RÉPUBLIQUE DU CAMEROUN
Paix – Travail – Patrie
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UNIVERSITÉ DE YAOUNDÉ I
Faculté des Sciences
Département d'Informatique
B.P. 812 Yaoundé

REPUBLIC OF CAMEROON
Peace – Work – Fatherland
- . - . - . -
UNIVERSITY OF YAOUNDÉ I
Faculty of Science
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Specification Document

FarmSmart

Work

INF4178: Software Engineering

Team Members

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4. MENGUE OWONA VICTOR AUDREY 19M2241
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Supervisions

Dr. Kimbi Xaviera

Table of Content

1. Topic

Online course platform for small and medium size farming.
"FARMSMART".

2. Research Problem

Smallholder farmers in Africa are still among the poorest in the world.Farmers also lack proper education into modern farming techniques. FARMSMART originates from the need to provide quality education on farming techniques to farmers. We found that most farmers nowadays go into the practice based on what their parents had taught them or what they had seen others doing. This method isn't the best given the poor yield most of the farmers get which equates to loss of investment and also some sort of disappointment having invested time and energy into it.

3. General objective

FARMSMART is aimed at providing small scale farmers with education on the best practices and techniques they could employ so as to obtain the best farm products.

a. Specific objectives

Specifically, FARMSMART's goal is to transmit knowledge from well trained and experienced people in the domain of agriculture to those seeking to do well. By doing so, they will be able to obtain tips which will be employed to carry out their agricultural tasks thus improving productivity.

4. System requirements

a. Functional requirements.

FARMSMART offers the following:

-Authentification: This will permit users of the platform (both instructors and students) to create accounts so their transactions can be traced and properly managed.

-Course enrollment: To permit students to sign up to follow courses they are interested in.

-Course Management: This gives room for the instructor to upload videos on specific domains.

-Quiz Management: This gives room for the instructor to test the progress of the students following a course by uploading a form of questions which the students will answer.

-Schedule Management: In this part, the student will be able to define a learning time that works at his/her convenience. Based on this, they'll be notified on their progress.(slow/ok/fast).

-User Management: Given that the tutorials on this platform are based on benevolence of people with good knowledge on agricultural practices, Security isn't that tight leaving room for people to upload unrelated information. Such practices will be tracked and the user banned from the platform.

b. Non-functional requirements.

-Usability: Given that FARMSMART is open to all groups of people, it offers an intuitive interface to facilitate understanding for all users.

-Capacity: FARMSMART is highly scalable giving room for massive user growth.

-Localization: The application being open to all categories takes into consideration two languages: English and French.

5. Application of Scrum

a. Presentation of scrum team

In order to properly develop FARMSMART we organized the team as follows:

-Productowner: Mr. Tekoh Palma

-Product advocate:

-Scrum master:Bikimbi Jean Petit

-Scrum team

-Frontend:Yemaleu Jocelyn
Mengeu Owona
Chin Suila Joyce

-Backend:Bikimbi Jean Petit

Nkweshceu Kon Serges

b. Description of how you applied scrum to your specific project

i. Explanation of how Sprints were carried out

To ensure a proper organization of our work, we used the “Trello" application where tasks were shared by the scrum master in sprints. Asides the daily meetings we had on Telegram everyday at 9pm, we also created a whatsapp group where we could discuss matters concerning the work when need be.

ii. Team organization and roles

Productowner: Mr. Tekoh Palma
-Product advocate:
-Scrum master:Bikimbi Jean Petit
-Scrum team
-Frontend:Yemaleu Jocelyn
Mengeu Owona
Chin Suila Joyce
-Backend:Bikimbi Jean Petit
Nkweshceu Kon Serges

iii. Daily scrum Agenda

We proceeded thus to build FARMSMART:

-Meetings after every 3 days were done on telegram which took approximately 20-30 minutes.

-During the meetings, each member stated what he had done after the previous meeting and the roadblocks faced.

-The scrum master then gave room for members to suggest solutions.

-Then in turns defined by the scrum master, each member stated what he will do before the next meeting.

-Members who failed to complete their stated objectives got a warning from the scrum master.

iv. Scrum conflict Resolution

In the event of conflicts which were inevitable the scrum master would call a meeting where the parties will:

-State their facts

-Reiterate the other parties facts

-Votes will be made

-The losing party will say “I accept the decision and will work accordingly”

Example: During the development, we had conflicts in deciding what exactly to name our system and getting a theme color for the site.

We had a meeting where we all stated why we wanted the name and color we were for. After which some members were convinced and others weren’t.

The scrum master then sent a whatsapp voting message where we voted and the highest vote won. Thus the name: FARMSMART and color:Green.

v. Scrum workflow management

To improve efficiency of our code, we employed a Test Driven Development. The test case table is as shown below:

Test caseId	Test Case objective	precondition	steps	input data	Expected output	Actual output	Status
TC1	test authentication	Be on the website	-click on signup -enter name and password -tap okay	-name and password	system homepage displayed	system homepage displayed	pass
TC2	test	Be an	-click	file(vi	receive	receive	pass

	course upload	instructor in the system	upload course -select file -click ok	deo)	notification(course uploaded)	notification(course uploaded)	
TC3	test course enrollment	Be a student in the system	-select a course -click enroll	selected course	receive notification(successful enrollment).	receive notification(successful enrollment).	pass
TC4	test quiz upload	Be an instructor in the platform	-click upload quiz -select form link -click ok.	form	receive notification (quiz uploaded)	receive notification (quiz uploaded)	pass

vi. Product Backlog

Task ID	User story	Acceptance criteria	Priority	Initial estimate	Adjustment factor	Final estimate
1	As a user I want to login to the platform so I can access the functionali	In order to access functionalities,given I'm on the site, when I	1	2	1	2

	ties	enter the required information and click login, then I can access the different functionalities.				
2	As a student want to enter my interests so that tutorials can be recommended to me	In order to get tutorial recommendations given I'm connected to the site, when I enter my specifications, then related tutorials are recommended.	2	5	1.5	7.5
3	As a student I want to define my study plan to ensure	So as to define my study plan given I'm enrolled	5	3	1	3

	effective learning.	for a course, when I select a schedule I get notifications based on it.				
4	As a student I want to enroll for a course so I can start learning.	In order to enroll for a course given I'm connected to the platform when I select the course and click enroll, the course is added to my list of courses.	4	3	1.5	4.5
5	As an instructor, I want to upload tutorials to put them at the students' disposal	In order to put tutorials at the students' disposal, given I'm an instructor in the	3	5	1	5

		platform I can upload videos under a category based on the course content.				
6	As an instructor, I want to upload Quizzes for the students taking my course so they can track their improvement.	In order to permit students' track their projects, given I'm an instructor in the platform, when I click uploadQuiz, I can select a form and upload to the site.	6	2	1.5	3.0

vii. Sprint Backlog

Release	sprint	User story ID	Period
Release 1:REST API	sprint 1	1,2,3	12/05/2023 - 9/06/2023
	sprint 2	4	

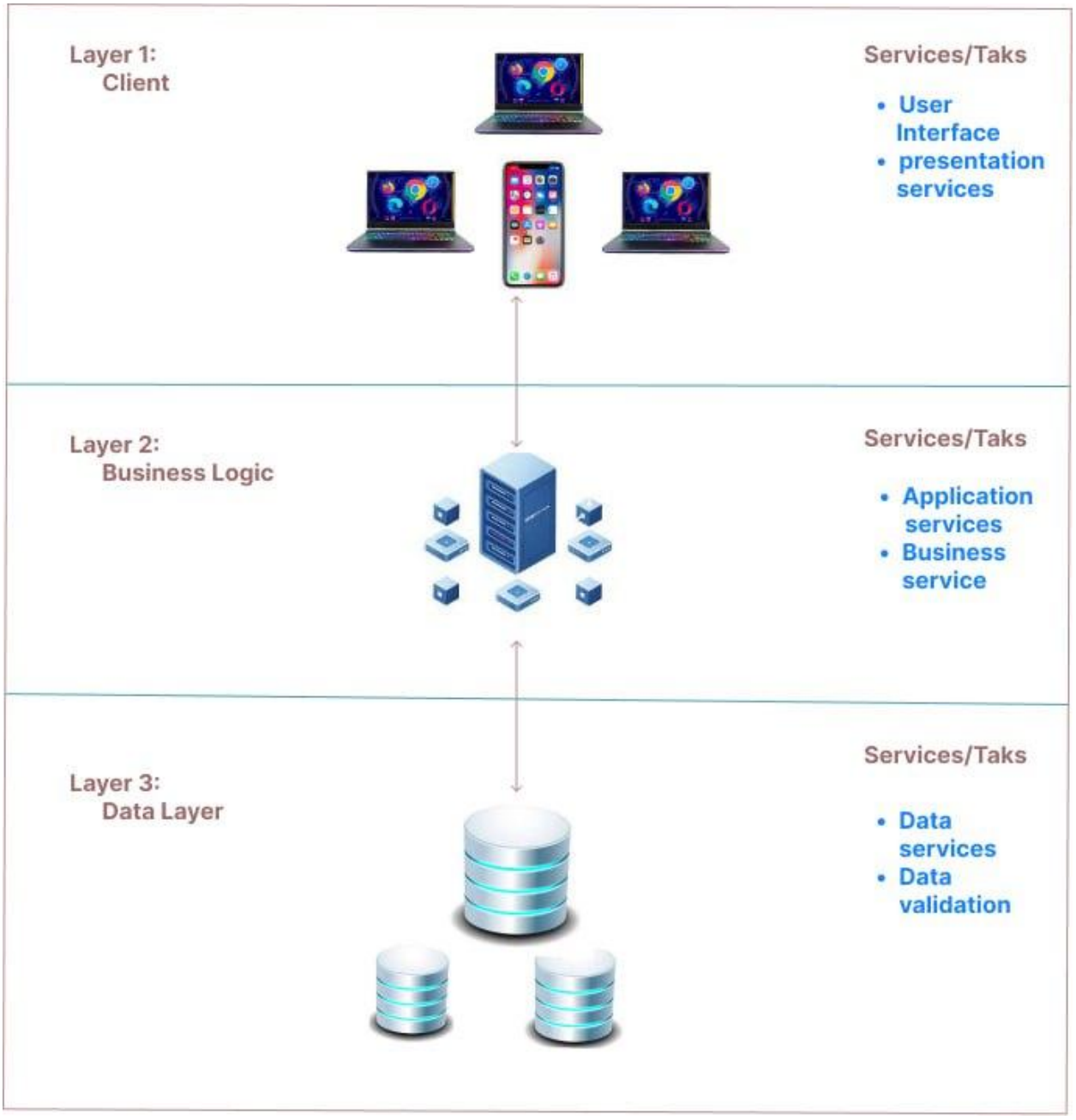
Release 2:Responsive web App	sprint 3	5,6	10/06/2023 - 22/06/2023

6. Methodology

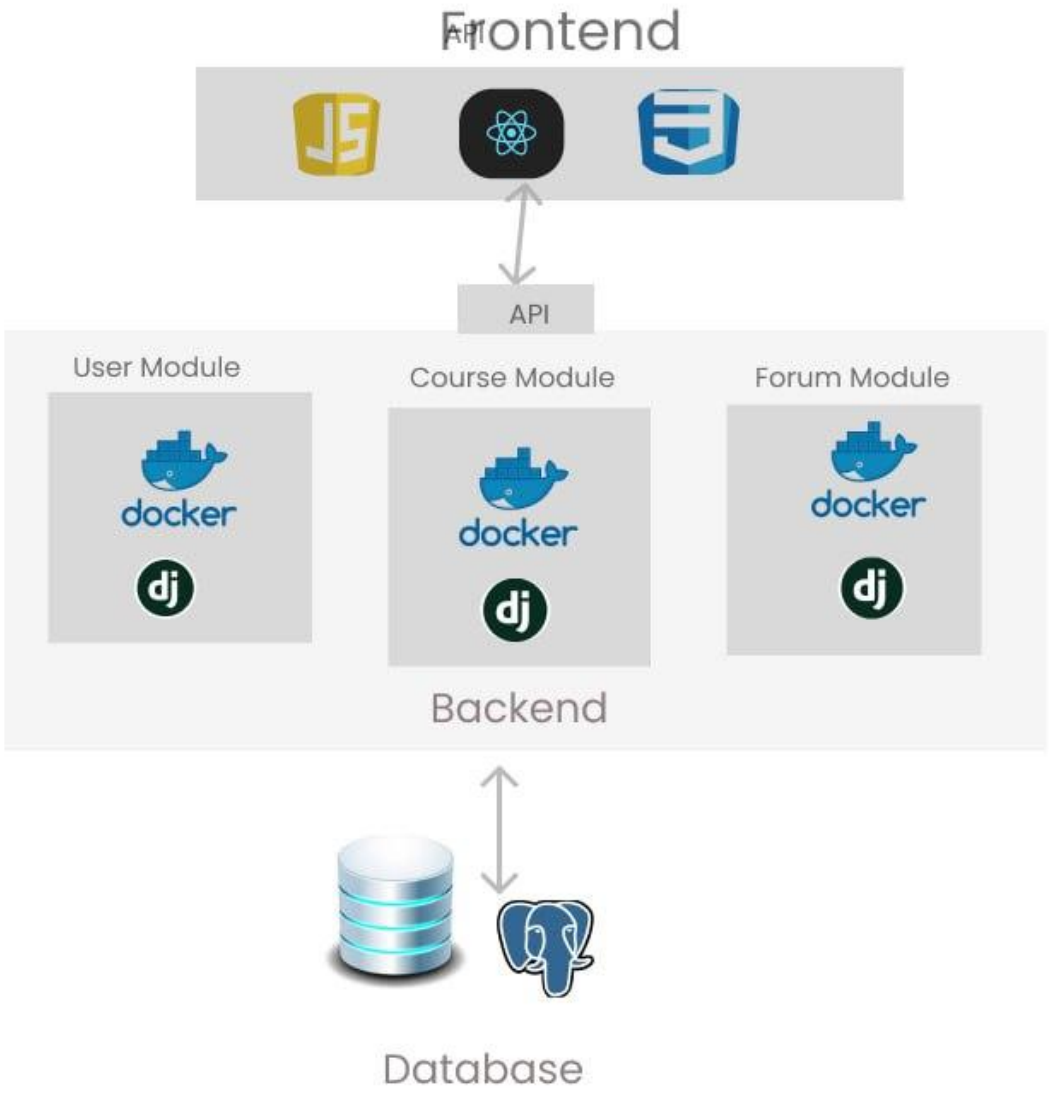
a. Architecture of your system

i. Architectural Diagram

Physical Architecture



Logical Architecture



ii. Description of Architecture

Frontend: Permits the user to visualize and interact with the FARMSMART platform.

API: permits the front end communicate with the backend

Backend: It's divided into the user, course and forum module.How the information being input by user and how

information(courses,messages,quizzes) retrieved from the database is processed.

Database: Data input by users, user information, courses and forum messages are stored here.

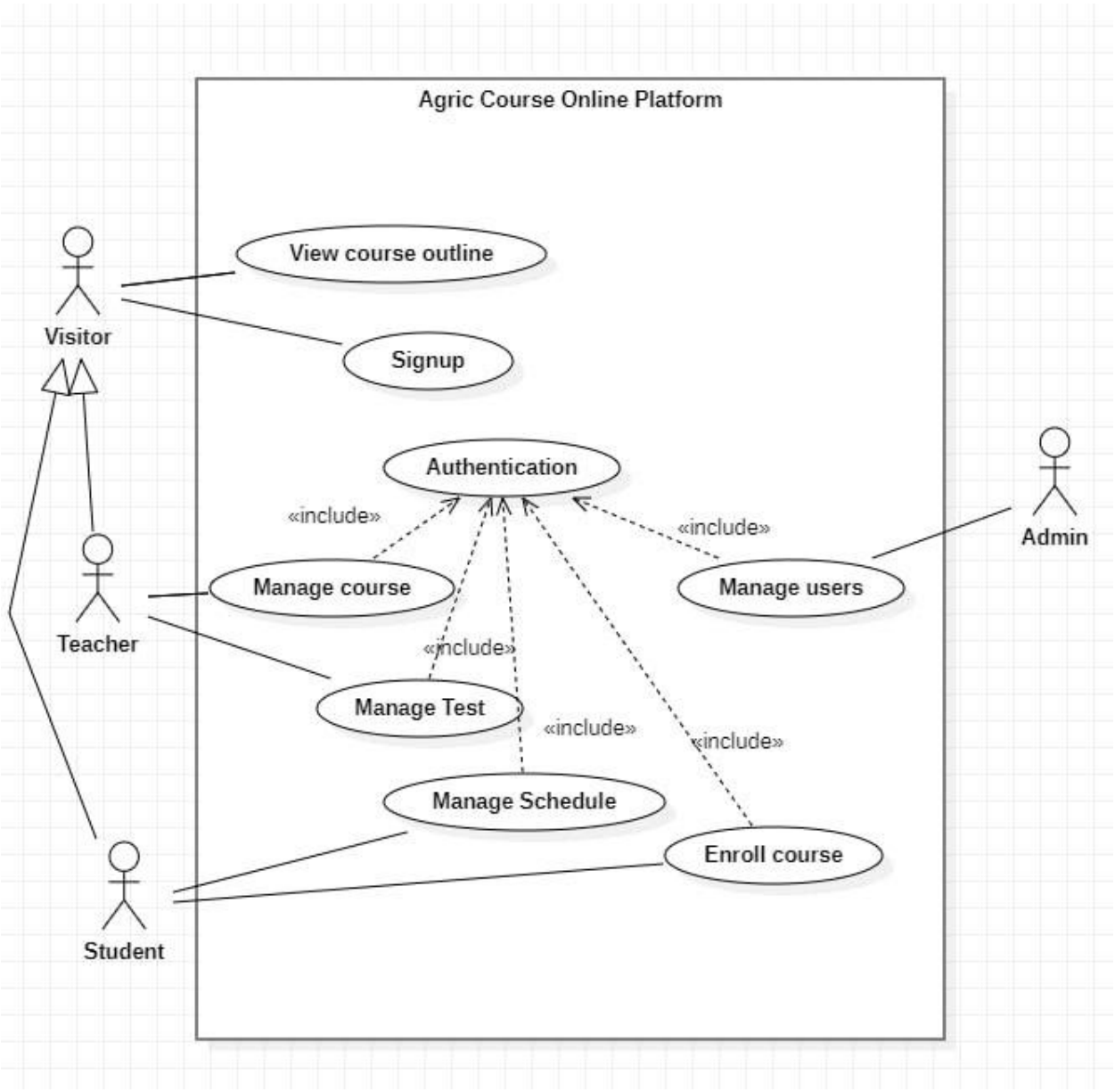
iii. Architectural Drivers

- Interoperability:The system can usefully exchange information with an external system.
- Maintainability: due to the small size of the system it's easily maintainable.
- Reliability: The system will be able to satisfy all the requirements.
- Usability:

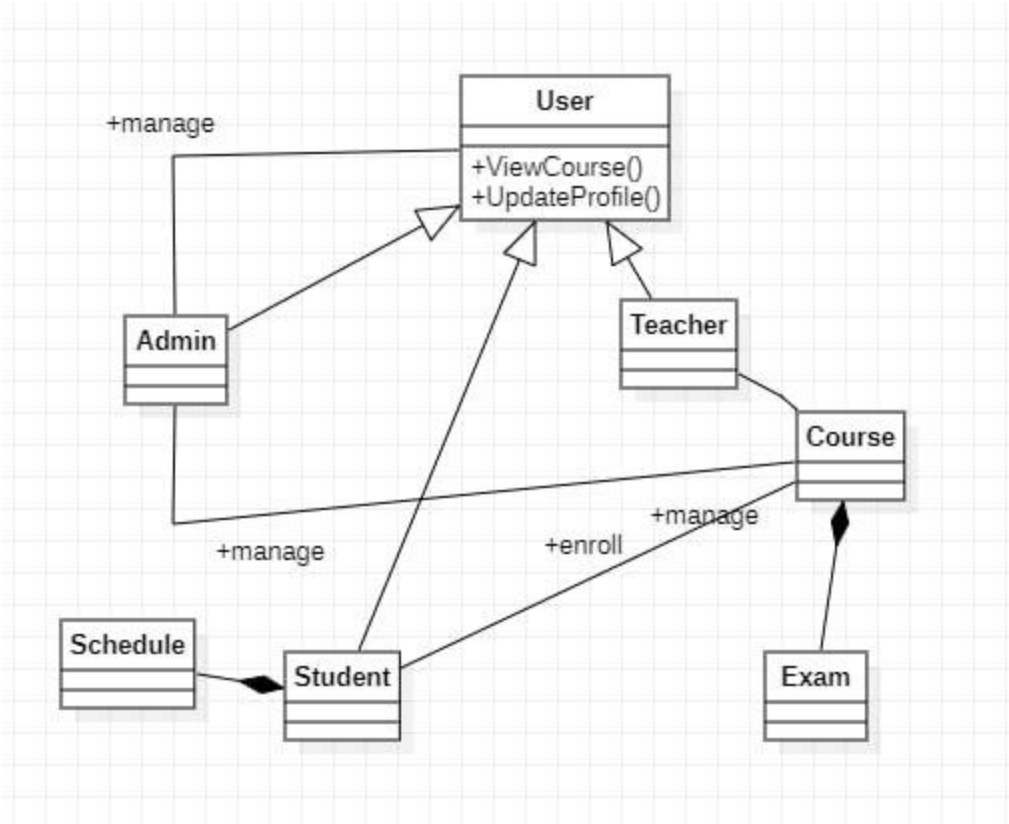
b. Model of your system

i. Model UML

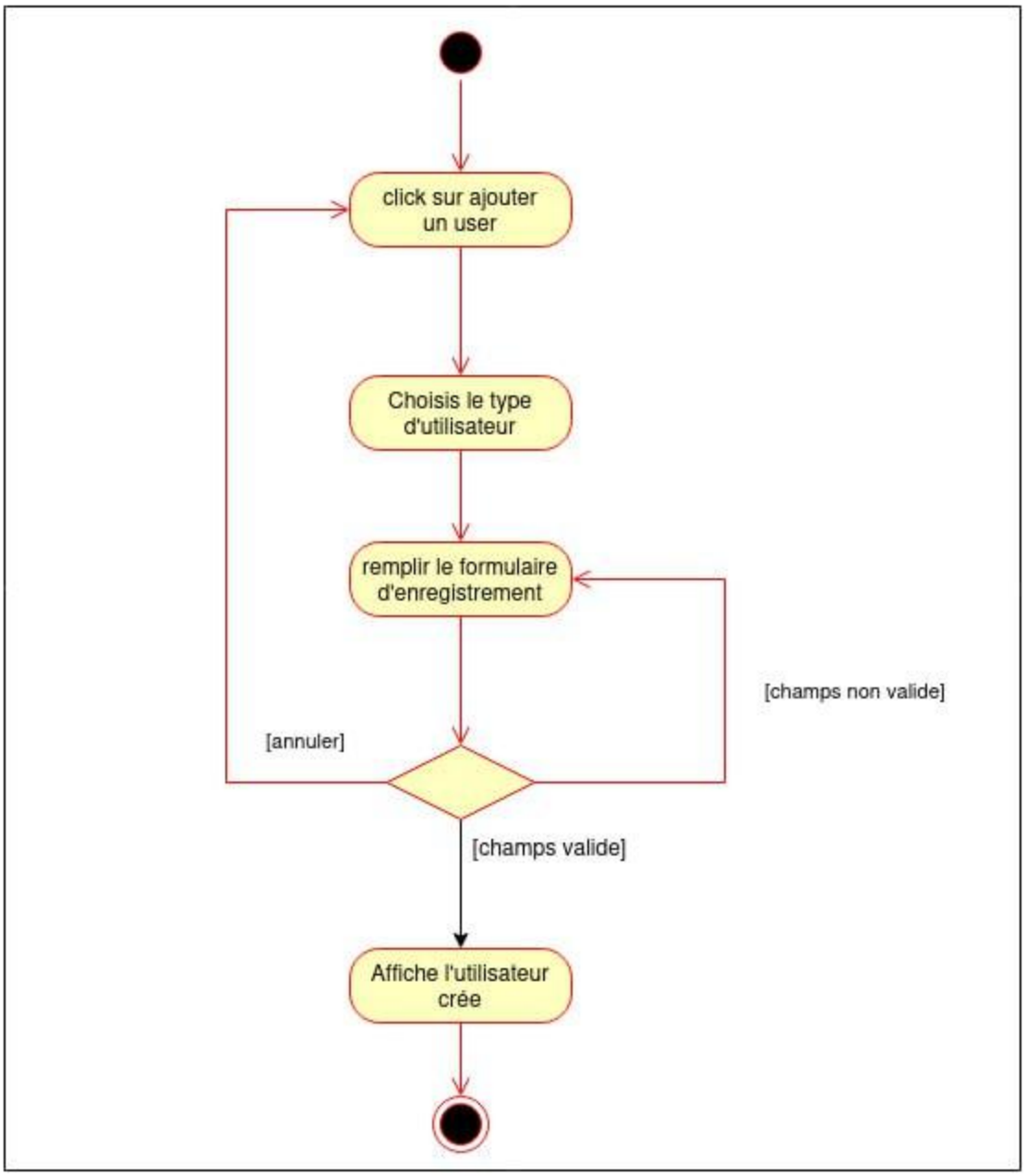
1. Use case diagram

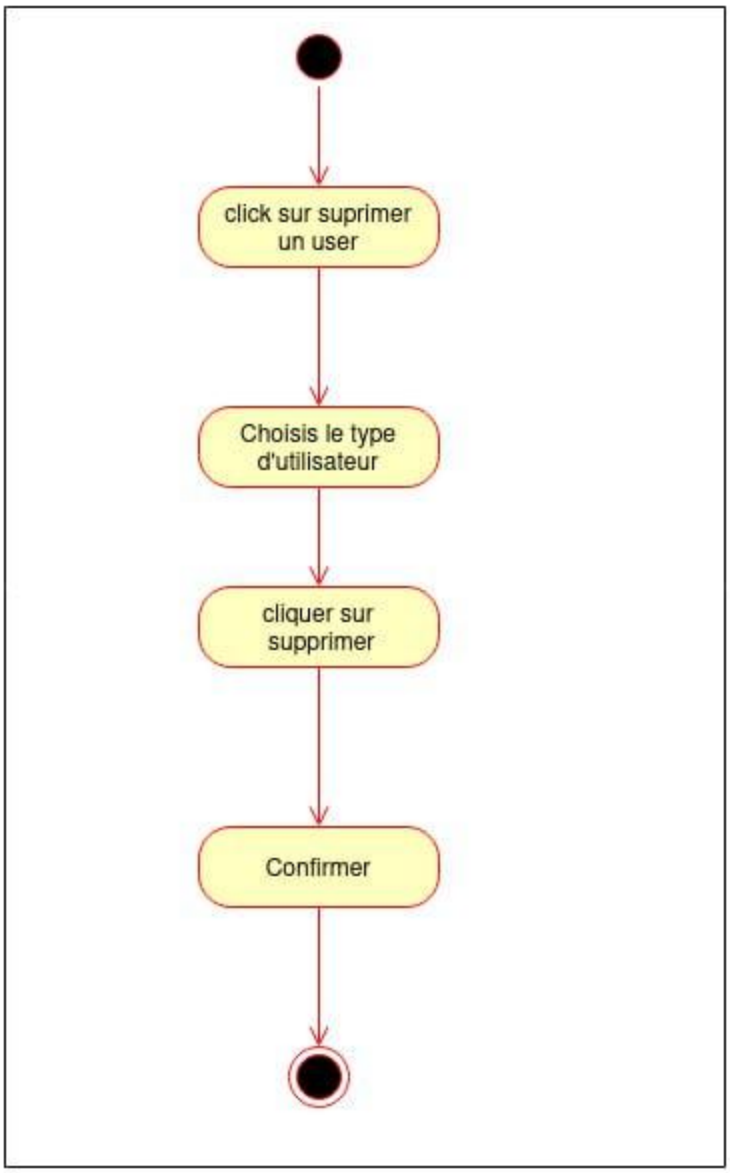


2. Class diagram

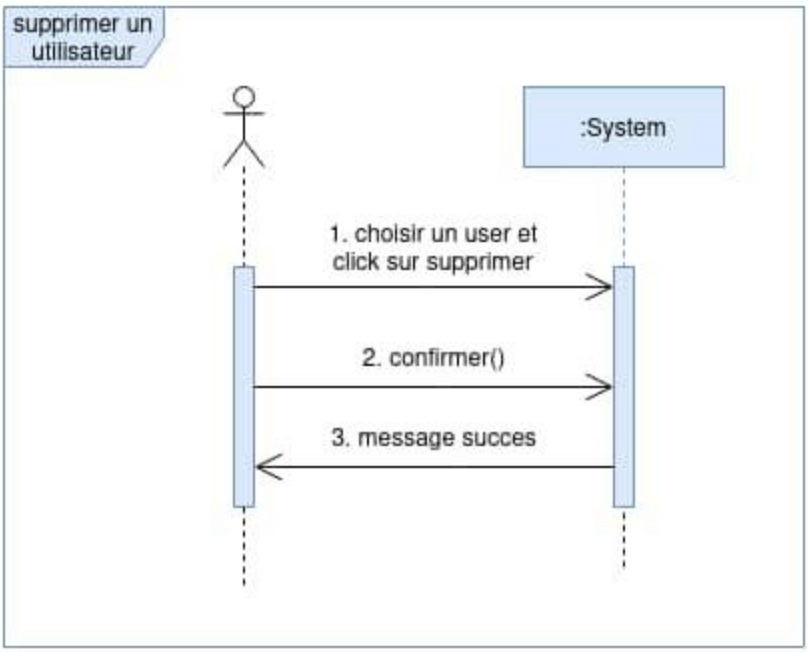


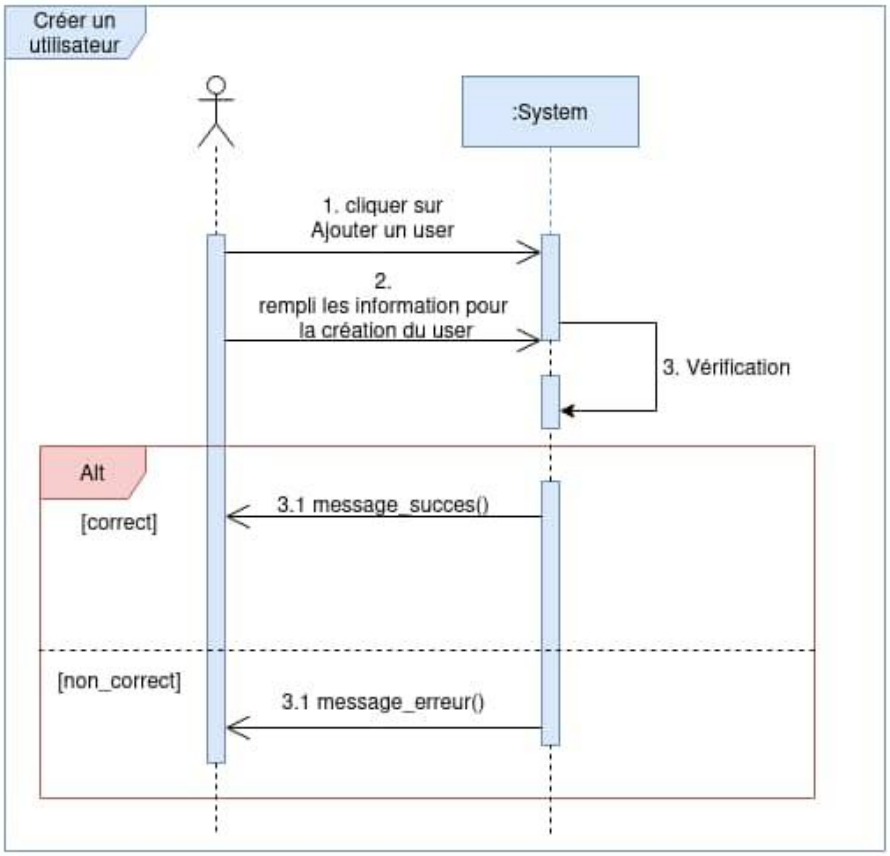
3. Activity diagram


click sur ajouter un user
Choisis le type d'utilisateur
remplir le formulaire d'enregistrement
[champs non valide]
[annuler]
[champs valide]
Affiche l'utilisateur crée



4. Sequence diagram





ii. Mathematical Model

Purpose : Mapping teachers and theirs courses to potential learners

- For a teacher (T)
  Let T stand for i teachers who have courses on the platform
  Therefore Fi = (1,2,3,...i)
- For a teacher's course (C)
  Let C stand for j teachers' courses
  Therefore C_j = (1,2,3,...j)
- For a Learner (L)
  Let L stand for k Learners
  Therefore C_k = (1,2,3,...k)
- Matrix for mapping teachers and courses

Match(T_i,C_j) = $\begin{bmatrix} T_1 & T_2 & \dots & T_i \end{bmatrix} \begin{bmatrix} C_1 \\ C_2 \\ . \\ C_j \end{bmatrix}$

$$= \begin{bmatrix} T_1C_1 & T_1C_2 & \dots & T_1C_j \\ . & . & . & . \\ T_iC_1 & T_iC_2 & \dots & T_iC_j \end{bmatrix}$$

- Matrix for mapping learners to teachers and their courses

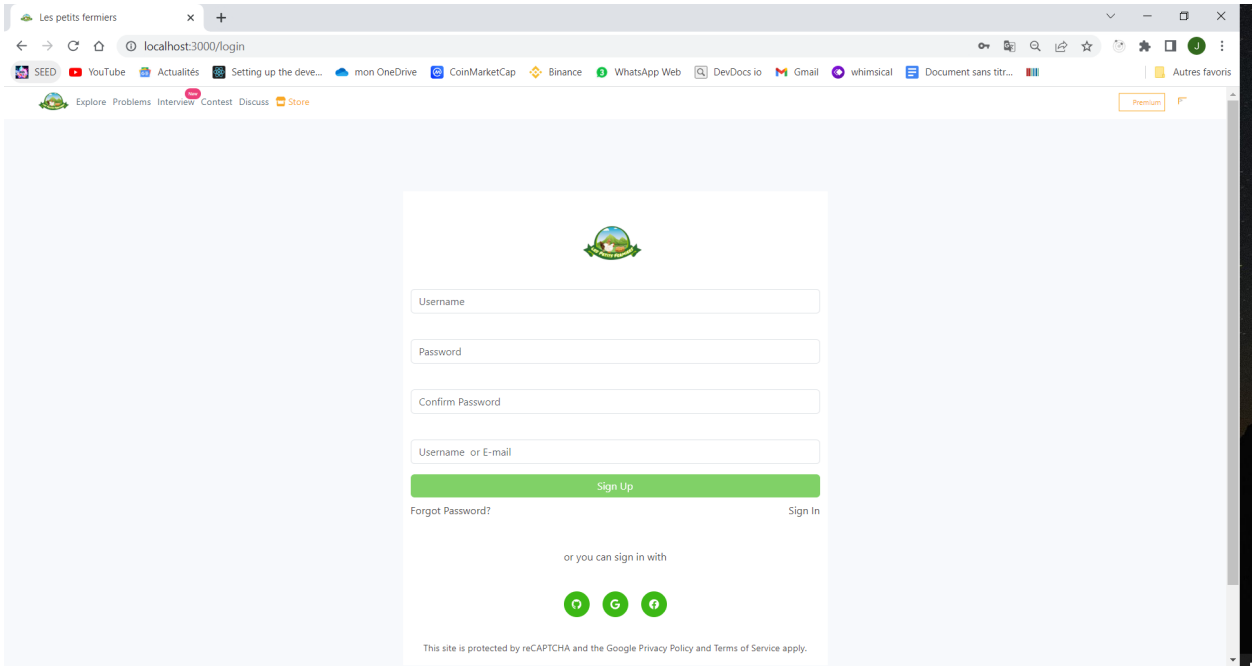
Match(T_i,C_j,L_k) = $\begin{bmatrix} L_1 & L_2 & \dots & L_k \end{bmatrix} \begin{bmatrix} T_1C_1 & T_1C_2 & \dots & T_1C_j \\ . & . & . & . \\ T_iC_1 & T_iC_2 & \dots & T_iC_j \end{bmatrix}$

$$= \begin{bmatrix} L_1T_1C_1 & L_1T_1C_2 & \dots & L_1T_1C_j \\ . & . & . & . \\ L_kT_iC_1 & L_kT_iC_1 & \dots & L_kT_iC_j \end{bmatrix}$$

iii. Algorithms

```javascript
export default function applyAHP(courses) {
  // Étape 1 : Comparaison par paires et construction de matrices de comparaison
  const pairwiseComparisons = [
    [1, 3, 5, 7], // Comparaisons pour le critère de coût
    [1 / 3, 1, 3, 5], // Comparaisons pour le critère d'expérience
    [1 / 5, 1 / 3, 1, 3], // Comparaisons pour le critère de rating
    [1 / 7, 1 / 5, 1 / 3, 1], // Comparaisons pour le critère d'heures
  ];

  // Étape 2 : Calcul des poids des critères
  const criteriaWeights = pairwiseComparisons.map((row) =>
    row.map((value) => value / row.reduce((acc, val) => acc + val, 0))
  );      You, 3 hours ago • add course and Ahp function version1.0 …

  // Calcul des moyennes pondérées des colonnes
  const columnSum = criteriaWeights.reduce(
    (acc, row) => row.map((value, j) => value + acc[j]),
    Array(criteriaWeights[0].length).fill(0)
  );

  const criteriaWeightsNormalized = columnSum.map(
    (sum) => sum / columnSum.reduce((acc, val) => acc + val, 0)
  );

  // Étape 3 : Évaluation des alternatives
  const courseScores = courses.map((course) => {
    const score =
      course.cost * criteriaWeightsNormalized[0] +
      course.experience * criteriaWeightsNormalized[1] +
      course.rating * criteriaWeightsNormalized[2] +
      course.hours * criteriaWeightsNormalized[3];

    return { ...course, score };
  });

  // Étape 4 : Sélection du meilleur cours
  const sortedCourses = courseScores.sort((a, b) => b.score - a.score);
```

iv. Maquettes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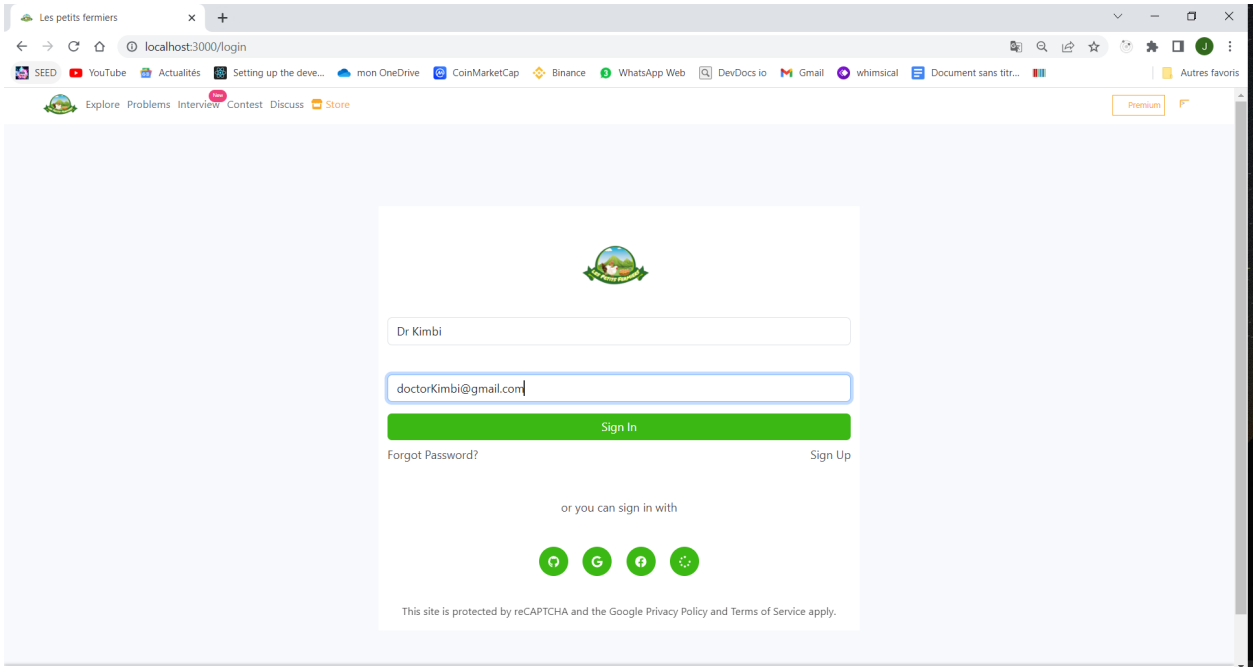
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doctorKimbi@gmail.com
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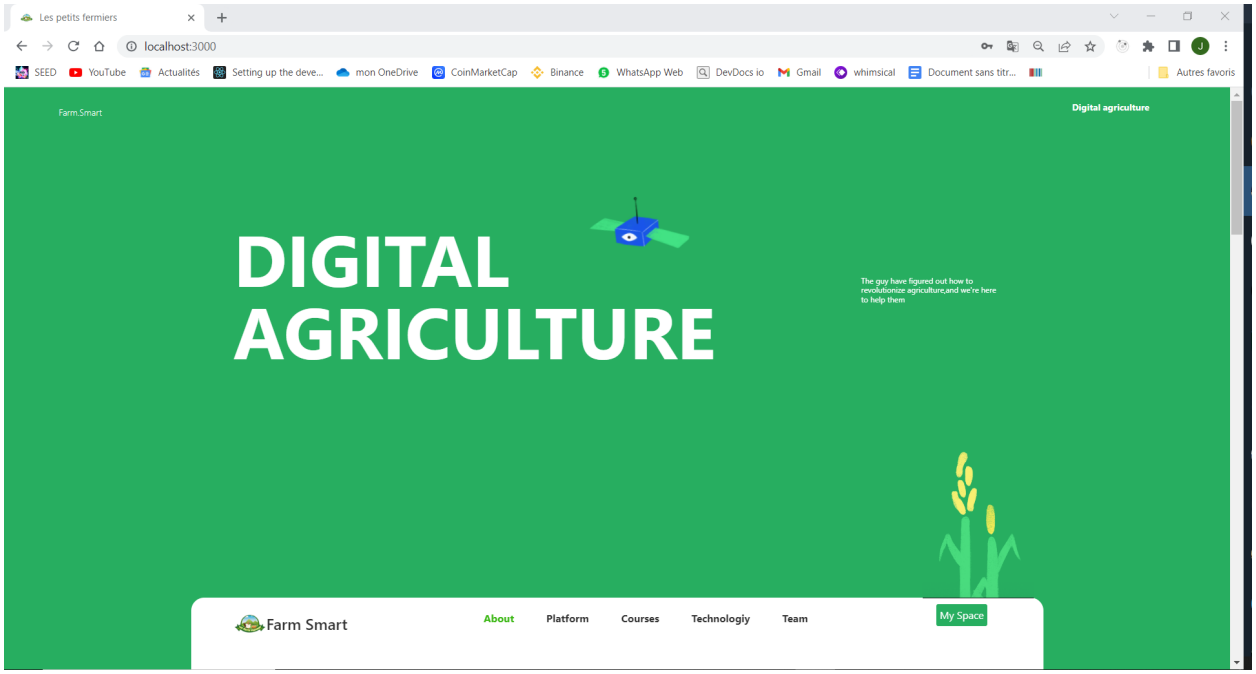
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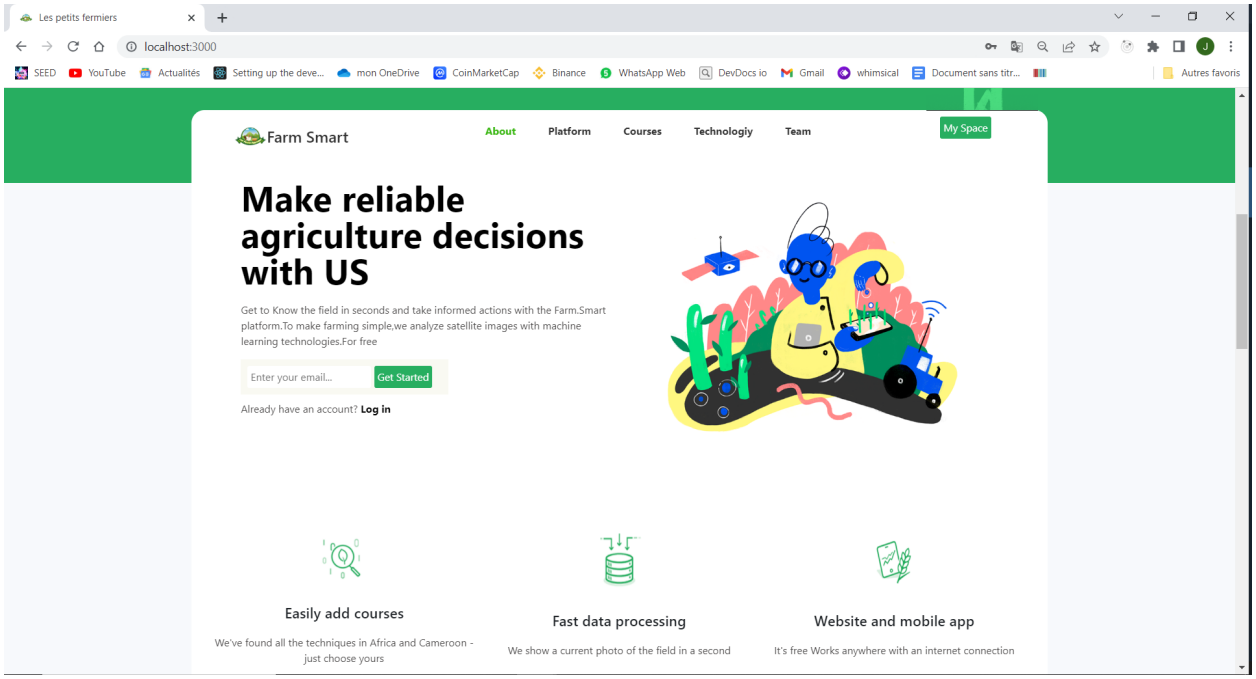
Digital agriculture
DIGITAL AGRICULTURE
The guy have figured out how to revolutionize agriculture,and we're here to help them
Farm Smart
About
Platform
Courses
Technologiy
Team
My Space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Make reliable agriculture decisions with US
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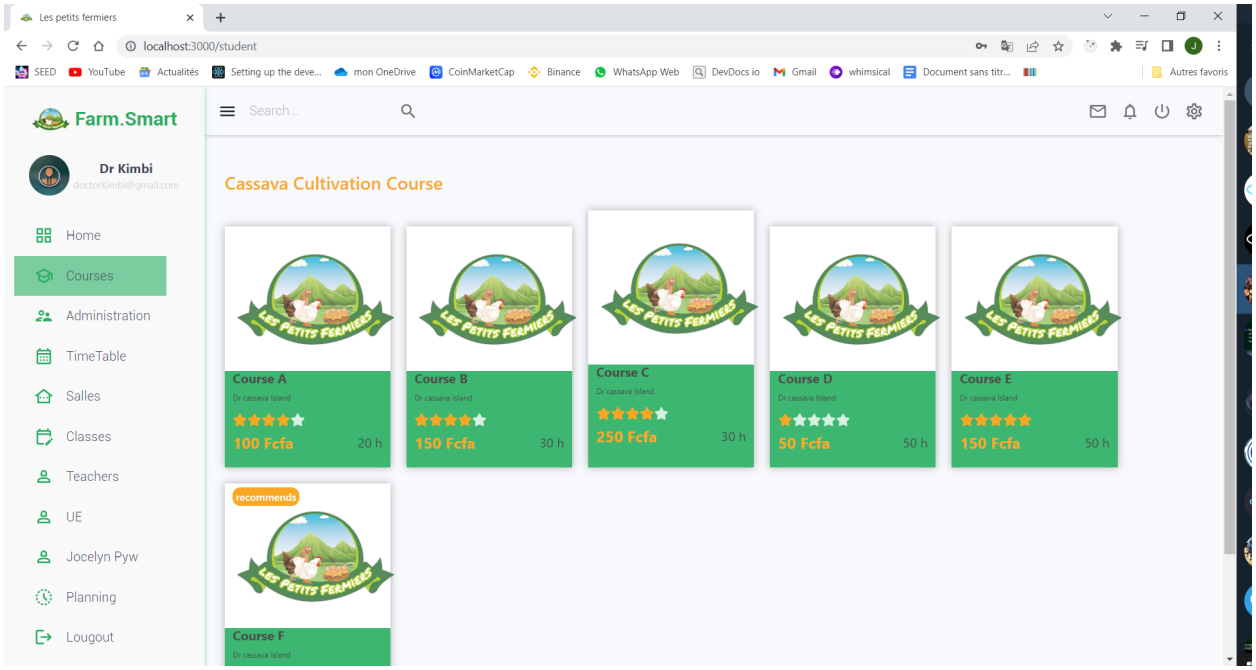
Enter your email...
Get Started
Already have an account? Log in
Easily add courses
We've found all the techniques in Africa and Cameroon - just choose yours
Fast data processing
We show a current photo of the field in a second
Website and mobile app
It's free Works anywhere with an internet connection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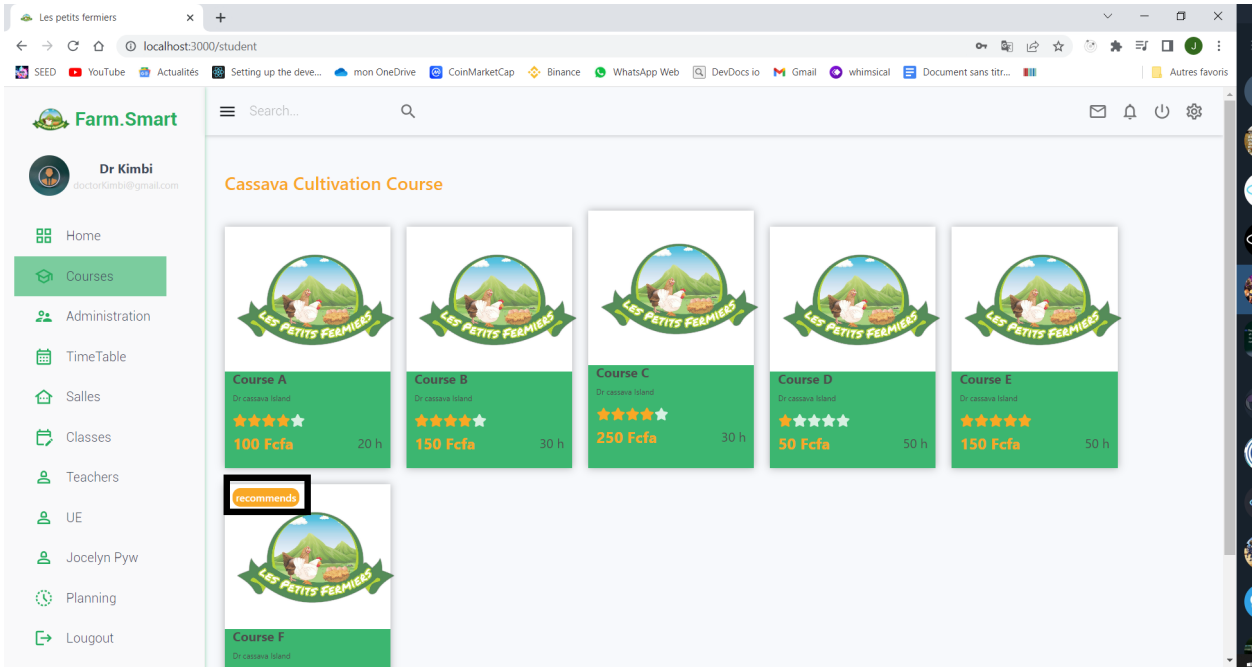
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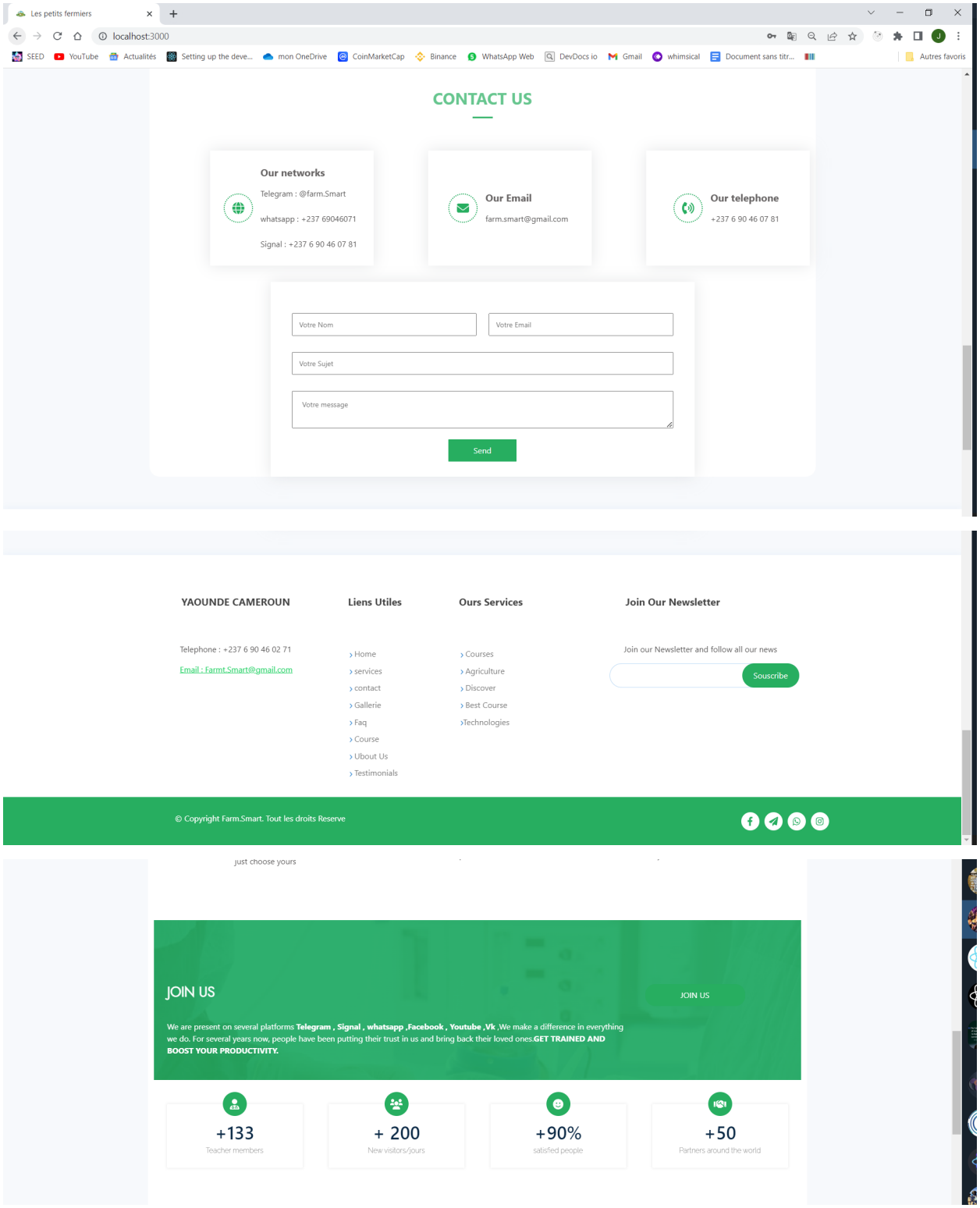
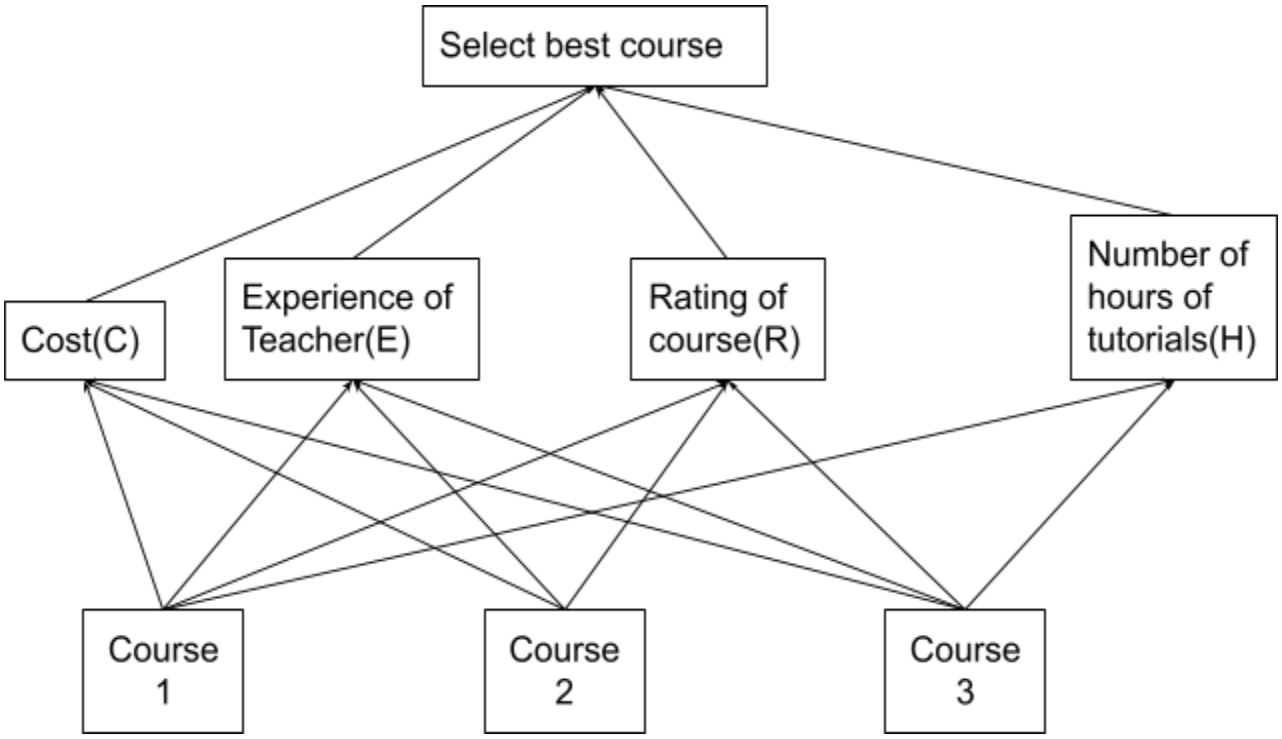


c. Analytical Hierarchical process (AHP) algorithm applied to your project.

Decision Problem: Select Best course
Criteria list:
-Cost of Course (FCFA)
-Experience of Teacher(years)
-Rating(range between 1 and 5)
-Number of hours of tutorial(hours)



Criteria relative scale of preference
1- Equal Importance
3- Moderate Importance
5- Strong Importance
7- Very strong Importance
9- Extreme Importance
⅓, ⅕, 1/7, 1/9 Inverse values
2, 4, 6, 8 intermediate values

Pairwise comparison matrix

	C	E	R	H
C	1	5	4	7
E	1/5	1	2	3
R	1/4	1/2	1	3
H	1/7	1/3	1/3	1
SUM	1.59286	6.83333	7.33333	14

Normalized pairwise comparison matrix and criteria weight

	C	E	R	H	Criteria Weight
C	0.6278	0.73171	0.54545	0.5	0.601241138
E	0.12556	0.14634	0.27273	0.21429	0.189728747
R	0.15695	0.07317	0.13636	0.21429	0.145192689
H	0.08969	0.04878	0.04545	0.07143	0.063837426

Checking for consistency:

Calculate Criteria weight sum and λi

	C	E	R	H	Criteria Weight Sum	λi
C	1*0.601241138	5*0.189728747	4*0.145192689	7*0.063837426	2.57751761	4.286995

E	(⅕)*0.601241138	1*0.189728747	2*0.145192689	3*0.063837426	0.79187463	4.17372
R	(¼)*0.601241138	(½)*0.189728747	1*0.145192689	3*0.063837426	0.581879624 26	4.007637689
H	(1/7)*0.601241138	(⅓)*0.189728747	(⅓)*0.145192689	1*0.063837426	0.261369496	4.094299

λmax = Average(λi)

= (4.286995+4.17372+4.007637+4.094299)/4

= 4.14066

Calculate consistency index (CI)

CI = (λmax - n)/(n-1) where n = number of criteria , n = 4

CI = (4.14066-4)/3 = 0.046888

Calculate consistency ratio (CR)

CR= CI/RI (with n=4)

CR = 0.046888/0.9 = 0.052097

	C	E	R	H
Course 1	10,000	5	5	30
Course 2	5,000	6	4	20
Course 3	10,000	10	5	35

	C	E	R	H	Total Item Weight
Course 1	6,012.41138	0.948643735	0.72596344	1.91512278	6016.00111
Course 2	3,006.20569	1.138372482	0.580770756	2.23430991	3010.159143

Course 3	6,012.41138	1.89728747	0.72596344	1.27674852	6016.311379

The learner should choose **Course 3**