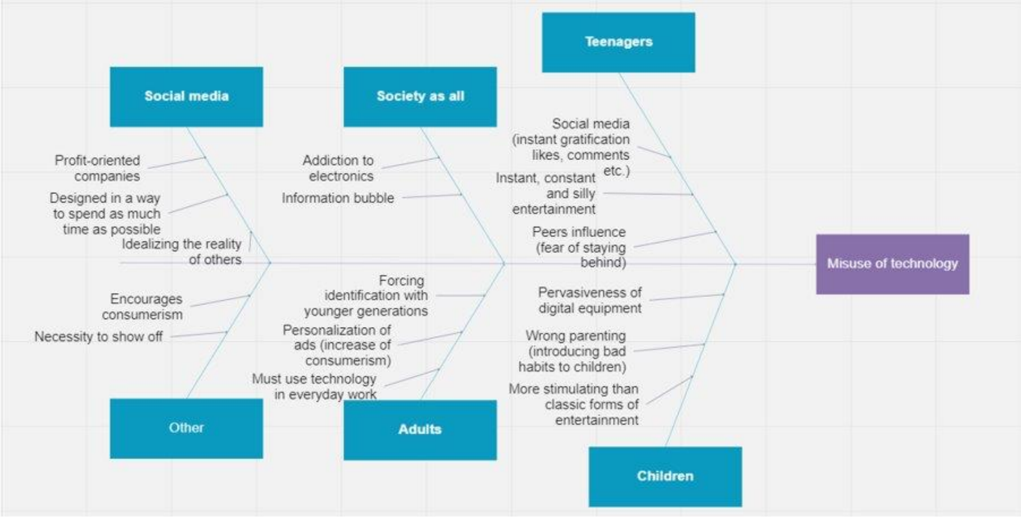

Teenagers
Social media
Society as all
Profit-oriented companies
Designed in a way to spend as much time as possible
Idealizing the reality of others
Addiction to electronics
Information bubble
Social media (instant gratification likes, comments etc.)
Instant, constant and silly entertainment
Peers influence (fear of staying behind)
Misuse of technology
Encourages consumerism
Necessity to show off
Forcing identification with younger generations
Personalization of ads (increase of consumerism)
Must use technology in everyday work
Pervasiveness of digital equipment
Wrong parenting (introducing bad habits to children)
More stimulating than classic forms of entertainment
Other
Adults
Children

Fig 2. Fishbone diagram.

Applications are designed so that the companies that control them earn profits, and so that once you use them it is difficult to disengage, and they create addiction. They are also created in order to encourage consumerism, due to the excessive use of adverts when navigating through the social media. Another issue that was found, and that was explained before is the necessity to show off and to look cool on the social media what causes a distortion of reality that can lead to mental health issues. It was all explained on the fishbone diagram.

Since students are a group that is fully involved in social media activities, nowadays even more with the remote classes due to the pandemic, the project will be focused on these stakeholders. In that way the **target group** was stablished as students between 20 and 26 who have lost their motivation to work and educate themselves due to easily accessible entertainment provided by technology. Being the **problem statement** the lack of motivation in students caused by passive time spent on the phone.

Finally, some ways in which we could counteract this problem of the lack of motivation in students, that would be the following:

- Information and consulting sessions.
- Awareness movements to understand the side effects of social media.
- Parental control and higher security systems on social networking sites.
- Dissociation of social websites that promote discrimination, violence, etc.
- Social media applications to help the addicts.

2. Idea finding

2.1. State of the art

The lack of student motivation caused by the large amount of time spent passively using technology can be addressed from different perspectives using our knowledge as information technology engineering students.

But in most solutions, there is a common point, the algorithm that governs the behaviour of the program. When working with statistical data, data mining and machine learning, it is essential to make an exhaustive selection of the model that will oversee handling the data set to produce results.

Currently there are different types of classification algorithms when it comes to machine learning. After an exhaustive search, it can be highlighted 4 different classification algorithms that stand out in machine learning.

First, it is important to define why data classification must be done, and what does it mean. In machine learning, input training data is used to predict the behaviour of different data sequences. Thanks to this we can classify the information and know in advance what kind of behaviour it will tend towards.

In our project, we want to use machine learning as a possible solution for the previously stated problem. We can highlight the following models that stand out the most in statistics depending on the type of datasets we are working with:

Logistic Regression

It is defined as the calculation used to predict a binary outcome. It can be displayed as Yes/No, Pass/Fail, etc.

The independent variables are analysed to determine a binary outcome that will be classified according to two categories. The dependent variable always corresponds to a categorical outcome, and is written in this form:

$$\mathrm{P(Y = 1|X)\ or\ P(Y = 0|X).}$$

Using this classification model, it is possible to predict whether an outcome will be positive or negative, or for example whether a given object belongs to a group with a probability between 0 and 1.

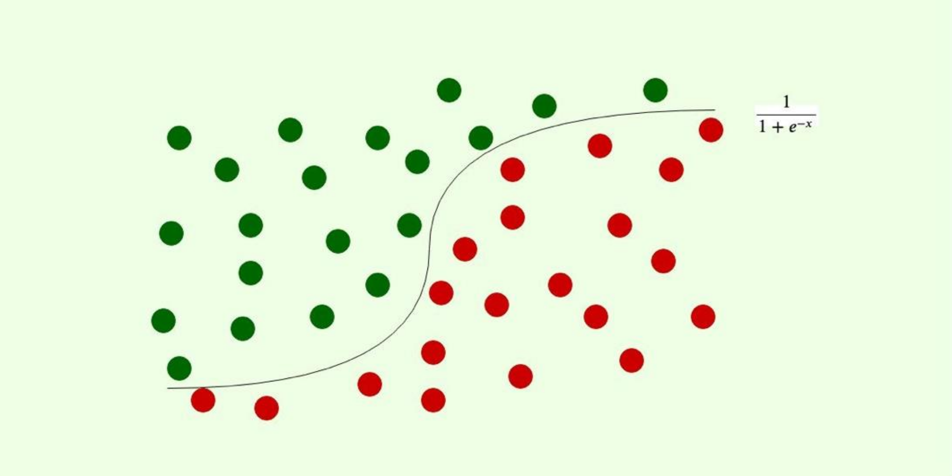


Fig 3. Logistic Regression Algorithm Diagram

Naive Bayes

Thanks to this algorithm, it is possible to calculate the possibility that a given data falls into a specific data category. When analysing a text, we can categorize for example parts of the text as belonging or not to a given tag.

To make these decisions we need to calculate the following probability operation:

$$P(A|B) = \frac{P(B|A) x\ P(A)}{P(B)}$$

Here is an example of the use of Naive Bayes in machine learning:

Text = Tag

"The grade point average was passed" = Academic
"He danced in a peculiar way" = Not academic
"His final paper was outstanding" = Academic
"The dolphins jump very high" = Not academic
"The class was over by then" = Academic
"The labs were fully equipped" = Academic

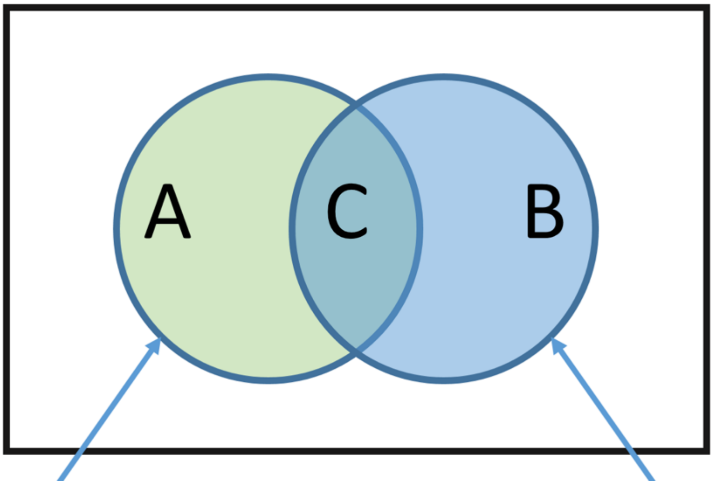


Fig 4. Naïve Bayes diagram

K-nearest Neighbours

This classification algorithm consists of a pattern that uses training datasets to find the k values that are relatively close to each other.

The classification using k-NN, calculates in which position the data are located, to which category they belong, and which are their nearest neighbours.

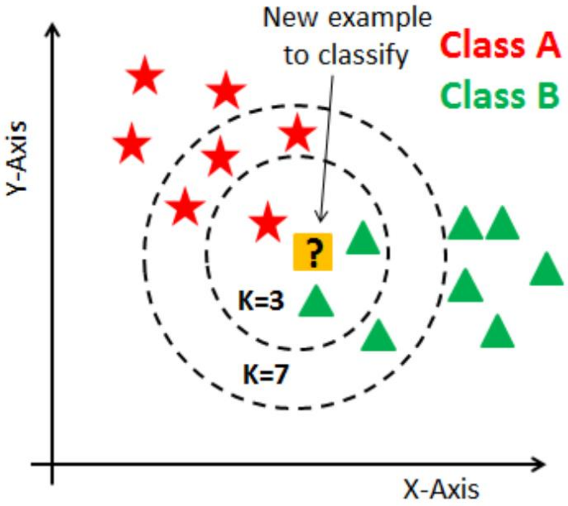


Figure 3. K-nearest Neighbors Diagram

Decision Tree

A decision tree is a supervised machine learning algorithm that is able to sort classes at a very precise level.

This classification algorithm is structured in the form of a tree that works as follows: the internal nodes represent the common characteristics of a dataset, each of the branches represents the decision rules and each leaf node represents the outcome. As we move through its structure, we can easily find the similarities of the different subgroups simply by looking at the source group of origin. Thus, we are able to create categories within categories, all following human supervision.

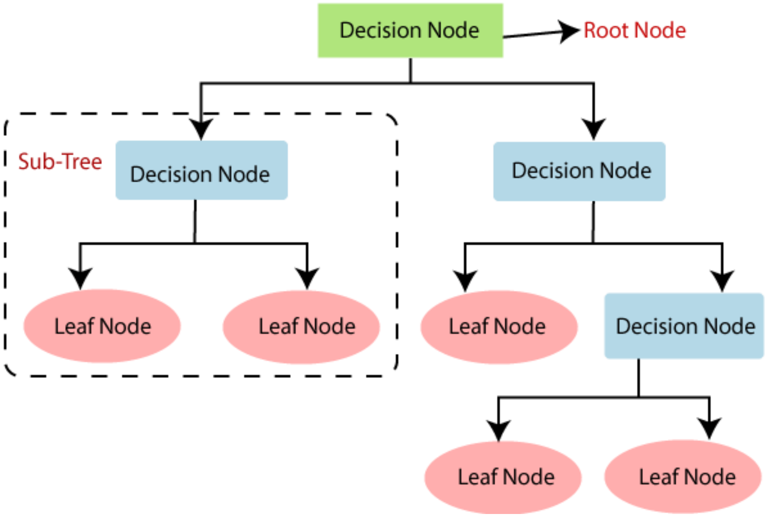


Fig 5. Decision Tree Diagram

2.2.Innovative ideas

Once the search for tools was completed, the result obtained was as follows. It is intended to implement an algorithm model that together with more features, can provide an effective solution.
The decision tree algorithm is the one that best fits the needs since it can accurately and efficiently solve classification problems. The intention is to develop software that can use the machine learning algorithm to predict user performance.

First, goals must be defined, and based on the performance it will be possible to make statistical calculations to determine the percentage of effectiveness with which the user will or will not meet the goals.

In the market we can find numerous software that serve as an aid for planning and organization to manage time. Some of them are:

- Todoist: a cross-platform application that allows to manage the tasks in a simple and visual way.

- Trello: it is a flexible and free tool to organize plans and projects.

- Any.do: to keep track of your progress and organize your task. Available multiplatform.

But none of them provides a prediction based on machine learning and a previously obtained database to calculate the academic performance and the probabilities of success over your goals.

To obtain the database that would serve as support for the machine learning algorithm, we considered two possible solutions:

- First solution: Obtain a database found on the internet. This would be the result of a study previously carried out, with academic data on numerous students.

- Second solution: Create our own database from scratch. The answers would be obtained through an online survey that would be sent to all university students in our environment and would be used for the statistical calculations of the algorithm.

Regarding the pros/cons of each one, in the first solution, we would have a large amount of recorded data, which would increase the effectiveness of our prediction. But for the search, it would be difficult to find a database that fits our model, because many of them have data that are useless for our study. Therefore, it would be necessary to filter and select them.

On the other hand, the second solution allows us to efficiently select exactly what data we want to collect from our respondents. But we would run into the problem that the amount of data samples obtained after launching our survey would not be large enough to make an adequate prediction.

2.3.Main idea selection and justification

Finally, we want to focus our project on the development of an online platform that allows users to track their performance with respect to their desired goals.

Each solution has its pros and cons, which is why we have to discuss each one intensively, analysing their advantages and disadvantages in order to make the right choice. In the second option, we are faced with an important factor: time. For our prediction algorithm to work properly, we need a large number of people to fill in the survey, because the more samples, the more effective our estimator will be. But unfortunately, getting enough respondents will take too much time, which will slow down the implementation of our algorithm.

This has been a key factor in considering discarding this option and choose the first solution.

This factor has been key to consider discarding this option and choosing the first solution. The only drawback is that there are databases that have more features than the ones we want, so we would need to filter them by obtaining only the data we are interested in. In this way we can have a large number of samples and it would take us little time since with simple programming we can carry out a satisfactory filtering.

It is for all the above discussed that the first solution is clearly the optimal solution to implement and that is why it is the chosen one.

Regarding the selection of the sorting algorithm, the decision tree will finally be the one chosen. There are scientific articles that show that this algorithm is the one that best fits for the prediction of students' performance. It is ideal for quantities of data that are not exaggeratedly large, and its structure allows us to have different characteristics that will intervene in the final prediction.

Next, in the table we can find a summary of the analysis of the most conventional classifier algorithms. We can check the average accuracy as well as the accuracy on training set of each of the machine learning algorithms previously explained.

Classifier	Average accuracy	Accuracy on training set
Decision Tree	69,48%	75,00%
Logistic regression	67,44%	75,58%
Naïve Bayes	63,08%	65,12%
3-Nearest-Neighbor	63,66%	75,58%

Table 1. Summary Results for Conventional Classifiers

3. Solution implementation

3.1. Detailed solution description

Due to the continuous development of the Internet and its availability among the target group, the solution to the problem is an Internet platform that allows the user to visualize the effects of learning or work. Based on his work effects and lifestyle, it is possible to estimate his final result. It is enough to register, add the amount of time spent on a specific goal and observe the expected result.

Solution overview:

Users who do not have a profile can register, where they provide a unique nickname, first and last name and password. Then user is asked to fill a questionnaire containing questions about the non-sensitive data of the person, based on which it will be possible to estimate the effectiveness of learning. After that, the user has access to the part described by the following use-case diagram:

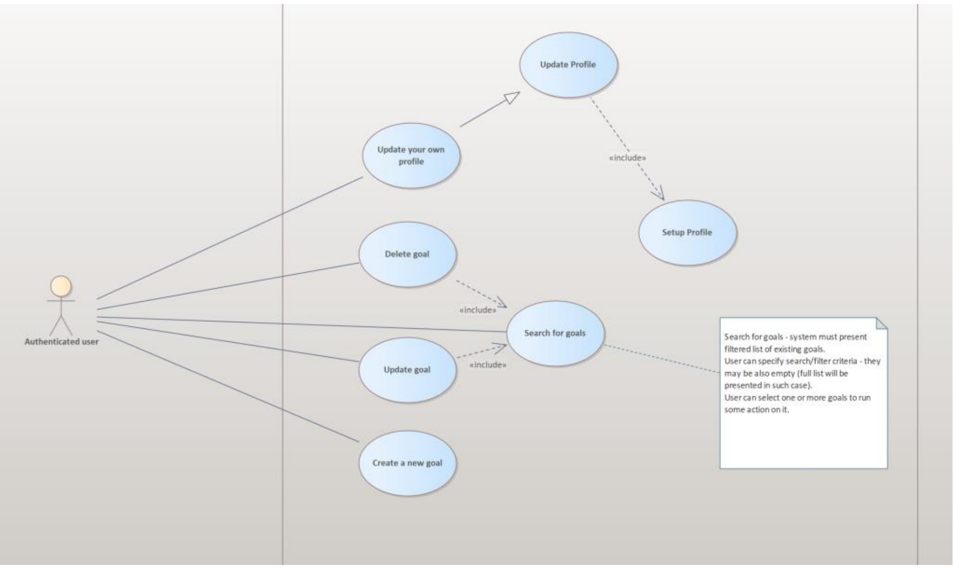

Update Profile
Update your own profile
«include»
Setup Profile
Delete goal
«include»
Search for goals
Authenticated user
Update goal
«include»
Create a new goal
Search for goals - system must present filtered list of existing goals.
User can specify search/filter criteria - they may be also empty (full list will be presented in such case).
User can select one or more goals to run some action on it.

Fig 6. Use-case diagram for proposed solution

Description of the functional requirements presented in the diagram:

- Setup, update profile - As previously mentioned, the user enters data about himself. At the moment, these are: gender, address (city or village), how much time off each week (on a scale from 1 to 5), how much time he goes out with friends (on a scale from 1 to 5), how much alcohol he drinks during the week and how much during the weekend (on a scale of 1 to 5) and how user rates his/her health on a scale of 1 to 5.

- Create a new goal - the user specifies the type (in this version there are two to choose from: math and foreign language), the starting date and the end date.

- Search for goals - the user can search for and choose a goal that he can delete or update. The predicted result is also displayed. The user also has access to completed tasks.

- Update goal - the user can add the number of learning hours and modify the end date (move it to a different date).

- Delete goal - possibility to delete the selected goal.

Implementation details:

The whole solution is based on the use of a Python server with the flask framework responsible for connecting the frontend with the backend and communication between them using HTTP protocol methods GET and POST. This framework is also responsible for creating user sessions and the possibility of creating sessions for many users at the same time and for switching the user between views. Views are written in html using javascript and css. The solution has several views that are described below:

- Home - Provides a choice between login and registration. The selection is made using two buttons which, when clicked, redirect the user to the selected login or registration page.

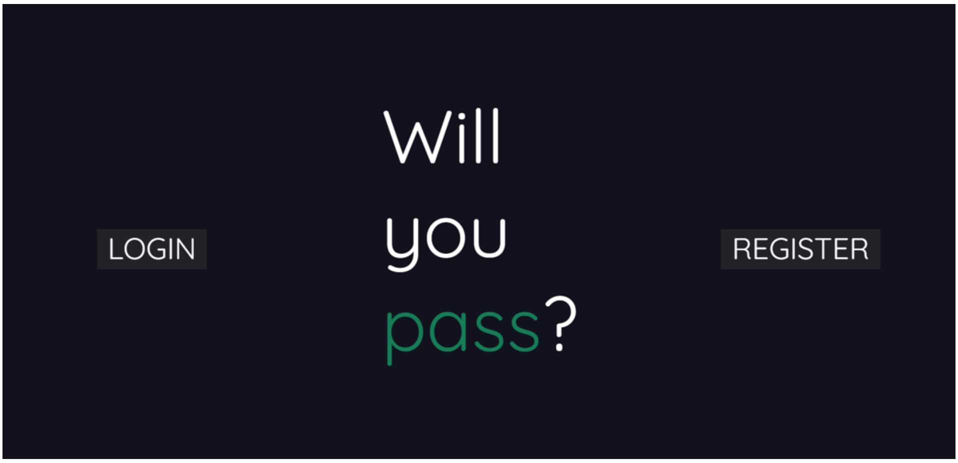


Fig 7.Main view of the application

- Login view - the user fills in the required fields (nickname and password). The fillability is provided by the HTML input-field. Since the father of these nodes is the mark-up form, it is possible to send this data to the server using the HTTP POST method. After logging in, the user is redirected to the calendar and goals view.

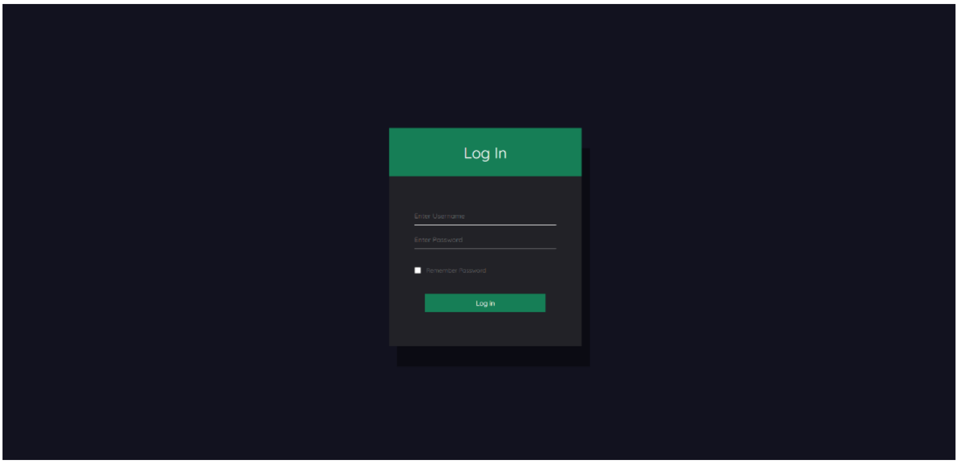


Fig 8. Login view of the application

- Registration view - the user fills in the required fields (nickname, first name, last name and password). The fillability is provided by the HTML input-field. Since the father of these nodes is the mark-up form, it is possible to send this data to the server using the HTTP POST method. After successful registration, the user is redirected to the questionnaire view.

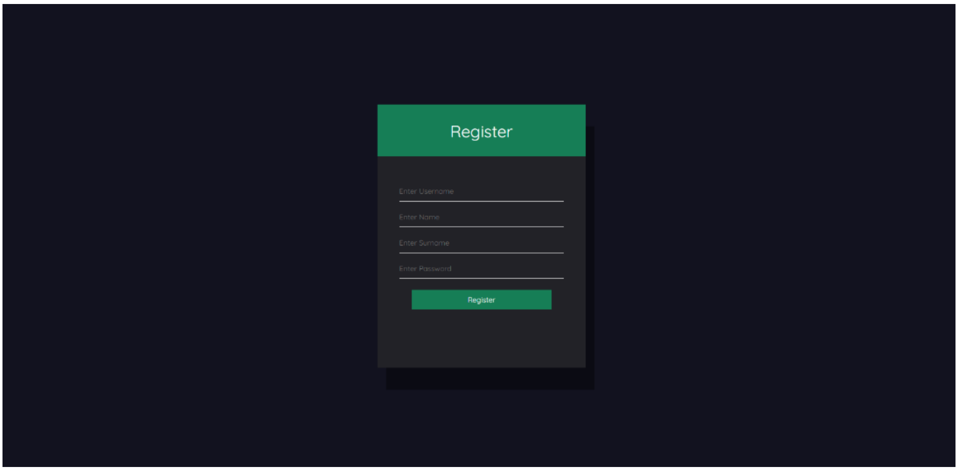
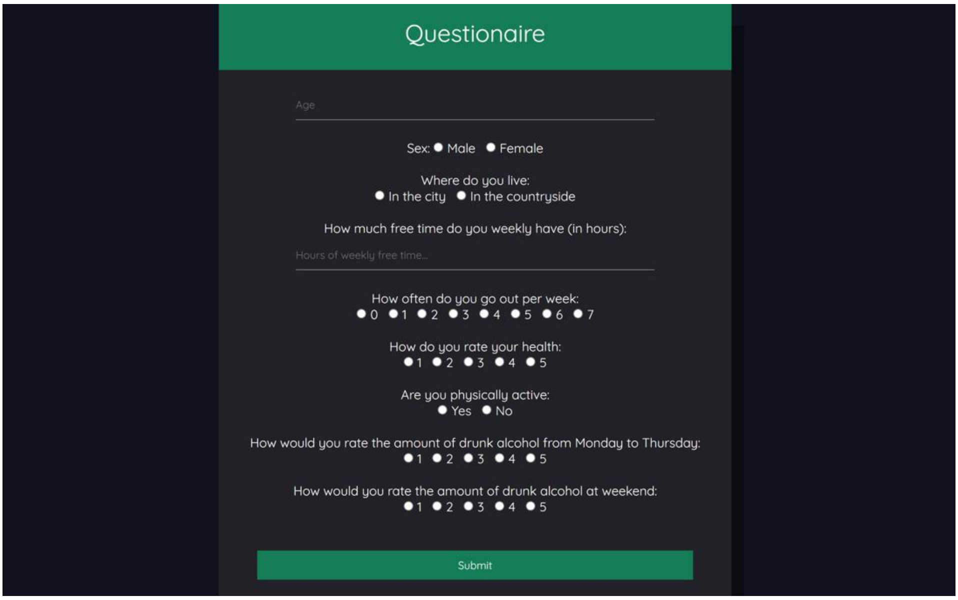


Fig 9. Registration view of the application

- Questionnaire view - the user fills in the required fields used to collect data about him. Most of the fields where the selection is limited (eg scale 1-5) are done using HTTP mark-up input with the attribute radio. Since the father of these nodes is the mark-up form, it is possible to send this data to the server using the HTTP POST method. After clicking submit, the data is sent to the server and redirected to the calendar and goals view.



Age

Sex: ● Male ● Female

Where do you live:
● In the city ● In the countryside

How much free time do you weekly have (in hours):

Hours of weekly free time...

How often do you go out per week:
● 0 ● 1 ● 2 ● 3 ● 4 ● 5 ● 6 ● 7

How do you rate your health:
● 1 ● 2 ● 3 ● 4 ● 5

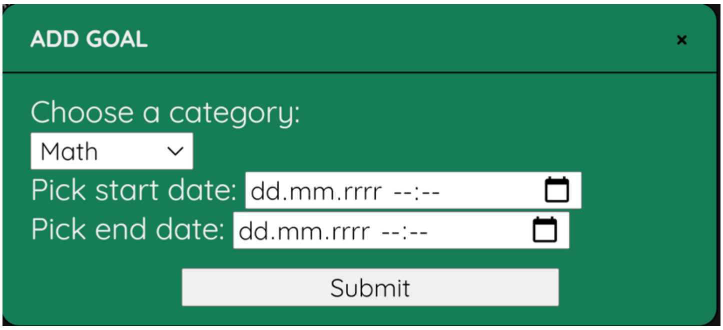
Are you physically active:
● Yes ● No

How would you rate the amount of drunk alcohol from Monday to Thursday:
● 1 ● 2 ● 3 ● 4 ● 5

How would you rate the amount of drunk alcohol at weekend:
● 1 ● 2 ● 3 ● 4 ● 5

Fig 10. Questionaire view of the application

- Calendar and goals view - Only the logged in user who has a session created has access to this view.
  Implementation of selected functional requirements:
  - Search for goals - The goals are displayed in two places: on the left side the current quests, on the right side finished. Data is retrieved from the server using the GET method and rendered using a for loop. The task type, start and end date, and expected result are displayed. For many tasks, a roll-bar is available, thanks to which the user can scroll in search of the goal. In the middle, a calendar is rendered that allows you to search for the appropriate date.
  - Update and delete goal - after clicking on the selected goal, we can change the date based on the pop-up window, where using HTML input with the date-local attribute, the user, the date and time of the new end date, and using the input mark-up with the number attribute the number of learning hours is chosen. After confirming with the use of the button, the data is sent to the server. The possibility of deletion is made using the button and the request is sent to the server.
  - Create a new goal - After clicking the button, a window opens, where the user fills in the following fields: type (input with radio attribute), start date (input with radio date-local), end date (input with radio date-local). Once approved, the request is sent to the server.

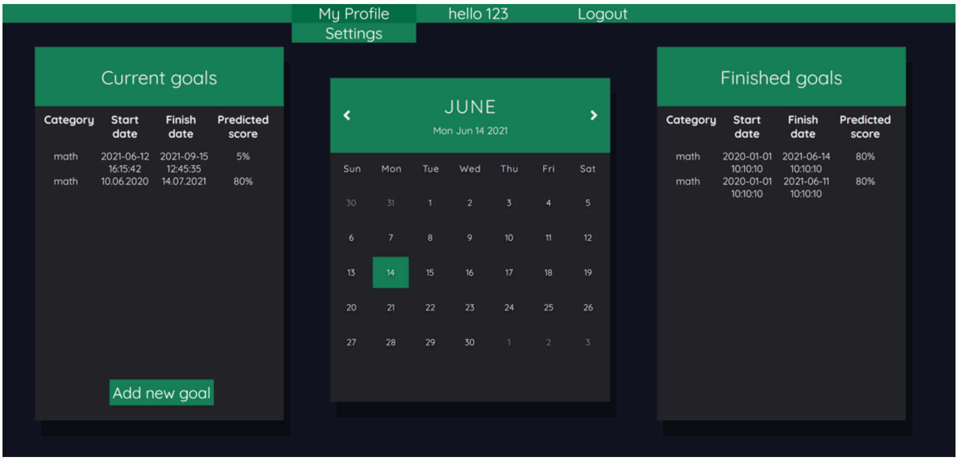

ADD GOAL

Choose a category: Math

Pick start date: dd.mm.rrrr --:--

Pick end date: dd.mm.rrrr --:--

Fig 11. Calendar and goal (add new goal window) view of the application



Current goals

Category	Start date	Finish date	Predicted score
math	2021-06-12 16:15:42	2021-09-15 12:45:35	5%
math	10.06.2020	14.07.2021	80%

JUNE

Mon Jun 14 2021

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	1	2	3

Finished goals

Category	Start date	Finish date	Predicted score
math	2020-01-01 10:10:10	2021-06-14 10:10:10	80%
math	2020-01-01 10:10:10	2021-06-11 10:10:10	80%

Fig 12.Calendar and goal view of the application

<u>Receipt of data and requests by the server:</u>

The Flask framework allows you to create specific paths with the use of annotations, therefore it is possible to construct the entire path tree, thanks to which the application and its structure are organized and easily managed. Flask is responsible for receiving data and requests. Data is transferred to the data layer and services through the use of appropriate components and methods. Depending on the request, their service is carried out on an ongoing basis (e.g. redirects, etc.), while some are handled by the data and services layer (e.g. authentication of the user).

<u>Data and services layer:</u>

It is implemented by one Python 'DataAccess' package. The connection with the database is provided by the PyMySQL framework, and the component responsible for predicting the result (MLPredictor) in a particular goal is provided by the 'ML_model' package.

The dependencies and class components are shown in the UML diagram below:

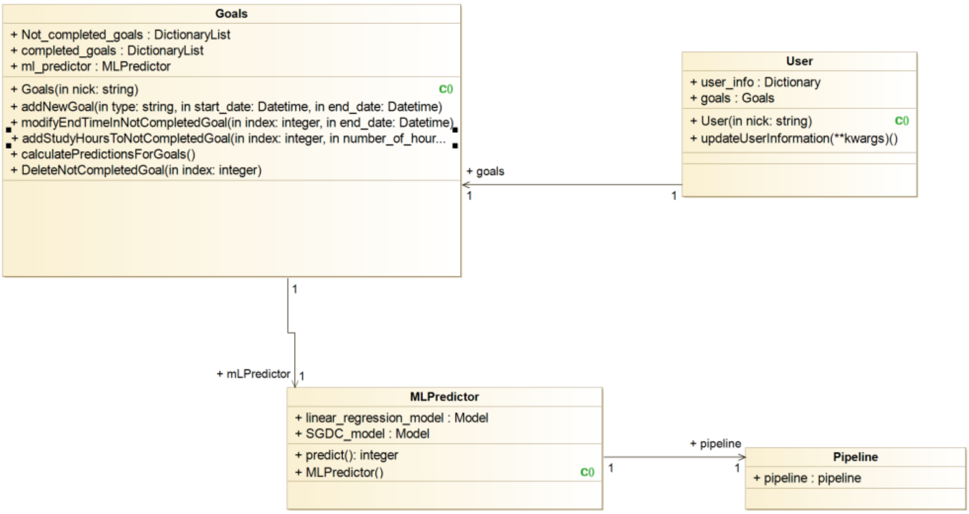

Goals
+ Not_completed_goals : DictionaryList
+ completed_goals : DictionaryList
+ ml_predictor : MLPredictor
+ Goals(in nick: string)
C0
+ addNewGoal(in type: string, in start_date: Datetime, in end_date: Datetime)
+ modifyEndTimeInNotCompletedGoal(in index: integer, in end_date: Datetime)
+ addStudyHoursToNotCompletedGoal(in index: integer, in number_of_hour...
+ calculatePredictionsForGoals()
+ DeleteNotCompletedGoal(in index: integer)
User
+ user_info : Dictionary
+ goals : Goals
+ User(in nick: string)
C0
+ updateUserInformation(**kwargs)()
+ goals
1
1
1
+ mLPredictor
1
MLPredictor
+ linear_regression_model : Model
+ SGDC_model : Model
+ predict(): integer
+ MLPredictor()
C0
+ pipeline
1
1
Pipeline
+ pipeline : pipeline

Fig 13. UML diagram for backend

The user_info objects are stored as key-> value dictionaries, and completed_goals, not_completed_goals are stored as dictionary arrays, because PyMySQL creates a dictionary or an array of dictionaries when loading and is very efficiently managed.

Description of the classes:

- User- contains Goals objects of particular User (each logged user has his own goals) and user_info which is the information about the user fetched from database. Description of method:
    - updateUserInformation- takes many arguments marked as **kwargs. It is python language feature enabling to provide many arguments and label them (ex. age=20). By this it is possible to update many features as well as only one about the user. It also sends modified data into database.
- Goals- retrieves information about goals from the database about a given user and places them in two lists of dictionaries - completed_goals and not_completed_goals. The methods are described below:
    - addNewGoal - creates a new goal, sends it to the database and updates not_completed_goals (possibly completed_goals)
    - modifyEndTimeOfNotCompletedGoal - Modifies the end date in the selected dictionary from the not_completed_goals list.
    - addStudyHoursToNotCompletedGoal - adds the number of hours to the selected goal with not_completed_goals and the weekly

average calculated from the number of hours of study, start date and end date, and updates them both in the database and for the selected goal.

  - calculatePredictionsForGoals- creates a new key-> value in each dictionary in not_completed_goals. On the basis of ml_model it calculates the probable result and places it as value to which the key refers.
  - deleteNotCompletedGoal - usuwa element z listy not_completed_goals oraz z bazy danych.

- MLPredictor- It has two fields - a classification model (SGDC_model) and a linear model (linear_regression_model) read from 'Pickle' files. It has a 'predict' method that accepts user data provided in the questionnaire as well as the type and average duration of study per week and returns a percentage result. This method creates and uses two models where the classification model is assisted by a linear regression model.
  - Linear model - has 94% accuracy and predicts the result from the number of hours only. The dataset was taken from an open source dataset under public license[7]. The model was trained using the 'sciki-learn' library.
  - Classification model - The model classifies the given sample into 20 possible classes (the more the better) and uses all the data provided to the 'predict' method. It is characterized by RMSE = 4, therefore it cannot be considered as the main model, but as a supporting model. The stochastic gradient descent classifier from the 'scikit-learn' library was used as an algorithm. As a dataset, we used an open dataset from Portuguese schools under public license[8]. After selecting the appropriate data and rejecting those that should not be asked by the user, the current model was trained. It uses the user data from the questionnaire, the average number of hours studied and the type (language or math).
- Pipeline- Is contained in ‘ML_model’ package. Responsible for data rescaling using min-max scaling. In the future, it can also be used for more complex activities (e.g. filling in missing data based on the rest of the data). The contained pipeline attribute is a Pipeline object from scikit-learn library enabling sequence of operations on the given sample.

Database:

MySQL was used as the database. The entity-relationship diagram is as following (in Enterprice Architect notation):

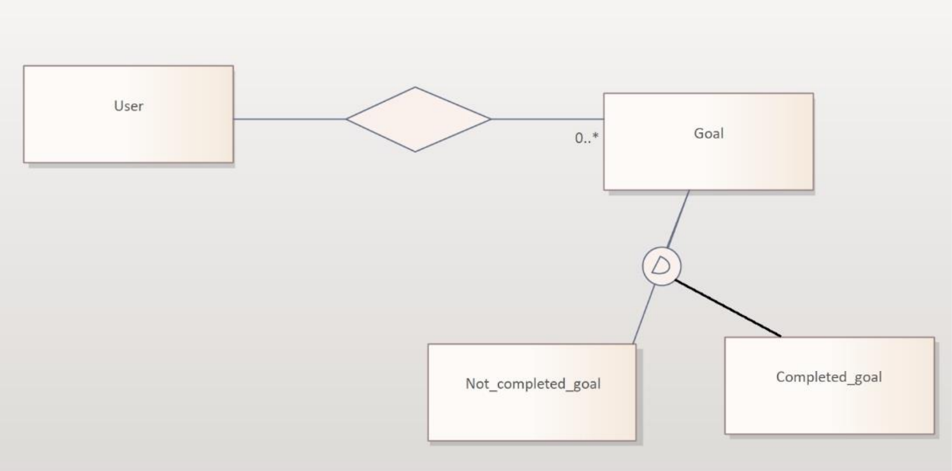


Fig 14. Entity-relationship diagram for proposed solution

As visible user can have many goals, and the goal can be completed or not. The most effective way to do this is presented on the following database diagram.

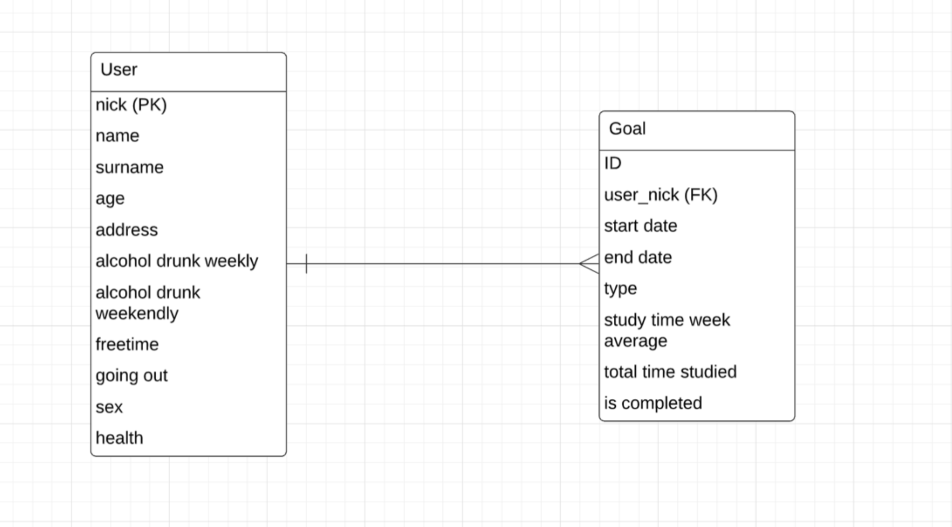


Fig15. Database diagram for proposed solution

The field ‘is completed’ determines if the goal is finished or not. The data from the aforementioned questionnaire and user data are stored in the User table, where the primary key is the user's unique nickname. The Goal table uses this key as a foreign key to identify which goal belongs to which user. It also stores data on the type of goal, start, end, and the total number of hours spent on learning, as well as the weekly average.

Solution diagram:
The generalized solution diagram is presented below in the physical component diagram.

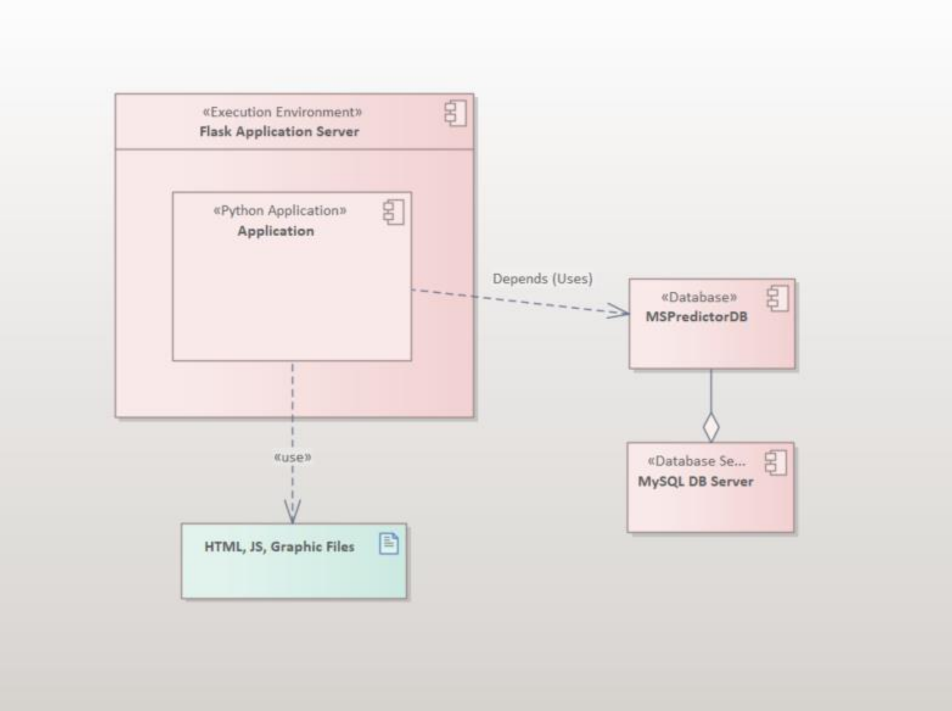


Fig16. Physical component diagram

3.2. Ways of verification

The verification of individual models described in implementation details is presented in the table below:

Table 2. Used models and their performance

Model	RMSE/Accuracy
Linear regression model	Accuracy 94%
Classification model	RMSE = 4.0

In the classification model, the RMSE should be followed, because the value that matters to us is the value and not the individual class (e.g. when the classifier predicts 19 and the true value is 18, the classifier made a mistake by 1. If it predicted the value 2, it would be wrong by 16 so it does matter, but the precision calculation does not take it into account.).

Comparison of classification models:
In order to provide the solution with the best possible model there were two options considered. The decision tree and stochastic gradient descent classifier.
The table below contains considered models and their RMSE.

Table 3. Classification models considered and their RMSE

Model	RMSE
Decision tree	4.7
SGDClassifier model	4.0

Further verification:
The best way is to give the product to a diverse group of people and ask for an evaluation of the application and a detailed description of impressions and feelings, what they lack, what they think should still be found in the application and, most importantly, whether the solution fulfils its duty.

4. Conclusions and perspectives

The problem posed concerns many young people. The problem is both the time passively spent on social media and the lack of motivation to achieve various goals. The proposed solution will allow users to organize their time better, and visualization of progress (e.g. in learning) will motivate them to continue, but it may allow them to develop their full potential.

The main advantage of the proposed solution is the use of machine learning algorithms, which can be improved with the development of the application and have a lower error. This will not only allow for a more accurate result, but can also attract a lot of new users. On the other hand, the initial versions of artificial intelligence algorithms are sometimes inaccurate, but as already mentioned, as the application develops, they will be improved until they reach maximum accuracy.

The financial potential of the presented solution is worth mentioning, because in today's world this factor is one of the most important, if not the most important, when it comes to large-scale success. This year, the total value of the artificial intelligence market will reach USD 72 billion. According to Dom Maklerski Banku Ochrony Środowiska (BOSSA), the rate of return of the ALLIANZ artificial intelligence fund since its inception (2016) has reached slightly over 142%, and in the last 12 months its value has increased by 76%. This is an example of investor confidence in this market and this trend will continue in the coming years. The presented solution with appropriate financing and development has a chance to become a common part of young's people generation.

Last, but not least, the mobile version of the application has to be mentioned. The presented prototype was written as a browser version. In the future, however, it is planned to create a mobile version, due to the fact that smartphones are an integral part of a young person's life. Offering the application in a mobile version is a standard today, and not a advantage as it was 10 years ago.

References

[1] **Melissa G. Hunt, Rachel Marx, Courtney Lipson and Jordyn Young -** University of Pennsylvania: NO MORE FOMO: LIMITING SOCIAL MEDIA.

[2] **Griffiths, M. D., & Kuss, D. (2017).** Adolescent social media addiction (revisited). Education and Health, 35(3), 49-52.

[3] **Tavares, A. I. (2017)**. Telework and health effects review, International Journal of Healthcare, 3(2), 30.

[4] **Bashir, H., & Bhat, S. A. (2017)**. Effects of social media on mental health: A review. The International Journal of Indian Psychology, 4(3), 125-131.

[5] **Abbasi, M. A., & Liu, H. (2013, April)**. Measuring user credibility in social media. In International Conference on Social Computing, Behavioral-Cultural Modeling, and Prediction (pp. 441-448). Springer, Berlin, Heidelberg.

[6] **Kalles, D., & Pierrakeas, C. (2006).** Analyzing student performance in distance learning with genetic algorithms and decision trees. *Applied Artificial Intelligence*, *20*(8), 655-674.

[7] **Priyam, A., Abhijeeta, G. R., Rathee, A., & Srivastava, S. (2013**). Comparative analysis of decision tree classification algorithms. *International Journal of current engineering and technology*, *3*(2), 334-337.

[8] ***Machine Learning Decision Tree Classification Algorithm - Javatpoint.* (2014).** Www.Javatpoint.Com. https://www.javatpoint.com/machine-learning-decision-tree-classification-algorithm

[9] ***5 Types of Classification Algorithms in Machine Learning*. (2020, August 26).** MonkeyLearn Blog. https://monkeylearn.com/blog/classification-algorithms/

[10] ***Student Study Hour*. (2021, April 22**). Kaggle. https://www.kaggle.com/jahidsizansani/student-study-hour

[11] ***Students Math Performance*. (2018, March 23).** Kaggle. https://www.kaggle.com/niyatijasani/studentsmathperformance

[12] **Sekar, N. (2020, November 16).** *Decision Tree and Random Forest Explained - Nandini Sekar*. Medium. https://medium.com/@nandinisekar27/decision-tree-and-random-forest-explained-3475cd50b36d

[13] ***Lecture 5: Bayes Classifier and Naive Bayes*. (2007).** Bayes Classifier and Naive Bayes. http://www.cs.cornell.edu/courses/cs4780/2017sp/lectures/lecturenote05.html

[14] **Programmer, G. A. I. (2020, June 6).** *Logistic regression and Keras for classification*. AI Geek Programmer. https://aigeekprogrammer.com/binary-classification-using-logistic-regression-and-keras/

[15] **Shah, R. (2021, March 5).** *Introduction to k-Nearest Neighbors (kNN) Algorithm*. Medium. https://ai.plainenglish.io/introduction-to-k-nearest-neighbors-knn-algorithm-e8617a448fa8

[i] NO MORE FOMO: LIMITING SOCIAL MEDIA
DECREASES LONELINESS AND DEPRESSION:
MELISSA G. HUNT, RACHEL MARX, COURTNEY LIPSON,
AND JORDYN YOUNG
University of Pennsylvania