

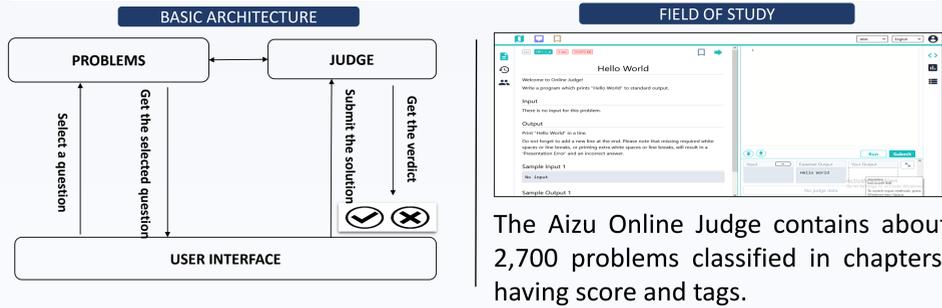
**ABSTRACT**

This is a recommendation system suitable for exercises in education. It will contain several criteria to be used either independently or combined. Thanks to visualization, the system will provide transparency and enable the user to decide by himself on the recommendation criteria by interacting directly with the charts.

**MOTIVATION**

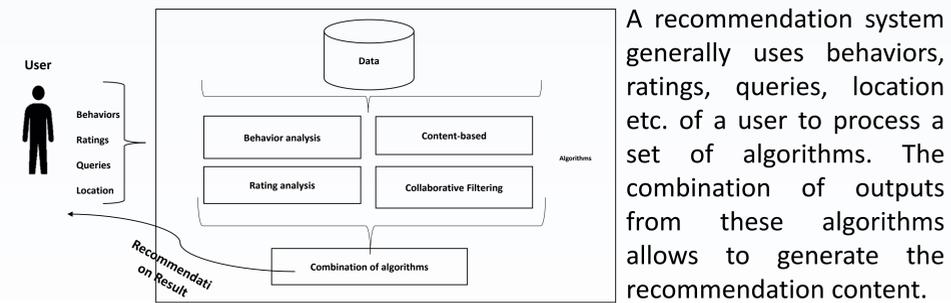
Adaptive and personalized learning are strongly required education to tailor the learning to the student.

**ONLINE JUDGE**



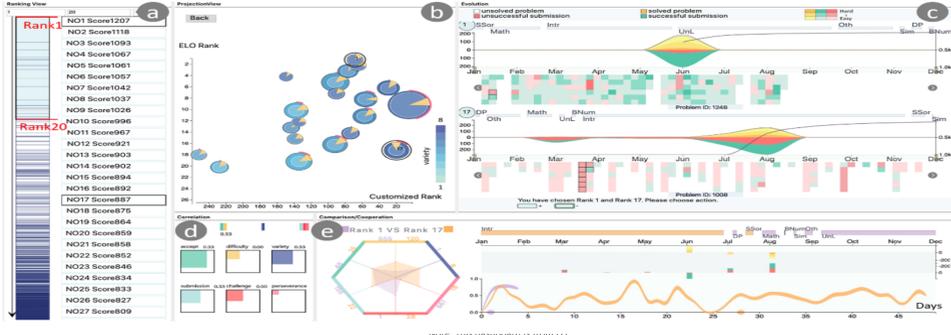
Goal: Helps student to improve programming skills.

**BASIC STRUCTURE OF A RECOMMENDATION SYSTEM**

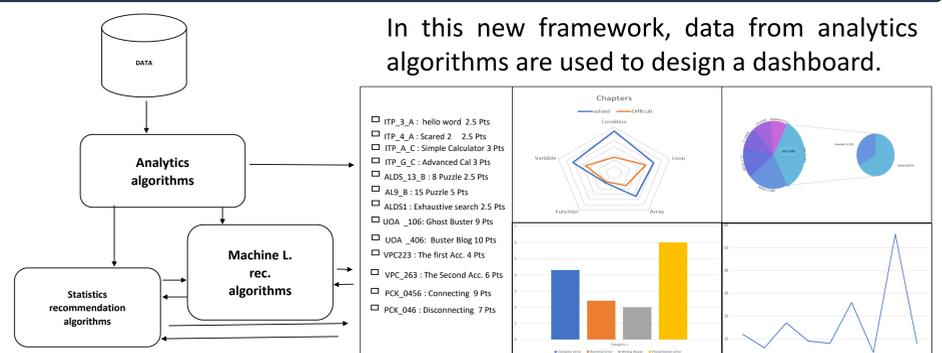


**DASHBOARD**

Analytics dashboards in education (Learning analytics dashboard) are designed to communicate insights about student learning and student performance within a learning context. The indicator to display depend on the purpose, it can be: cognitive and behavioral, related to performance, progress and so on[1].

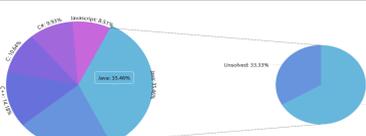


**PROPOSED RECOMMENDATION SYSTEM FRAMEWORK**

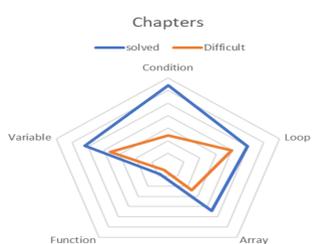


Recommendations algorithms to be used either independently or combined, are executed directly in the dashboard.

**SOME FEATURES**



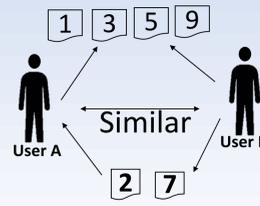
This chart is for a student who uses more than one language. By selecting (clicking) a programming language in the big pie, He can see the related score in the small pie and get recommended problems that he could solve in other languages but not in the selected one.



This chart enables a user to see results according to each chapter. He can also see how many difficult problems he solved for each of them. Thanks to this chart, the user can see that he needs some improvement in "Function". By clicking on that, problems related to "function" will be recommended.

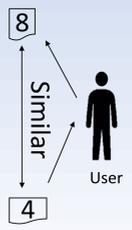
**SOME ALGORITHMS**

User A and user B solved the same problems: 1,3,5 and 9



Problems 2 and 7 solved by B are recommended to A.

User solved Problem 8



Problem 4 which is similar to 8 is recommended to the user

**CHALLENGES AND FUTURE WORKS**

This work is very challenging because it covers two aspects : Recommendation system and data visualization.

1. At first, we are building a full-fledged recommendation system that we want to be the most suitable for exercises in education.

To achieve our goal of providing transparency, our idea is to have many separated algorithms each of them processing only one criterion.

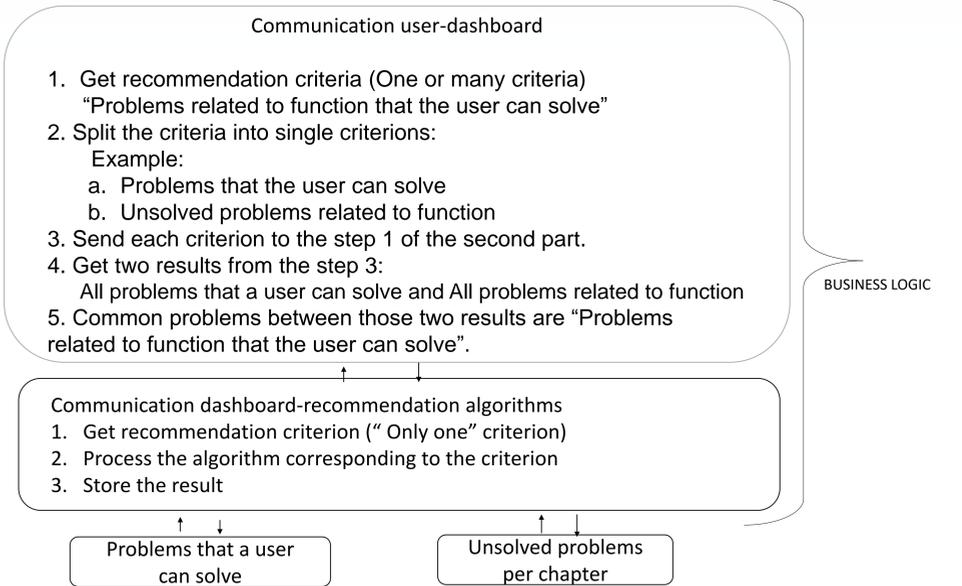
The system will have some machine learning algorithms to recommend problems that a user can solve based on:

- a. Collaborative filtering
- b. Content(-based)

It will also have some basic algorithms like:

- a. Getting unsolved problems per chapter,
- b. Getting unsolved problems per programming language.

The above flowchart shows how the system will process to recommend. Example of the criteria: "Problems related to function that a user can solve"

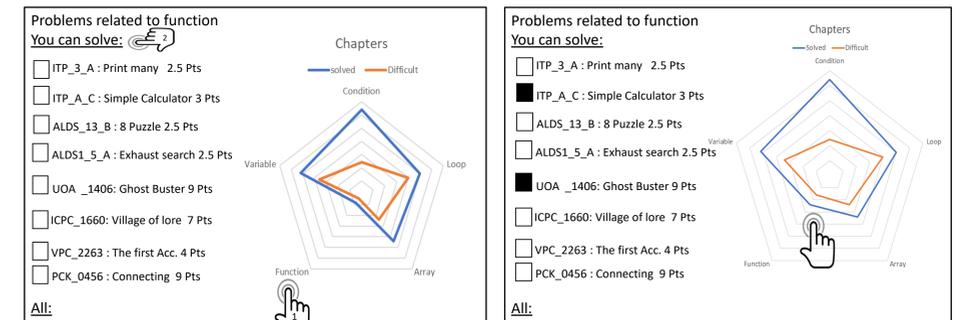


2. In addition, we are designing a dashboard as a support to the recommendation system. To achieve this, we will make clickable charts with events activating recommendation criteria.

Here is the corresponding action in the dashboard to the example given previously("Problems related to function that a user can solve"):

1. The user clicks on the corresponding chapter (function)
2. Then He clicks on: "You can solve"

To enrich, we plan to include "pre-visualization. In the following example, the user selected problems ITP\_A\_C and UOA\_1406, and could observe how solving the will impact his chart.



The other challenge in this work will be to provide an ergonomic tool that students can easily adopt. To achieve this, we plan to make enough experiments in real condition.

In future works, we plan to extends recommendation criteria and take into consideration other dimensions like time and data like source code.

**REFERENCES**

[1]Aguilar S.J., Karabenick S.A., Teasley S. & Baek C., Associations Between Learning Analytics Dashboard Exposure and Motivation and Self-Regulated Learning, Computers & Education, <https://doi.org/10.1016/j.compedu.2020.104085>.  
 [2] Xia, M., Xu, M., Lin, C., Cheng, T., Qu H. & Ma, X. (2020). SeqDynamics: Visual Analytics for Evaluating Online Problem-solving Dynamics. *Computer Graphics Forum* 39(3):511-522.