Habib University – Computer Science

CS 491 & CS 492 – Kaavish

CS Capstone Project 2019-20

Kaavish Committee

August 2019

Contents

1 Objective

CS 491 & 492 – Kaavish is a year-long experience for final year students that requires them to apply their acquired knowledge to solve a sufficiently challenging real-world problem. One of the key objectives of Kaavish is to enable students to build a connection between their theoretical concepts and practical applications. Kaavish is a reflection of their four years of intellectual journey that prepares them to integrate knowledge and skills that they have acquired, and make an effective contribution to the society.

2 Learning Outcomes

At the end of Kaavish, students should be able to:

- brainstorm and identify a problem and come up with alternative solutions
- assess feasibility of multiple solutions and narrow down the most feasible one
- plan their project while complying with scope, time and resource constraints
- design, implement and test a working system/model as per state of the art practices
- apply agile methodologies to execute a project
- exercise leadership and team building skills
- take ownership and work independently; and
- communicate their idea and solution effectively to a large audience via different mediums - presentations, reports, posters and so on.

3 Prerequisites

The decision to allow students to register in Kaavish is tentatively based on the following criteria:

- being in Senior year
- have cleared the following courses:
  - CS 101 – Programming Fundamentals
  - CS 224 – Object Oriented Programming and Design Methodologies
  - CS 102 – Data Structures & Algorithms
  - CS 201 – Data Structures II
  - CS 355 – Database Systems
  - CS 113 – Discrete Mathematics
  - CS 353 – Software Engineering

4 Kaavish Proposal

Kaavish ideas can broadly be of three main types:

- Product development – in which students identify a real-world problem and build its solution. The end product is a working system that satisfactorily addresses the problem under consideration.
- Research problem – in which students identify a research problem and thoroughly address it. Final deliverables include a prototype/simulation/mathematical model, results along with a research paper.
- Entrepreneurial idea – in which students address an innovative idea of a technology startup and build a working solution to implement that idea. The end deliverable includes a working system along with a business plan.

Problem Description	Is the problem clearly defined?
Motivation	Is there a clear motivation behind solving this problem? Is itworth solving? Is the project addressing some importantsocietal/real-world problem?
Originality/Novelty	What other solutions are there that solve this or similar problems? How is your solution different? What is the novelty of your approach?
CS Rigor	Does it involve significant CS contribution? Which higher-level CS courses contribute to this?
Scope	Is the scope clearly defined? Can you identify main modules of your system? Are deliverables clearly defined? Is the amount of work justified for a year-long group project?
Challenges	What challenges do you see in this project? Your project should be neither too simple nor too ambitious to complete in a year
Team Dynamics	Does the team have the capacity to address the problem? Have they taken or are taking relevant courses?
Feasibility	Are resources(datasets, libraries, hardware etc.) required to do the project available?

Table 1: Criteria to assess Kaavish proposals

4.1 Project Kickoff

Students are required to form groups of 3-5 members for Kaavish. The process formally kicks off in the Fall semester with a Kickoff event in which each group presents their proposal to CS faculty. The faculty will assess projects based on the criteria defined in table 1. However, depending upon the nature of projects, some factors may not be applicable to every project.

Students will also submit a Kaavish proposal form before the presentation. The template for the Kaavish proposal form and presentation guidelines are given in Appendix A – Kaavish Proposal Form and Appendix B. Based on the feedback from the faculty members, the Kaavish committee will finalize decisions on proposals. The final decision could be:

- **Accepted** – in this case, the project team will start working on their project.
- **Rejected** – in this case, the team will be asked to resubmit a new proposal within a week.
- **Need Revision** – in this case, the team will be asked to revise their proposal based on faculty's feedback and resubmit within a week.

The Kaavish committee will review the resubmitted proposals. They may seek help from some of the faculty members of respective areas (if needed). Each approved project is assigned a supervisor who is a full-time faculty member at the university. While submitting proposals, students can specify their preference for the supervisor that Kaavish committee takes care of while assigning supervisors. However, the final decision lies with the committee to assign supervisors to each project after having faculty's consent. In case of inter-disciplinary projects, multiple faculty members from different departments may co-supervise a project. A project may optionally have an external supervisor who can be an industry professional or any other domain expert.

5 Kaavish Process

After approval of Kaavish proposals, students start working on the project. Kaavish spans two regular semesters and is divided into Kaavish I and Kaavish II. Scrum model is adopted to execute projects and the whole timeline is divided into four sprints of roughly seven weeks. Two evaluations happen in both Kaavish I and II. Several artifacts are produced during different phases and are maintained throughout the project. The weekly plan of Kaavish is shown in table 2.

	Week	Activities	Deliverables
Summer		Brainstorming, discussion with faculty. finding problems in industry	
Kaavish I (Fall)	1	Semester Start	
	2	Proposal Presentations	
	3	Decision on proposals (accept, revise, resubmit), Supervisor assignment	
	4	Detailed project planning	Proposal resubmission, project backlogs – stories, features, sprint I backlog
	5		System diagram
	6		Interface: GUI mockups and use cases (if applicable)
	7	**Evaluation I**	SRS
	8	Research, design, and preliminary implementation	Sprint-II backlog, literature review,
	9		Design: UML class diagram, database model
	10		Prototype
	11		Dataset(if any)
	12		
	13		
	14		SDS
	15	**Evaluation II**	First prototype (30% complete)/literature review
Kaavish II (Spring)	1	Research, implementation, and integration	
	2		
	3		Mathematical model
	4		Demo/preliminary results
	5		
	6		
	7		
	8	**Evaluation I** (before spring break)	Working prototype (80% complete)
	9	Implementation, integration, and testing	
	10		
	11		Final demo/results
	12		Analysis
	13		
	14		
	15	**Evaluation II** (open house)	Poster, final report/research paper, final demo

Table 2: Kaavish I and II process

6 Assessment Criteria

Kaavish assessments are based on:

- supervisor's feedback based on students' performance throughout Kaavish
- evaluators' feedback
- peer evaluation

Separate grades are assigned to Kaavish I and Kaavish II. At the end of Kaavish-I, final results of Kaavish-I are posted on Peoplesoft.

6.1 Kaavish I Grading

The breakup of Kaavish-I grading is given in Table 3:

Kaavish proposal	5
Evaluation I (see Table 5)	15
Evaluation II (see Table 6)	30
Supervisor (see Table 4)	50

Table 3: Kaavish I grading

6.1.1 Supervisor grading

Weekly meetings		10
Scrum	Stories, project, sprint backlogs	10
	Execution/progress	10
SRS	Use cases	2.5
	Functional/non-functional requirements	2.5
	System diagram	2.5
	GUI	2.5
SDS	ERD	10
	UML class diagram	
	Related work	
Total		**50**

Table 4: Supervisor grading in Kaavish I

6.1.2 Evaluation I

Introduction	2.5
Planning	2.5
GUI mockups	2.5
Presentation skills	2.5
Q&A	5
Total	**15**

Table 5: Evaluation I grading in Kaavish I

6.1.3 Evaluation II

Literature review	5
Design	5
Prototype	10
Presentation skills	2.5
Technical challenges	2.5
Q&A	5
Total	**30**

Table 6: Evaluation II grading in Kaavish I

6.2 Kaavish II Grading

Supervisor (see Table 8)	50
Evaluation I (see Table 9)	20
Evaluation II (see Table 10)	20
Peer evaluation	10

Table 7: Kaavish II grading

6.2.1 Supervisor Grading

Scrum updates	5
Final report (organisation, quality, completeness)	10
Weekly progress	15
Work ethics (timeliness, teamwork, communication, commitment, resourcefulness, leadership)	10
Poster	5
Demo	5
Total	**50**

Table 8: Supervisor grading in Kaavish II

6.2.2 Evaluation I Grading

Final design/model/algorithm	2.5
Working prototype/results + validation	10
Limitation & future work	2.5
Q&A	5
Total	**20**

Table 9: Evaluation I grading in Kaavish II

6.2.3 Evaluation I Grading

Poster	5
Presentation	5
Demo	5
Q&A	5
Total	**20**

Table 10: Evaluation II grading in Kaavish II

7 Grading Procedure

Kaavish I and II grades will be computed as follows:

Grading Scale		
Letter Grade	**GPA Points**	**Percentage**
A+	4.00	[95, 100]
A	4.00	[90, 95)
A-	3.67	[85, 90)
B+	3.33	[80, 85)
B	3.00	[75, 80)
B-	2.67	[70, 75)
C+	2.33	[67, 70)
C	2.00	[63, 67)
C-	1.67	[60, 63)
F	0.00	[0, 60)

Please note Kaavish I and II will be graded separately

8 Roles and Responsibilities

The key roles involved in the execution of Kaavish are:

- Kaavish team (students)
- Supervisor
- Kaavish committee

The following sections outline expectations from each of these roles:

8.1 Expectations from Students

During Kaavish, students are responsible to do the following tasks:

- brainstorm and identify a sufficiently challenging project/research idea that they are motivated and comfortable to address
- identify current state-of-art in their chosen area and choose tools and technologies to build an innovative solution
- identify key milestones and deliverables and plan their project in sprints
- design, implement and test their project
- regularly meet their supervisor to communicate their progress
- communicate their idea and solution effectively to a large audience via different mediums – presentations, reports, posters
- be a team player – dealing with team dynamics, leading the team, resolving conflicts, distributing work
- collaborate with external stakeholders

8.2 Expectations from Supervisor

Supervisors play an important role during Kaavish execution. They are required to perform the following tasks:

- help students defining the scope of their project
- provide technical guidance in terms of tools and techniques to be used. This may also involve redirecting students to other relevant resources (wherever needed)
- assisting students in planning and design of the project
- setup regular meetings with the team and monitor their progress
- evaluate and grade students' work
- play a role of mediator in case of conflicts in teams
- assess and approve any budgeting requirement
- communicate with the external supervisor (wherever needed)
- assist Kaavish students in getting required hardware and software resources

8.3 Expectations from Kaavish Committee

Kaavish committee is responsible to:

- setup timelines for Kaavish
- define rubrics for different evaluations
- share templates and guidelines for different deliverables
- schedule and organize Kaavish evaluations
- compile and communicate evaluation results
- mediate in case of conflicts between Kaavish team and supervisor
- assist Kaavish students in getting required hardware and software resources
- Kaavish committee will send updates only via LMS and/or emails

9 Intellectual Property Rights

The intellectual property (IP) arising from your project will be jointly held by the University, students, and the faculty supervising and co-supervising the project. The exact terms of the IP sharing will be explicitly defined in the university policy on intellectual property. In the absence of the university policy on intellectual property, the IP shall be shared equally between all the aforementioned parties.

Appendix A – Kaavish Proposal Form

Section – Metadata

to be filled by students

1. **Project information**

Title:	Web based platform to promote arts & craft and DIY projects from Pakistan, earn money through purchases and facilitate the marginalized communities.

2. **Team information**

Name	**ID**	**Batch (e.g. 2020)**
Aiman Ahmed Moin	am02886	2020
Ubaid Ali Faruqi	uf02900	2020
Ahsan Qadeer	aq02756	2020

3. **Internal supervisor information** (second internal supervisor is optional)

Name: Syeda Saleha Raza (preference 1st)	**Program:** Computer Science
Name: Rahim Hasnani (preference 2nd)	**Program:** Computer Science

4. **External supervisor information** (if applicable)

Name: Potential Supervisors (Mohsin Nagaria, Jawwad Farid, Fahad Ahmed) TBD	
Email:	**Contact:**
Organisation Name:	
Address:	

Section – Project details

to be filled by students (continue on a separate sheet if necessary)

1. **Project description:** *Please provide a brief introduction of the project including its scope*

Problem: Lack of a single web-based platform which facilitates the indigenous artists and skilled workers belonging to marginalized communities (specifically the transgender community) in showcasing their talents and connecting with the larger audience.

"Through a cross-sectional study design, a sample of 189 transgender community living in twin cities of Rawalpindi and Islamabad was selected using snowball sampling technique.

The mean age of our study population was 29 ± 7.88 years. Around 94.2% (n=178) were unemployed. Majority (65.6%) were having monthly income of less than 10000; much less than the government's new laid-down minimum pay scale of Rs. 14,000/month (announced in 2016 budget)." [1]

Transgender are one of the neglected communities of Pakistani Society. Even after the passing laws on Transgender Rights, the amount of jobs provided to them are not enough to cater to their daily needs and earnings. Those who are provided with jobs are usually subjected to public harassment even after the existence of law against it. [2]

Relevance to real world: Transgender rights had been a taboo topic in Pakistan up until the 'Transgender Person (Protection of Rights) Act 2018' bill was passed in the Senate and the National Assembly, stating that transgender people have "fundamental rights to inheritance, education, employment, vote, hold public office, health, assembly, and access to public spaces and property. It confirms that they enjoy all the rights that the nation's constitution grants to its citizens." Despite this, there is a long-standing cultural and societal prejudice against people who identify as transgender and one of the most important and basic requirements, employment, is often either denied or very difficult to get in the current circumstances. [3]

Originality/Novelty: Web-based platforms today in our country are shaping the face of e-commerce. Although convenient for the consumers, the dominant e-commerce websites are highly capitalistic and providing profits to the already successful corporate organizations. Therefore, the need for a platform in our society which connects these artists and skilled workers (having little to no employment opportunity) directly to their audience, is essential to provide them exposure. The only two such platforms running in our country our team could find were "Kunayah" [4] and "Vceela" [5]. However, our web-based platform not only aims to sell the crafted products (something both of these websites are doing) but also to showcase and portray different individuals along with their skillsets so that they will get the chance of being employed by potential employer(s).

CS Rigor: For our project, a web-based platform will require the use of extensive web development, which in turn also involves concepts from Algorithms, Data Structures and OOP. We will be maintaining a database as well which uses concepts from Database Systems. Since the website is e-commerce, it will use Artificial Intelligence, Data Science Techniques and Natural Language Processing to make for a smoother experience on the user end, where users will be able to find similar and more relevant results. We also plan to use Digital Image Processing, Natural Language Processing and Machine Learning to automatically assign tags to items that are uploaded on the website, making it more SEO friendly and dynamic. Software Engineering will play a key role in this entire project since we are following an agile methodology and plan on keeping our project as organized and documented as possible.

Team Dynamics:

The team comprises of three individuals having diverse skillsets and interests. The details about each team member are as follows:

Aiman Ahmed Moin: Pursuing a minor in Mathematics along with CS major. Taken courses in the fields of Web and App development, Data Sciences, Artificial Intelligence, Computational Intelligence, Understanding Social Networks, Illustration & Design and Entrepreneurship. Having strong command over databases, server-side development, communication and management skills.

Possible roles: Working on the server-side Development of our Website and Databases. Incorporating the knowledge of Data Science Techniques, Artificial Intelligence, Design Methodologies and Entrepreneurship in this project.

Ahsan Qadeer: Having strong hold over full-stack Development, JavaScript, Node and MongoDB. Taken courses in the fields of Game Development, Artificial Intelligence, and Understanding Social Networks. Research interest lies in understanding consumerism dynamics within our society, and towards making our spaces more inclusive for marginalized and diverse communities. This lets me put my interdisciplinary knowledge acquired at Habib into practice. Also worked as Research Assistant at DevAct working on User Interface & Design of chatbots.

Possible roles: Working as a full-stack developer along with the entire team. Majorly focusing on Databases, UI design, Quality Assurance, Datasets, and Artificial Intelligence along with utilizing the knowledge of consumer goods in the context of e-commerce.

Ubaid Ali: Pursuing a minor in English & Comparative Literature. Research interest lies in connecting the literature, culture and anthropological diaspora with Computer Sciences to understand and find solutions of new-age problems in society. Have strong command over communication, presentation and analytical skills. Taken courses in Natural Language Processing, Design Research, Artificial Intelligence, Data Sciences, Web and App development, Understanding Social Networks and Entrepreneurship. Strong Command over UI/UX designing.

Possible roles: Working on the UI design, assuming the role of Scrum Master, working with databases and client-side development, natural language processing, communicating with external sources regarding the business plan in addition with looking after the design of the product and making sure it aligns with the end-user expectations.

Challenges: This project will nonetheless be a challenging but motivating task for us. We will be taking online courses to get up to speed with Digital Image Processing, since we have not taken that course. Apart from that, Machine Learning will be a challenge to get used to, but we plan on working on that online and as a team to be able to complete the project.

Apart from technical challenges, we will also face challenges in finding enough content to make available on our website for it to become a functioning e-commerce space. For this we have onboard with us a few NGOs who are working with transgender communities that will help us in making resources available for our marketplace. Combatting prejudices within our society when it comes to interactions with transgender people will also be another challenge and to counter this, we not only will share their products with our audience, but also their skillsets and stories, giving them a greater scope and recognition for finding employment opportunities.

Another potential challenge is that we might not have suitable datasets to use in our project, and we hope to solve that by creating our own dataset(s).

Feasibility: The resources that are required to complete the task will mostly involve simpler frameworks and libraries including libraries for Machine Learning that include Numpy, Scipy, Scikit-learn, Theano, TensorFlow, Keras, PyTorch, Pandas and Matplotlib. We will be using most, if not all, of these libraries. We will also make use of datasets available at Kaggle and other relevant platforms. Since a GPU instance is recommended for most deep learning purposes, that is a resource that we will need/require from University.

2. **Expected delivarables:** *Please list the expected outcomes at the end of this project, e.g. a working prototype of the solution, a report, and the expected contribution to be made by the participant(s)*

As part of our deliverables, we will be submitting:

Website: We will be sharing a link to a live website hosted on a server. The website will contain the following modules:

- Artisans will register and share their works as sellable items and mention their skillset(s) so that they can be approached by potential employers.
- Users can search items, buy an item, contact the artisan
- Different categories such as handicrafts, jewelries, bags and other locally manufactured items

Report: The report will contain a complete research of our project including the abstract idea that we started with, the statistics that were used to make our project more suitable for the real world, and the different technologies used, people and NGOs contacted for support and our follow up.

Contributions: We will be submitting another report that includes a detailed overview of contributions made by each team member. This will include our Agile report and summary of our Scrum meetings and sprint backlog.

3. **References:** *Kindly mention all sources that you used in preparation of this proposal*

[1] The Pan African Medical Journal. 2018;30:96. https://www.panafrican-med-journal.com/content/article/30/96/full/

[2] https://dailytimes.com.pk/353990/workplace-harassment-law-in-pakistan/

[3] Qureshi, K. (2019). The impact of Transgender Persons Act, 2018 on the intersex community in Pakistan. https://ueaeprints.uea.ac.uk/71847/

[4] http://www.kunayah.com/

[5] https://www.vceela.com/

Name and signature of internal supervisor(s)	**Date**
Name and signature of external supervisor	**Date**

Section – Faculty feedback

to be filled by faculty

Appendix B

Kaavish proposal presentation Guidelines:

- Project title, team
- Problem statement
- Motivation
- Challenges
- Major components to be developed
- Deliverables – (e.g., a mobile/web application, a library or a tool, a manual for end user, data import scripts etc.)
- Existing resources – (references to other similar systems, libraries, datasets that can potentially be used)
- Tools and Technologies – (platform, programming language, DBMS, hosting, technology, etc.)