UROPMatcher Design

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Overview

Most MIT undergraduates participate in a UROP during their time at MIT. However, oftentimes searching for UROPs can be difficult, and a student would have to look through many UROP listings before finding one suitable for them. Our app, UROPMatcher, is a platform where students can easily find UROPs that match their interests and professors can recruit only qualified students for their labs. The premise of the app is to match students with UROPs based their skills, interests, and experience, and thus students can easily find potential UROPs and labs can easily find candidates who best fit the UROP position.

Current UROP search platforms include MIT's UROP listing site, UROP sites for specific courses (i.e. Course 10, Course 22), and specific mailing lists (i.e. EECS-jobs-announce). These platforms do not provide an easy way to filter UROPs, and oftentimes have outdated UROP postings for positions that have already been claimed or are not needed anymore. MIT's UROP listing site and course UROP websites also list UROPs under a single major, so it is difficult to search and apply for interdisciplinary UROPs.

UROPMatcher solves problems presented by other UROP sites by becoming a single platform for students to apply for UROPs they qualify for and that match their interests. Students create a profile based on their experience, skills, interests, etc. Professors and graduate students can post UROPs needed in their lab, and specify skill requirements, tag project disciplines, etc. Students are then matched with postings based on if they fulfill the skill requirement and if the project matches their interests. This allows students to easily find suitable UROPs without having to scroll through long listings on multiple sites, and allows labs to recruit eligible and interested students. Because our site will contain UROPs from many different departments, students can also apply for interdisciplinary UROPs. The postings on the site are also up-to-date, as old UROP postings are removed. Students also have the option to subscribe to tags so they can easily find UROPs that match their interests. Finding UROPs relevant to a student's interests is a difficult task on other platforms, but tags are used on postings in UROPMatcher so that these UROPs are more visible to students who are interested.

UROPMatcher aims to attract a large enough user base so that we do not add to the problem of becoming another one of the many UROP search platforms available. A future goal for our website is to become MIT sponsored so that we replace the old UROP listings website.

Concepts

Note: By 'staff', we refer to users who are professors or graduate students.

Match:

- Description
  - Pairing between a student and a UROP
- Purpose:
  - Let students see only relevant UROPs
  - Let staff see only qualified students
- Operational principle:
  - If a student is subscribed to UROPs regarding a specific interest, then they will be matched with UROPs within that interest that they qualify for with their skillset.
  - If a staff member posts for a UROP with a certain interest tag, requiring a certain skillset, their UROP posting will be matched with students with that interest and skillset.
- Misfits:
  - If a student makes false claims to their skills, they can be matched with a UROP that they are not eligible for. On the staff side, their lab may end up recruiting students that do not meet requirements for the position.
    - How to Avoid: Mitigate this misfit by incentivizing students to be more honest in their skill claims. They would benefit most from applying to UROPs most relevant to their skills.

Posting:

- Description
  - Represents an open UROP position
- Purpose:
  - Makes an available position visible to students who are looking for UROPs
- Operational Principle:
  - Staff create a posting for an open UROP position, and can add a description, the requirements needed, a deadline, and tags for the categories/disciplines the UROP falls under. They then submit the post to the website so it is visible to matched students.
- Misfits:
  - If a UROP position has been claimed, and the posting has not expired, the staff who made the post may forget to remove the posting on UROPMatcher. As a result, students may end up applying to a UROP that is not available anymore.
    - How to Avoid: Postings are required to state a deadline, any posting available past a deadline will be removed.
    - How to Avoid: Postings available past the credit/volunteer deadline (the last deadline for UROP applications) for that semester will be automatically removed.

Tag:

- Description

    - Represents a category or discipline
- Purpose:
    - Allows students to match with UROPs from a specific category or discipline that lines up with their interests.
    - Allows staff to make the UROP more visible to students who are more interested in a certain area of discipline.
- Operational Principle:
    - When a staff creates a UROP posting, they add tags indicating the category or discipline the UROP falls under. These tags are visible when they make the posting.
    - When a student subscribes to tags that they are interested in (i.e. “machine learning”, “web development”, “big data”, etc.), they will match with UROPs that are tagged with disciplines/categories they subscribed to.
- Misfits
    - If staff want to make their UROP really visible they could add fake tags. Students would end up matching with UROPs they are not interested in.
        - How to Avoid: Add warning note to advise staff to add tags only relevant to their UROP, because having an applicant pool of students who are not interested is not beneficial for the lab.
    - There could be multiple tags for the same discipline (i.e. “ai”, “artificial intelligence”, etc.) so students might not see all the UROPs for the disciplines they are interested in.
        - How to Avoid: Add autocomplete to textbox where users enter tags, so they can see what tags have been already used with UROP postings.

Security

Luckily, UROPMatcher does not present a very attractive target for attackers, since it will not contain any sensitive data like passwords or health information. However, an insecure site would still allow attackers to alter UROP postings or user info, or force other users to run attacker-written code.

Logging in will be handled through MIT certificates, so that even passwords do not need to be stored in the database. By requiring certificates for access to the site, we also manage to prevent most attacks from people not affiliated with MIT, since they would not be able to make any HTTP requests to the site. Unfortunately, this does not prevent CSRF attacks from such non-MIT attackers. We will mitigate such CSRF attacks by limiting user sessions to at most 20 minutes of inactivity, after which the session will time out. (We will make sure to warn users 5 minutes before any session time-out.)

We also intend to handle standard web attacks from MIT users. We will prevent XSS attacks through the use of templates. Thus, any user input data with special characters displayed on the website will be made safe through the use of escape sequences, preventing attacker-written code from being executed in that way. In combination with safe Javascript coding practices,

XSS attacks should be blocked. We will also prevent database injection attacks through the use of Mongoose as a library for interacting with our MongoDB database.

Design Risks

This application places a huge amount of trust on its users to use the site for its intended purpose. Placing any amount of trust in users always carries risk. We have identified a few key areas of risk and have planned to address those risks.

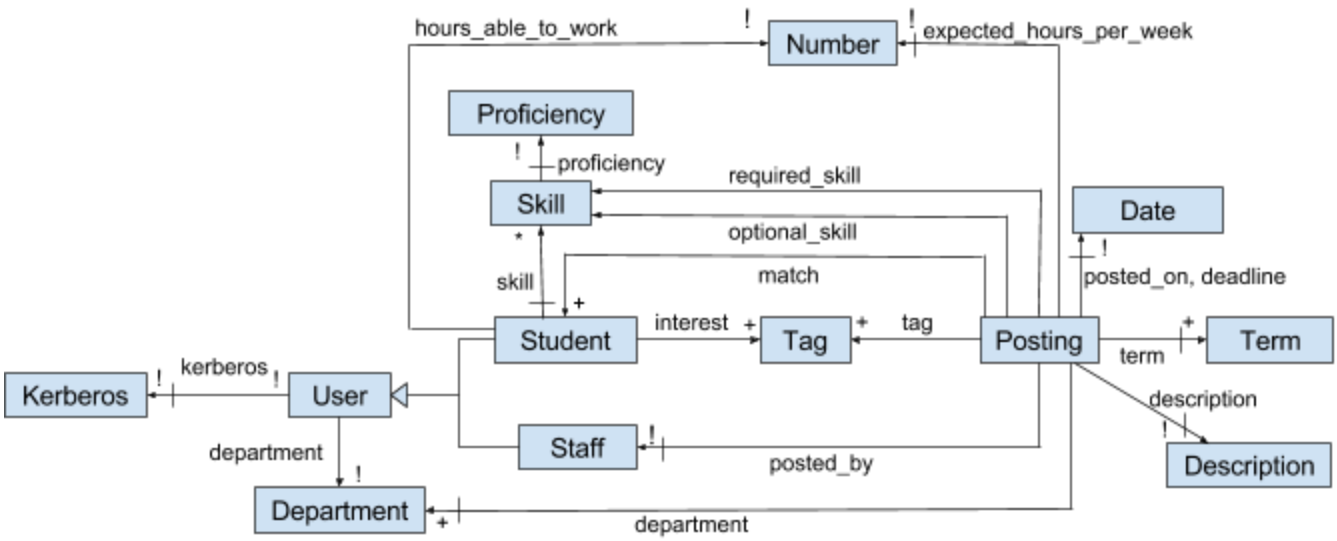
One, users may make fake UROP postings. To prevent most such posts, UROPMatcher will only allow professors and graduate students to make UROP postings, rather than allowing any student to do so.

Also, users may make false claims of skills or expertise. This is an issue anywhere regarding job applications, and remains an unsolved problem. The MIT students are incentivized to be honest in order to get matches relevant to them, so we do expect such cases to be outliers. In addition, a match only opens up the avenue of contact between a professor and student. The two must still go through the steps to meet and discuss the potential UROP before it becomes a reality.

The professors and graduate students also may forget to update their UROP postings once they have found students to work in their lab. To deal with this issue of information not being up-to-date, our application requires posters to specify a deadline to apply for the UROP, after which date the UROP posting will be hidden from student view. The deadline must fall before the final UROP application deadline for the semester.

There is also an additional risk of adding to the problem of having too many different UROP sites. If UROPMatcher does not achieve a large enough user base, it will end up becoming yet another unreliable place to possibly check for UROPs. In order to solve this issue, our application not only has to effectively address all the issues with the other UROP sites, but also become the official primary source of UROPs. Upon the completion of our application, we intend to contact the organizers of the current official MIT UROP site in order to replace their current mode of UROP advertisements with a link to UROPMatcher.

Data Model



- Textual Constraints
    - A match is only established when a student's interests match the posting's tags and the student has the required skills.

- Explanations
    - Department is information extracted from a user's certificate. Staff can be a professor, research scientist or graduate student who is looking for undergraduate students to work with.
    - Proficiency of a skill is self-indicated by a student.
    - Tag represents a discipline - a student can use tags to indicate the disciplines they are interested in and a staff can use tags to indicate the disciplines the posting is related to.
    - A posting can be related to as many departments as applicable (e.g. 6-3 and CMS, 14 and 18).

- Insights
    - We need an efficient and fair way to let students determine the proficiency of their skills, which we tried to express in our wireframe.
    - We allowed a posting to have optional and required skills because sometimes UROP mentors are willing to teach optional skills and other times, they are not willing to supervise much.

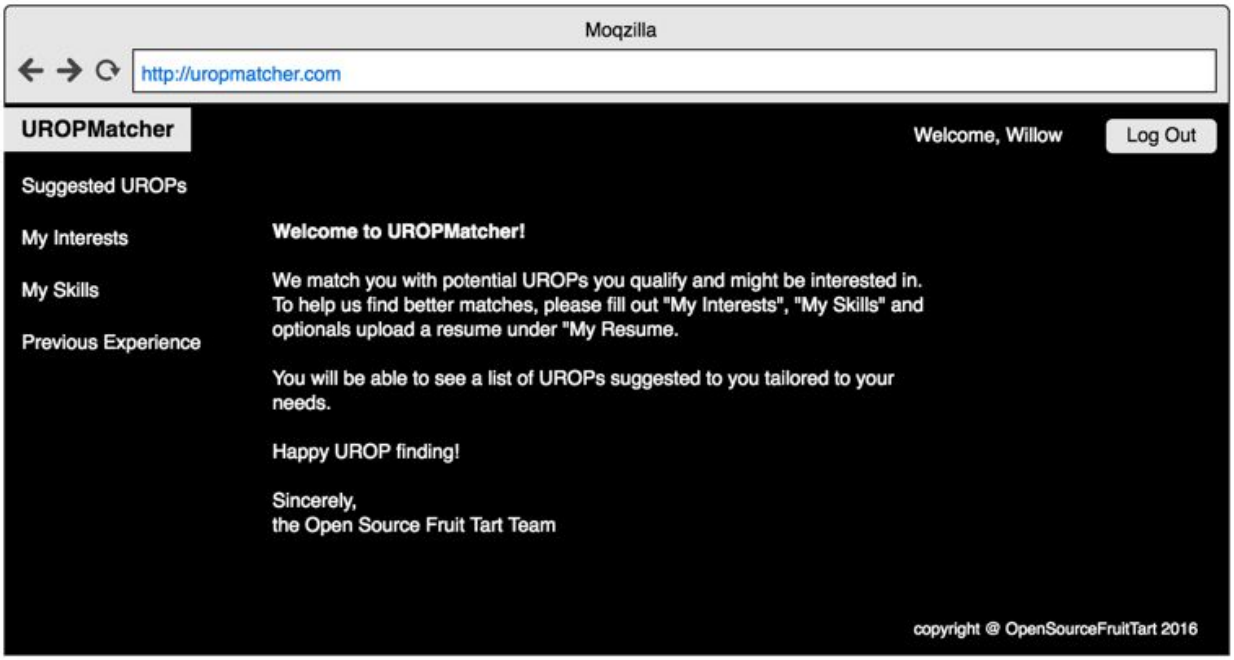
- Schema
  var studentSchema = new Schema({
    kerberos: { type: String, required: true },
    department: { type: String, required: true },
    interests: { type: [String], required: true },
    skills: { type: [Schema.Types.ObjectId, ref: 'Skill'], required: true },

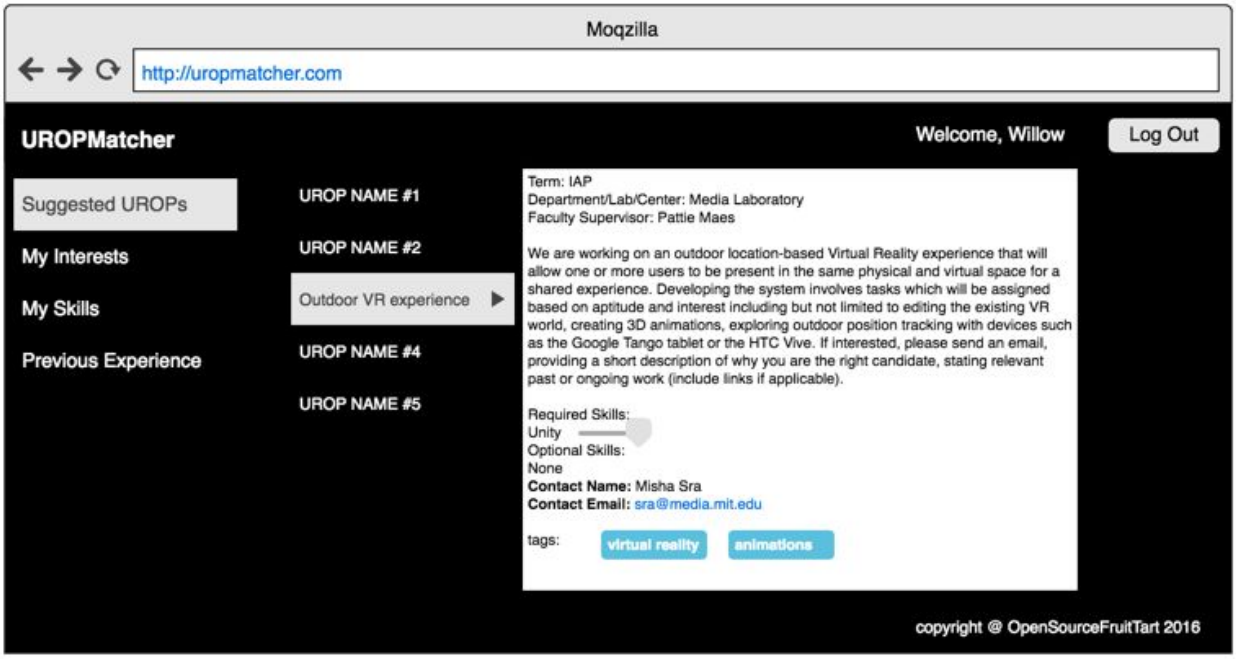
```
        hours_able_to_work: { type: Integer, required: true }
});

var staffSchema = new Schema({
        kerberos: { type: String, required: true },
        department: { type: String, required: true }
});

var skillSchema = new Schema({
        name:  { type: String, required: true },
        proficiency: { type: Integer, required: true }
});

var postingSchema = new Schema({
        posted_by: { type: Date, default: Date.now },
        description: { type: String, required: true },
        tags: { type: [String], required: true },
        deadline: { type: Date, required: true },
        term: { type: [String], required: true },
        expected_hours_per_week: { type: Integer, required: true }
});
```

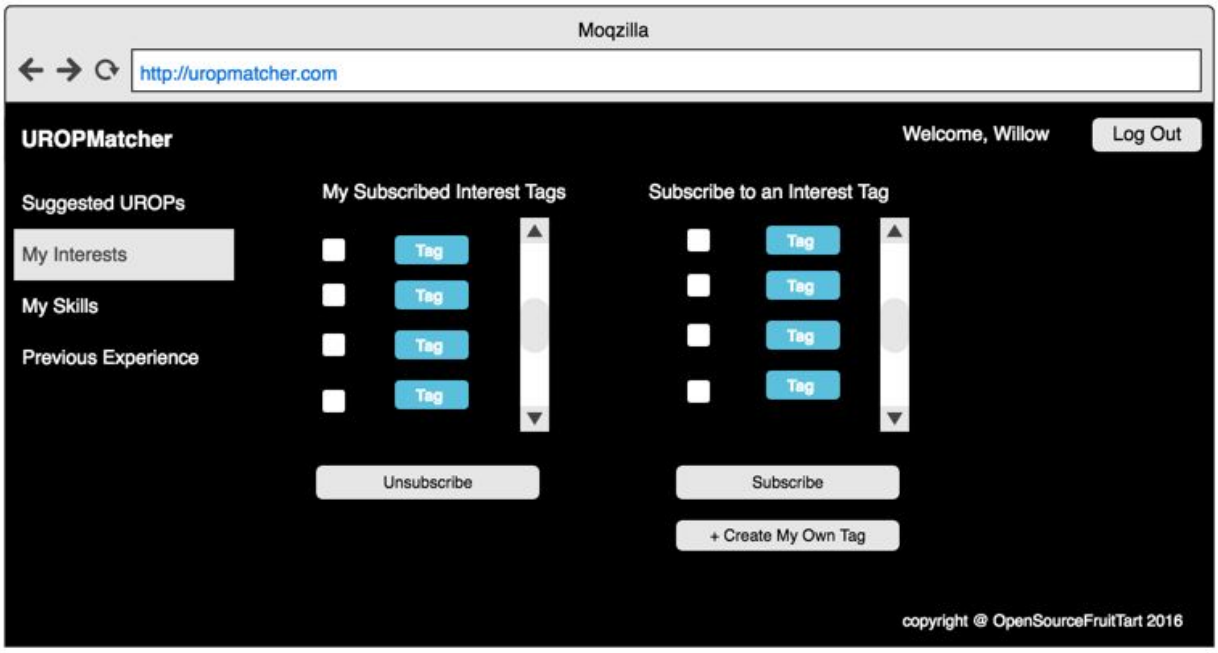
Wireframes

You can also find our wireframes at this link: https://app.moqups.com/wjarvis/C8h3kSHb01/view. You can see specific comments by clicking the numbers in the UI mockups.
Screenshots are also included below in case the above link doesn't work.

Student Views:






Moqzilla
http://uropmatcher.com
UROPMatcher
Welcome, Willow
Log Out
Suggested UROPs
My Interests
My Skills
Previous Experience
My Subscribed Interest Tags
Subscribe to an Interest Tag
Tag
Unsubscribe
Subscribe
+ Create My Own Tag
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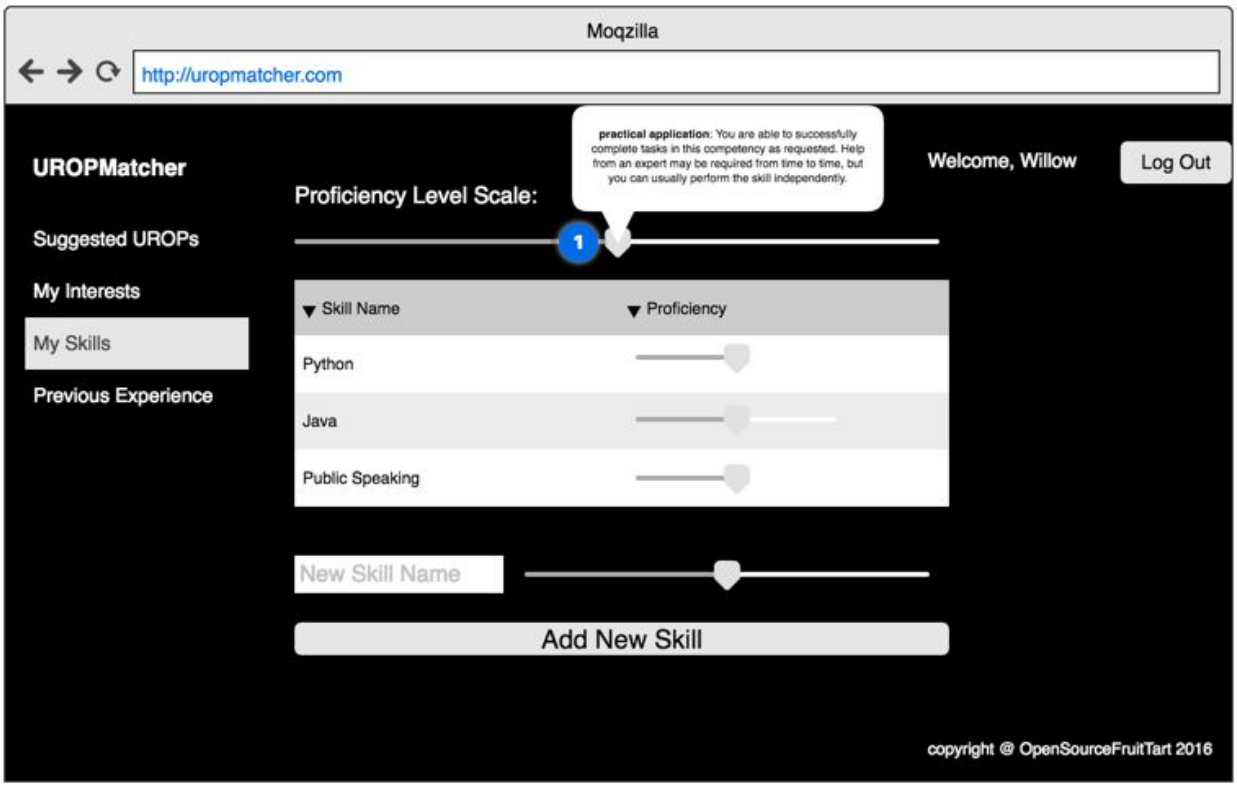
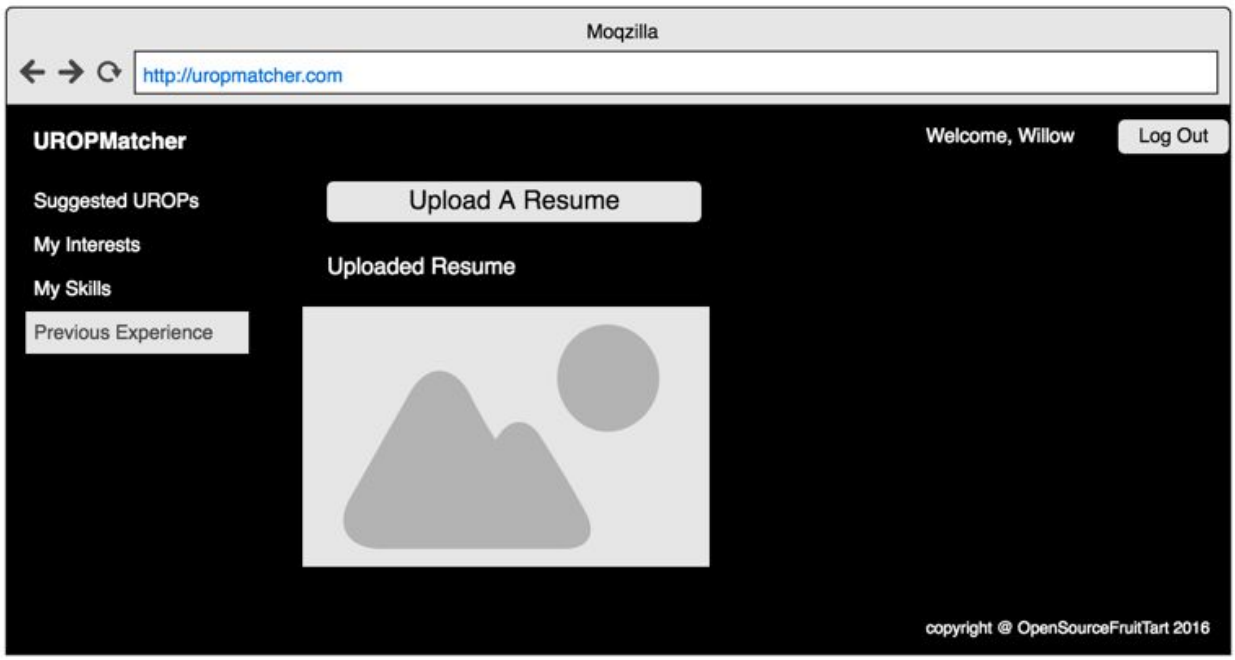
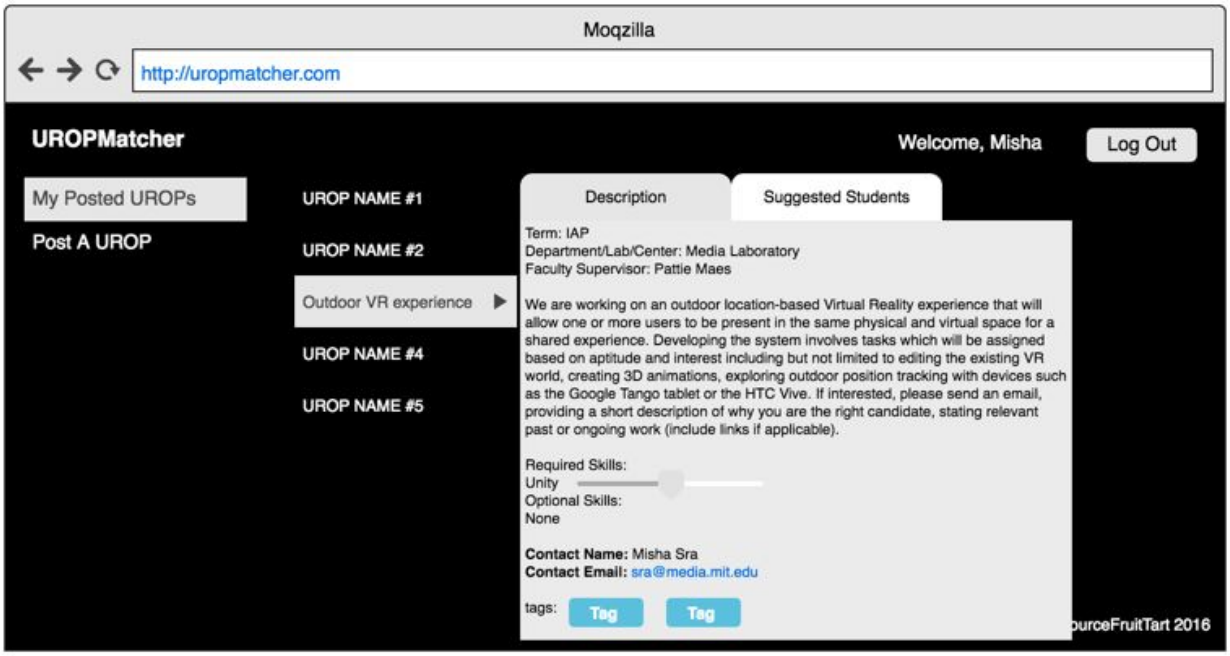

Moqzilla
http://uropmatcher.com
UROPMatcher
Welcome, Willow
Log Out
practical application: You are able to successfully complete tasks in this competency as requested. Help from an expert may be required from time to time, but you can usually perform the skill independently.
Proficiency Level Scale:
1
Suggested UROPs
My Interests
My Skills
Previous Experience
Skill Name
Proficiency
Python
Java
Public Speaking
New Skill Name
Add New Skill
copyright @ OpenSourceFruitTart 2016


Moqzilla
http://uropmatcher.com
UROPMatcher
Welcome, Willow
Log Out
Suggested UROPs
My Interests
My Skills
Previous Experience
Upload A Resume
Uploaded Resume
copyright @ OpenSourceFruitTart 2016

Staff Views:


Moqzilla
http://uropmatcher.com
UROPMatcher
Welcome, Misha
Log Out
My Posted UROPs
Post A UROP
UROP NAME #1
UROP NAME #2
Outdoor VR experience
UROP NAME #4
UROP NAME #5
Description
Suggested Students
Term: IAP
Department/Lab/Center: Media Laboratory
Faculty Supervisor: Pattie Maes
We are working on an outdoor location-based Virtual Reality experience that will allow one or more users to be present in the same physical and virtual space for a shared experience. Developing the system involves tasks which will be assigned based on aptitude and interest including but not limited to editing the existing VR world, creating 3D animations, exploring outdoor position tracking with devices such as the Google Tango tablet or the HTC Vive. If interested, please send an email, providing a short description of why you are the right candidate, stating relevant past or ongoing work (include links if applicable).
Required Skills:
Unity
Optional Skills:
None
Contact Name: Misha Sra
Contact Email: sra@media.mit.edu
tags:
Tag
Tag
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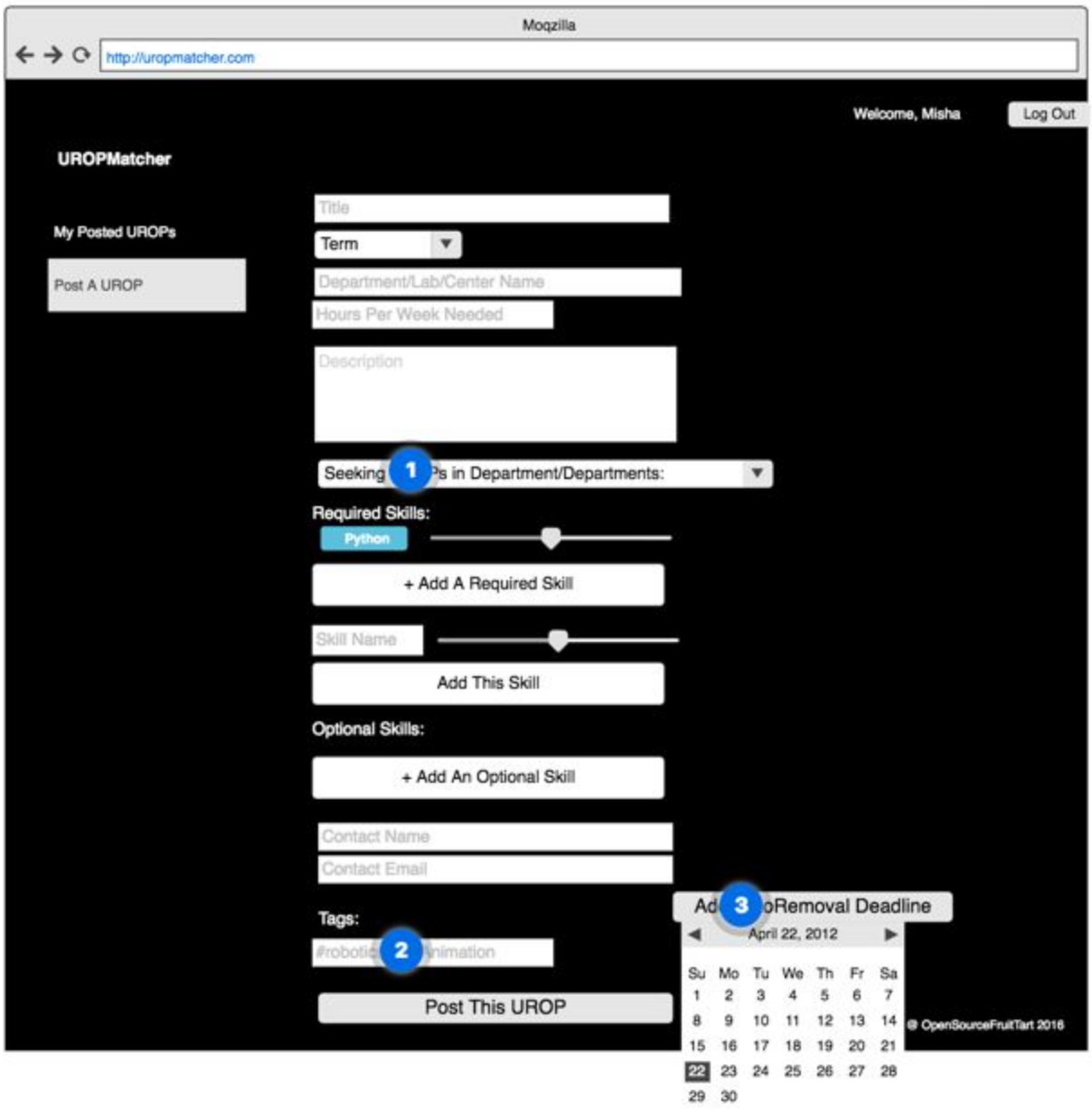

Conclusion

UROPMatcher addresses all of the key issues identified with current ways to find UROPs. Students no longer have to manually search through many irrelevant or outdated postings in order to possibly find one of interest. In addition, they will more easily be able to identify labs within their interest with openings that they qualify for, instead of fruitlessly sending out a large amount of emails to different labs. Professors no longer have to go through the hassle of identifying which UROP sites or email lists would bring them the most success with their target groups. Instead, we ease the process of connection between students and professors by

matching based on key factors, limiting misfits and security risks along the way. Our design will be the new portal for finding and recruiting for UROPs.