Intelligent guidance and reorientation system for higher education students: challenges and prospects

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Short bio

- Professor in Big Data at ESP/UCAD
- Member of the LIMBI research lab
- Member of the RAIL AI4D project
- Co-own AI4CARDIO project with colleagues from IMSP and UAC
- Co-PI in the AI4DECLIC-SN AI4PEP project
- Co-PI in the DIORES AI4Edu Project

University Cheikh Anta Diop

- Created in 1957
- Over 85,000 students
- 6 Faculties, 39 Schools and Institutes
- ESP-UCAD is the leading Engineering School in Senegal

LIMBI

- LIMBI stands for Medical Imaging and Bioinformatics Laboratory
- 20 permanent members and around 10 PhD students
- 2 research teams
  - Data, Models, Knowledge Team
  - Network Systems and Telecommunications Team
- The lab is composed by researchers from multiple domains such as computer science, electrical engineering, social science, etc.
- **Ongoing project:** 3D Slicer, IA4D Scholarship, AI4DECLIC-SN, AIME, ect.

Higher Education Landscape in Senegal

Context of Higher Education in Senegal (1)

- Higher Education in Senegal and sub-saharan Africa suffers from:
  - high growth of student numbers ;
  - the insufficient reception capacity of universities ;
  - low rate of supervision (e.g. 15 students for 1 professor at the master level).

- UCAD represents nearly 58% of public higher education in Senegal in 2020.

- To deal with difficulties, the use of digital technology is increasingly recommended in teaching and administration.

Context of Higher Education in Senegal (2)

- UCAD is becoming increasingly digital
  - An application bouquet of around ten applications (e.g. PGI, UCAD admission platform, etc.)
  - 70% of administrative procedures are digitalized
  - 80% of UCAD establishments have a distance learning platform

- Generating large amounts of data with over 85,000 students and 5,000 agents

- However, very high rate of failing or drop out students at the different levels and faculties where the average number of students is high.

- **Problem:** data not valued and not used for smarter governance
  - monitoring student progress;
  - the identification and personalized support of students in difficulty;
  - profiling students to better guide them through training courses.

Open questions

- **Is there a good adequation between training programs where students are enrolled and their profiles?**

- **Does data centric university governance the solution to the high rate falling or drop out?**

- **What should be the contribution of Artificial Intelligence for intelligent student orientation/reorientation?**

First year admission system (1)

First year admission system (2)

- Criteria are defined by faculties and implemented in the system

UNIVERSITE CHEIKH ANTA DIOP DE DAKAR												
faculté des Sciences et Techniques (FST)												
Conditions d'orientation pour 2022												
	G	STEG	L1a	L1b	L2	L'1	LA	S1 / S1A	S2/S2A	S3	S4	S5	LA-F
Licence en Mathématique-Physique-Informatique (de préférence S1, S1A et S3)et si des places sont disponible S2, S2A,S4 et S5. Nombre de passage au baccalauréat(Pénalité sur le nombre de points): 1 passage (pas de pénalité), 2 passages (-5%), 3 passages(-10%), 4 passages(-15%). Etre âgé(e) de 23 ans au plus au 31 décembre								Math*9+Phys*6 +100	Math*9+Phys*6	Math*9+Phys*6+100	Math*9+Phys*6	Math*9+Phys*6	
Licence en Physique-Chimie-Sciences de la Matière (Etre agé(e) de 23 ans au plus au 31 décembre de l'année en cours.Nombre de passage au baccalauréat(Pénalité sur le nombre de points): 1 passage (pas de pénalité), 2 passages (-5%), 3 passages(-10%), 4 passages(-15%).								Math*6+Phys*9	Math*6+Phys*9	Math*6+Phys*9	Math*6+Phys*9	Math*6+Phys*9	
Licence en Biologie-Chimie-Geosciences (Etre agé(e) de 23 ans au plus au 31 décembre de l'année en cours. Nombre de passage au baccalauréat(Pénalité sur le nombre de points): 1 passage (pas de pénalité), 2 passages (-5%), 3 passages(-10%), 4 passages(-15%).).								Math*4+Phys*5+SVT*6	Math*4+Phys*5+SVT*6		Math*4+Phys*5+SVT*6	Math*4+Phys*5+SVT*6	

+ ≡ FLSH ▾ FMPO ▾ FSJP ▾ FASEG ▾ FST ▾ CURI ▾ IPP ▾ CERER ▾

First year admission system (2)

- **Example algorithm :** admission to MP1 First Year

  Input : Profile, Age, MathGrade, PhysicGrade, NbBacTryPen, NbofPLaces

    if Age < 23

      Not ranked

    else if Age >= 23 and (Profile=S1 or Profile=S3)

      rank : = Math*9+Phys*6 +100 + NbBacTryPen

      if rank <= nbofPLaces

        Admitted

      else

        Not Admitted

    else if ……..

First year admission system (3)

- Multiforme scoring methods are used in the form of linear equations
  - Subjects as main admission
  - Various coefficients associated to series (L1/L2/S1/S2)
  - Biases related to the series, ages and grades
- Priority given in a specific academic profile
- Age is a disqualifying variable

First year admission system (4)

- Do we have fairness ?

First year admission system (4)

- Do we have fairness ?
- Do we reach optimality and required compliance level ?

First year admission system (4)

- Do we have fairness?
- Do we reach optimality and required compliance level?
- What is the relevancy level of considered conditions?

First year admission system (4)

- Do we have fairness?
- Do we reach optimality and required compliance level?
- What is the relevancy level of considered conditions?
- Do we have something left aside?

Master level admission system

- Follow similar criteria compared to first year admission system

First attempt to use AI for admission at UCAD (1)

- CURI, one of the UCAD institutes, in particular, developed in 2022 an experimental solution (AI-REORIENT) for the reorientation of students in higher classes.

- AI-REORIENT is a solution for profiling and guiding students from one level to another.
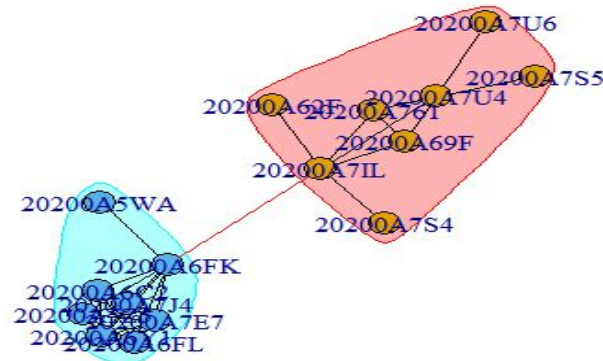
First attempt to use AI for admission at UCAD (2)

- AI-REORIENT uses an intelligent algorithm for classifying students according to their profiles constructed from their academic results.
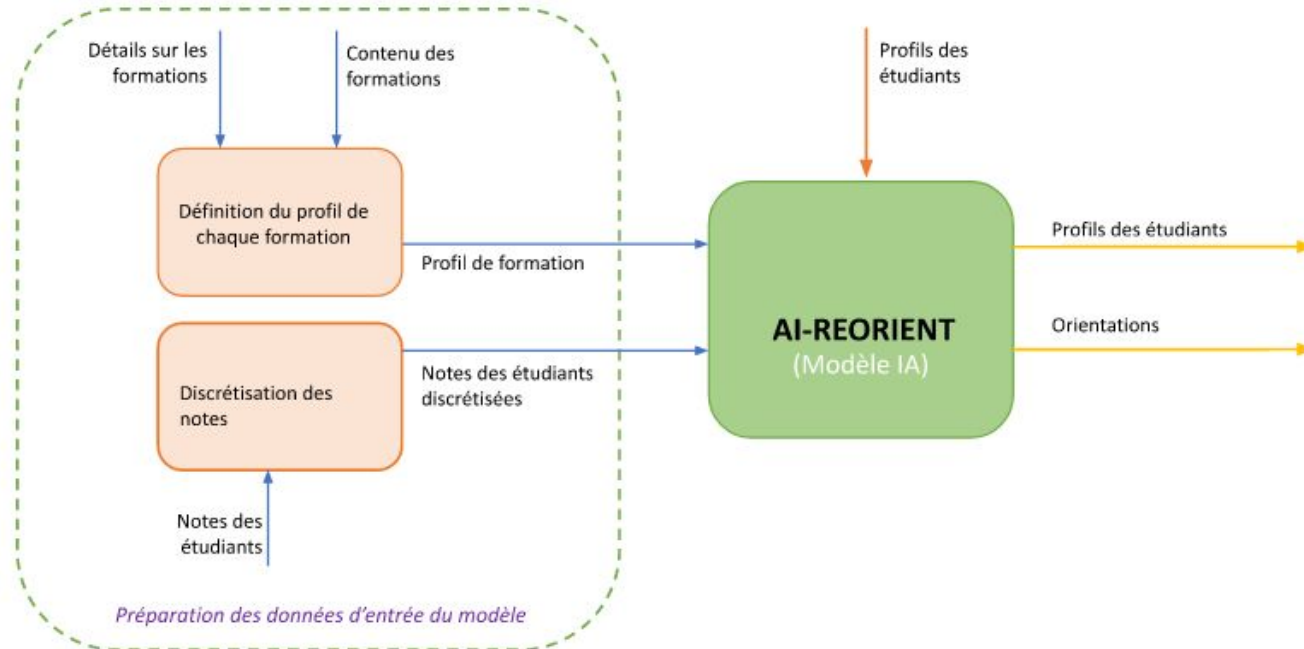
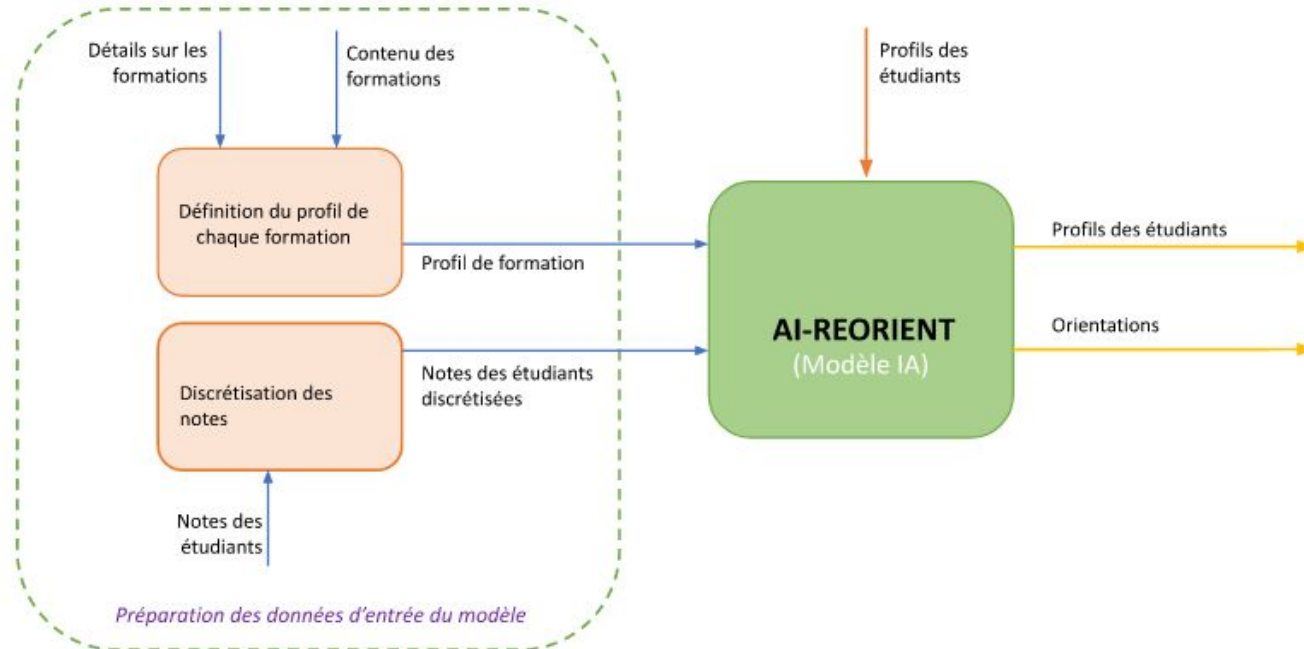- The actual version of AI-REORIENT operates on a small scale and was exclusively developed for the needs of CURI.

Beyond UCAD ......

University admission process: a prescriptive analytics approach

Mohammadreza Kiaghadi & Pooya Hoseinpour ✉

Abstract

Students typically do not have practical tools to help them choose their target universities to apply. This work proposes a comprehensive analytics framework as a decision support tool that assists students in their admission process. As an essential element of the developed framework, a prediction procedure is developed to precisely determine the student's chance of admission to each university using various machine learning methods. It is concluded that random forest combined with kernel principal component analysis outperforms other prediction models. Besides, an online survey is built to elicit the utility of the student regarding each university. A mathematical programming model is then proposed to determine the best universities to apply among the candidates considering the probable limitations; the most important is the student's budget. The model is also extended to consider multiple objectives for making decisions. Last, a case study is provided to show the practicality of the developed decision support tool.

University Admission Prediction Using Google Vertex AI

Publisher: IEEE   Cite This   📄 PDF

Jayashree Katti ; Jony Agarwal ; Swapnil Bharata ; Swati Shinde ; Saral Mane ; Vinod Biradar   **All Authors**

Abstract

Abstract:
For a pursuing graduate student, shortlisting the colleges could be an intense issue. College undergraduates frequently have an inclination to ponder over the chance that their profile suits the college requirements. Computer programs are exceptionally well trained and faster than humans in making decisions. Moreover, the cost of admission in a college is a lot, making it very crucial for a student that their profile gets shortlisted for a university admission. A University prediction machine learning algorithm is very advantageous for college undergraduates to choose their dream university which also matches their resume. The proposed method considers diverse variables related to the student and his score in various tests. The dataset includes LOR, GRE score, CGPA, TOEFL score, University rating, SOP, etc. Based on all these criterias, the admission to a particular university of an undergraduate will be predicted.

Document Sections

I. Introduction

II. Vertex Ai

III. Literature Review

IV. Comparative Study

V. Proposed System

A Recommender System for Predicting Students' Admission to a Graduate Program using Machine Learning Algorithms

Inssaf El Guabassi, Faculty of Sciences, Tetouan, Morocco ; **Zakaria Bousalem**, Faculty of Sciences and Technology, Settat Morocco ; **Rim Marah**, Faculty of Sciences, Tetouan, Morocco ; **Aimad Qazdar**, ISI Laboratory, FS Semlalia UCA, Marrakech, Morocco

Abstract

In the 21st century, University educations are becoming a key pillar of social and economic life. It plays a major role not only in the educational process but also in the ensuring of two important things which are a prosperous career and financial security. However, predicting university admission can be especially difficult because the students are not aware of admission requirements. For that reason, the main purpose of this research work is to provide a recommender system for early predicting university admission based on four Machine Learning algorithms namely Linear Regression, Decision Tree, Support Vector Regression, and Random Forest Regression. The experimental results showed that the Random Forest Regression is the most suitable Machine learning algorithm for predicting university admission. Also, the Cumulative Grade Point Average (CGPA) is the most important parameter that influences the chance of admission.

Current challenges

- Deeper evaluation of existing admission criteria

- Integration of socio-economic and social information

- How to account for potential gender/equity/inclusion issues

- Fully fletched orientation/reorientation system at the university level

Prospects

- Design and develop an intelligent system called DIORES to support the orientation and/or reorientation of students across the entire UCAD in higher education training courses.

- With four specific objectives:

    - **OS1 :** Specify the multifaceted needs for managing the re/orientation of students in UCAD training courses;

    - **OS2 :** Develop metrics for management of orientations in UCAD university courses;

    - **OS3 :** Develop an AI-based model for the orientation and/or reorientation of students by adapting AI-REORIENT to the plural realities of UCAD training;

    - **OS4 :** Develop the user application, including a graphical interface for the use and evaluation of the proposed AI model with a view to scaling.

DIORES Target

- Given a set of desiderata
  - Fairness criteria X
  - GEI desiderata W
  - Educational records Y
  - University training program constraints : C
  - Training program minimum time duration : tmin

- DIORES optimal targeted admission function f is defined as :

$$f <X, Y, W, C, tmin> \longrightarrow 0$$

DIORES Overview
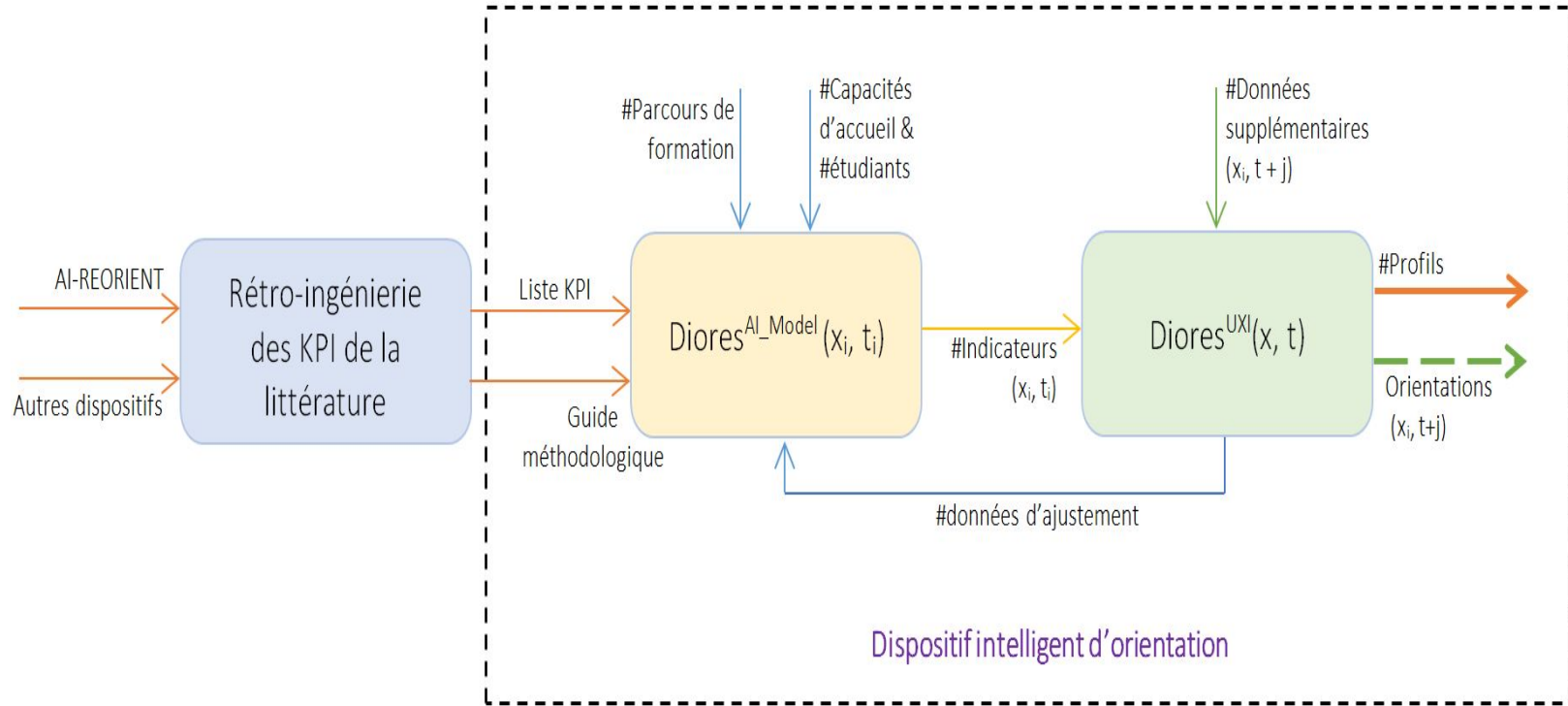
DIORES Project Team

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Questions ?

Thank you for you attention

Thanks for the AI4Edu hub for supporting this project