

**2017-2018 Spring
CS 353 Database Systems**

**BilinkedIn
Project Final Report**

GROUP 40:

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Available at: <https://github.com/dsipahioglu/bilinkedin>

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1. Project Description

BilinkedIn is a web platform where people in need of everyday services such as cleaning, handiwork, event organization and transportation can put up announcements and get offers from professionals providing these services. The customer can choose a suitable offer among those given by the professionals. When the job is complete, the customer can comment on the job quality, and give the professional a rating.

The platform accommodates two types of users: Professional users and customers. Professional users are providers of service in different fields, and customers are users who are offering jobs to professional users. Every professional user is related to at least one field of service.

To post an announcement, the customers choose a work field and give a detailed job description. After an announcement is posted by a customer, the professionals in the related field can see the announcements matching their area of expertise, and can make an offer to these announcements, at the cost of a fixed price.

The customer is able to see all the applications made by the professionals, can receive and send messages related to the offer. When an offer is chosen by the customer, the price of the offer is subtracted from the customer's balance and put on hold until the job is complete and approved by both sides.

Other than the feeds of the customers, there is a feed where all offers related to a field can be seen, which is visible to both the customers and the professionals.

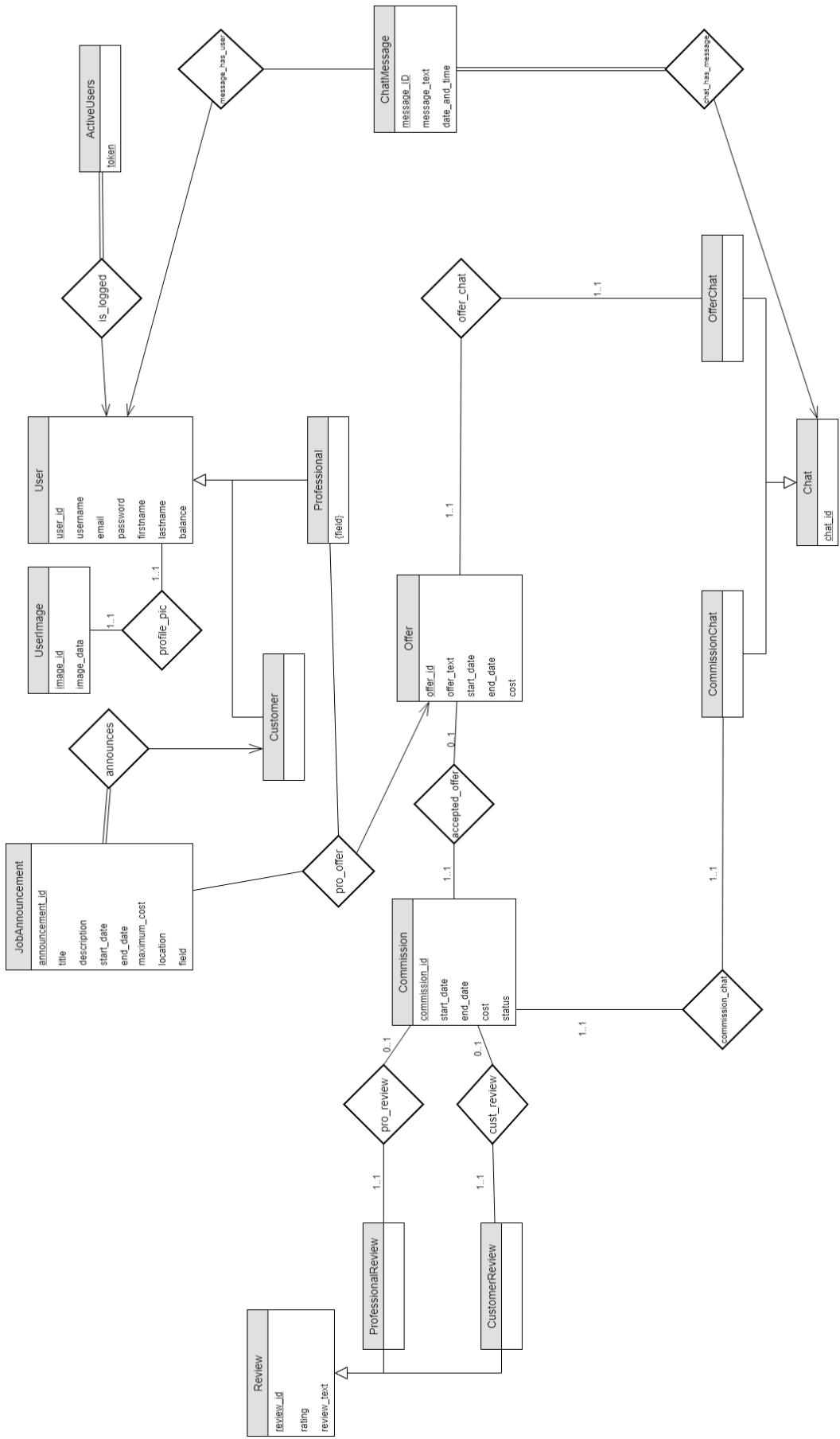
Mehmet Enes Keleş: Helped designing the E/R diagram. Wrote SQL queries in the design report including views and triggers. Wrote SQL queries and server endpoints (backend) during the implementation.

Deniz Ulusel: Helped designing the E/R diagram. Designed mockups. Implemented the graphical user interface and the frontend using Vue.js.

Ata Gün Öğün: Designed the E/R diagram and relational schemas.
Helped writing the SQL queries during the implementation. Helped writing some of the functions in db_interface.py module.
Introduced the concept of “toy tables”(pseudo tables, wrapper views) to use INSTEAD OF triggers.

Deniz Sipahioğlu: Helped writing reports. Designed mock-ups.
Helped with the design of the graphical user interface and the frontend using Vue.js.

2. Final E/R Model



3. Final List of Tables

3.1. User

Relational Model:
User(user_id)

Note: Despite the presence of disjoint generalisation, we included a User table since all user types participate in “message_has_user”, “profile_pic” and “is_logged” relations. The book Database System Concepts (Silberschatz, Korth and Sudarshan, 2011) says that ,in this specific case, a relation schema User should be created, containing at least the primary-key attributes of the User entity in the ER table(Pages 303,304). Since we have disjoint generalisation, there is no downside or upside of not including the common attributes in the User table.

PK: user_id

3.2. Customer

Relational Model:
Customer(user_id, username, password, email, firstname, lastname, balance)

PK: user_id
FK: user_id **references** User

3.3. Professional

Relational Model:
Professional(user_id, username, password, email, firstname, lastname, balance)

PK: user_id
FK: user_id **references** User

3.3.1. ProfessionalField

Relational Model:
ProfessionalField(user_id, field)

PK: user_id, field
FK: user_id **references** Professional

3.4. JobAnnouncement

Relational Model:

```
JobAnnouncement(announcement_id, user_id, title,  
description, start_date, end_date, maximum_cost, location,  
field)
```

PK: announcement_id

FK: user_id references Customer

3.5. Offer

Relational Model:

```
Offer(offered_id, chat_id, offer_text, start_date, end_date,  
cost)
```

PK: offered_id

FK: chat_id references OfferChat

3.5.1. pro_offer

Relational Model:

```
pro_offer(offered_id, user_id, announcement_id)
```

PK: user_id, announcement_id

FK: offered_id references Offer,
user_id references Professional,
announcement_id references JobAnnouncement

3.6. Commission

Relational Model:

```
Commission(commission_id, offered_id, chat_id, start_date,  
end_date, cost, status)
```

PK: commission_id

FK: offered_id references Offer,
chat_id references CommissionChat

3.7. ProfessionalReview

Relational Model:

```
ProfessionalReview(review_id, commission_id, rating,  
review_text)
```

PK: review_id

FK: commission_id references Commission

3.8. CustomerReview

Relational Model:
CustomerReview(review_id, commission_id, rating,
review_text)

PK: review_id
FK: commission_id **references** Commission

3.9. Chat

Relational Model:
Chat(chat_id)

PK: chat_id

3.10. CommissionChat

Relational Model:
CommissionChat(chat_id)

PK: chat_id
FK: chat_id **references** Chat

3.11. OfferChat

Relational Model:
OfferChat(chat_id)

PK: chat_id
FK: chat_id **references** Chat

3.12. ChatMessage

Relational Model:
ChatMessage(message_id, chat_id, user_id, message_text,
date_and_time)

PK: message_id
FK: chat_id **references** Chat,
user_id **references** User

3.13. ActiveUsers

Relational Model:
ActiveUsers(token, user_id)

PK: token
FK: user_id **references** User

3.14. UserImage

Relational Model:

ActiveUsers(token, user_id)

PK: token

FK: user_id **references** User

4. Implementation Details

We implemented our database system with Sqlite3. Each member used a different setup for their workspace, all the tools we used are as follows: PyCharm 2018.1, WebStorm 2018.1, Postman API development environment, Git, Chrome 66, Notepad++.

The back-end is implemented using Python with Flask framework to allow communication between our Sqlite database and our front-end. We used Pysqlite (Python DB-API module for SQLite 3) for connecting and executing SQL queries.

We used the GUI framework Vue.js to build the front-end of the project. The front-end communicates with the REST API endpoints using HTTP requests and renders the data on the screen using bootstrap components after post-processing. Our server executes SQL queries with accordance to the HTTP requests received, and sends appropriate info/response code to the sender of the request.

Some other libraries we used include: Vue.js, Bootstrap Vue, Vue Session, Vue Router, Vue Resource.

We used chrome for testing our project.

Some problems we faced:

Some of us were using python2.7 and some of us were using python3.6 and we had a hard time deciding which one to use and just hoped it would work on both versions. We finally decided to use python3 because of the secrets module that's on python3. We argued a lot about how the database interface should be like. We had struggles setting up a development environment for front-end. We had to learn new tools to use and we faced many nuisances, tiny little details which costed us hours to fix. We depended on 3rd party components for the front-end and it was hard to find components that fit our purposes.

Design Changes:

- Ticket feature later became a burden therefore we needed to remove everything related.
- customer_tickets, professional_tickets views are removed.
- Ticket, ticket_chat, TicketChat, CustomerSupport tables are removed.

5. Advanced Database Components

5.1. Secondary Indices

5.1.1. Announcement Start Date

The user will quite frequently filter announcements by start date in order to see the latest ones therefore we added JobAnnouncement table's start_date attribute as a secondary index.

5.1.2. Offer Start Date

Most of the time the customer will filter the offers coming to their announcements in terms of start date therefore we added Offer table's start_date attribute as a secondary index.

5.1.3. Commission Start Date

To filter the latest on-going commissions, this index is used.

5.2. Advanced Features

We had to create many views which acted as middleman for us to take advantage of the INSTEAD OF trigger. The INSTEAD OF trigger only works for views (not tables), so we had to create "wrapper" views which basically contained all the attributes of a table. We called those "toy" tables; this made inserting new entries to tables which have disjoint generalization way easier. For example, when we want to add a new entry to the Customer table, an insertion to the User table should be made first to get a unique, auto-incremented user_id. It is only then possible to make an insertion to the Customer table(using the user_id that is created from the insertion to the User table). Instead of going through all that hassle, we just try inserting an entry to toyCustomer and the INSTEAD OF trigger takes care of actually inserting stuff to User and Customer tables. This makes inserting (and deleting) stuff way easier.

5.2.1. View

SQL queries of all views are included in the CODE section.

5.2.1.1. Professional Commissions View

This view has two attributes: user_id and commission_id. The user_id attribute denotes the

`user_id` of a Professional and the `commission_id` denotes the `commission_id` which is related to a professional.

5.2.1.2. Customer Commissions View

This view has two attributes: `user_id` and `commission_id`. The `user_id` attribute denotes the `user_id` of a Customer and the `commission_id` denotes a commission which is related to a customer.

5.2.1.3. Professional Average Ratings View

This view has two attributes: `user_id` and `avg_rating`. The `user_id` attribute denotes the `user_id` of a Professional and the `avg_rating` attribute denotes the average rating received by the professional.

5.2.1.4. Customer Average Ratings View

This view has two attributes: `user_id` and `avg_rating`. The `user_id` attribute denotes the `user_id` of a Customer and the `avg_rating` attribute denotes the average rating received by the customer.

5.2.1.5. Professional Reviews View

This view has two attributes: `user_id` and `review_id`. The `user_id` attribute denotes the `user_id` of a Professional and the `review_id` denotes a review received by that professional.

5.2.1.6. Customer Reviews View

This view has two attributes: `user_id` and `review_id`. The `user_id` attribute denotes the `user_id` of a Customer and the `review_id` denotes a review received by that customer.

5.2.1.7. “Toy Table” Views

These views are wrappers for tables that have disjoint generalization properties. These views allow us to use INSTEAD OF triggers for hierarchical entry insertion (INSTEAD OF triggers are only for views in sqlite). The details are discussed in more detail in “5.2.2. Triggers”.

Here is the list of the names of all the “toy table” views: oyuncakProfessional, oyuncakCustomer, oyuncakCommission, oyuncakOffer.

5.2.2. Triggers

The triggers we have ensure the integrity of the disjoint generalization hierarchy. Other than ensuring the integrity of the hierarchy, it makes inserting/deleting easier, as discussed in section 5.2. Some triggers we have are not related to hierarch at all and they are there for the ease of insertion to relation tables.

SQL queries for all the triggers we have are included in the CODE section.

5.2.2.1. add_commission Trigger

This trigger is an INSTEAD OF trigger which triggers when an insertion is made on oyuncakComission. It takes care of the creation insertion new of Chat,CommissionChat,Comission entries in their respective tables. This allows easy and insertion.

5.2.2.2. add_offer Trigger

This trigger is an INSTEAD OF trigger which triggers when an insertion is made on oyuncakOffer. It takes care of the creation insertion of new Chat,OfferChat,Offer,pro_offer entries in their respective tables. This allows easy and insertion.

5.2.2.3. add_professional Trigger

This trigger is an INSTEAD OF trigger which triggers when an insertion is made on oyuncakProfessional. It takes care of the actual insertion to the User and Professional tables. The assignment of user_id's to professionals is consistent thanks to this trigger. This trigger ensures the integrity of the disjoint generalization hierarchy that is shown in the ER diagram.

5.2.2.4. add_customer Trigger

This trigger is an INSTEAD OF trigger which triggers when an insertion is made on oyuncakCustomer. It takes care of the actual insertion to the User and Customer tables. The assignment of user_id's to

customers is consistent thanks to this trigger. This trigger ensures the integrity of the disjoint generalization hierarchy that is shown in the ER diagram.

5.3. Reports

All codes are included in the CODE section.

5.3.1. Commission Costs

This report gives the average, maximum and minimum of costs of on-going and completed commission that are published every month.

5.3.2. Popular Fields

This report gives the number of announcements published per field every month.

5.3.3. Offer Durations

This report tells the average duration of offers every month.

5.4. Constraints

There are lots of constraints in the table creations. All these constraints can be seen in the CODE section, in the init_db.py file. They are not rewritten here to avoid repetition.

6. User Manual

6.1. Login Screen

Welcome to BilinkedIn

Welcome to BilinkedIn

E-mail

Password

Customer Professional Login

Register ▾

This screenshot shows the initial state of the BilinkedIn login interface. It features a header "Welcome to BilinkedIn", two input fields for "E-mail" and "Password", and three buttons: "Customer", "Professional", and a green "Login" button. Below these is a "Register" button with a dropdown arrow.

Welcome to BilinkedIn

E-mail

Password

Customer Professional Login

Register ▾

as Customer
as Professional

This screenshot shows the "Register" dropdown menu open. It contains two options: "as Customer" and "as Professional". The "as Customer" option is highlighted with a blue border.

This is the Login screen of BilinkedIn. Here, the user can Login as a Customer/Professional, or register as a Customer/Professional. In order to log in, the user needs to have an account and select the type of the account correctly.

6.2. Register as Customer

The screenshot shows a registration form titled "Register as Customer". At the top left, there is a message "Welcome to BilinkedIn". The main form has five input fields: "Username:", "Password:", "First Name:", "Last Name:", and "E-mail:". Below these fields are two buttons: a green "Register" button and a white "Back" button.

Username:	<input type="text"/>
Password:	<input type="password"/>
First Name:	<input type="text"/>
Last Name:	<input type="text"/>
E-mail:	<input type="text"/>

Register **Back**

If the user chooses to register as a customer, he needs to create a password and a unique username, and enter his name, last name and e-mail address to the register screen. He will be redirected to his profile after logging in, and will be able to edit his information later on, from the profile screen.

6.3. Register as Professional

Welcome to BilinkedIn

Register as Professional

Username:

Password:

First Name:

Last Name:

E-mail:

Fields:

Welcome to BilinkedIn

Register as Professional

Username:

Password:

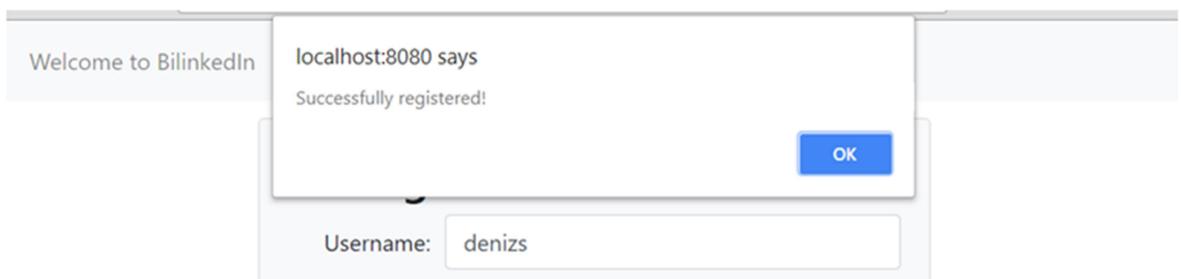
First Name:

Last Name:

E-mail:

Fields:

Graphic Design
 Writing & Translation
 Video & Animation
 Programming & Tech
 Consultancy
 Music
 Cleaning
 Cooking

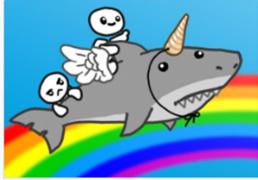


If the user chooses to register as a professional, he needs to create a password and a unique username, and enter his name; last name and e-mail address, and select the fields he is skilled in, on the register screen. He will be redirected to his profile after logging in, and will be able to edit his information later on, from the profile screen. After registering, if the account is created successfully, the user will be notified as shown in the figure above.

6.4. Professional Profile - Self View

Welcome to BilinkedIn, professional denizs

Profile Offers Made Commissions Jobs for You Logout



Professional

★★★★★

Balance: \$0

Deniz Sipahioğlu

denizs
deniz@sipahioglu.org

Fields:

- Music
- Programming & Tech
- Writing & Translation

Add Balance Edit Profile

Welcome to BilinkedIn, professional denizs

Profile Offers Made Commissions Jobs for You Logout



Professional

★★★★★

Balance: \$0

Deniz Sipahioğlu

denizs
deniz@sipahioglu.org

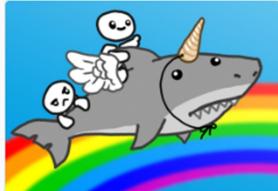
Change profile picture

Music Programming & Tech Writing & Translation

After logging in, the professional will be redirected to his profile. Here, he will be able to see the Offers Made, Commissions, Jobs for You, Add Balance, Edit Profile, and Logout. The professional can see the reviews that the customers made to them, which is shown in part 6.5. Customer Profile - Self View.

6.5. Customer Profile - Self View

Welcome to BilinkedIn, customer atagunz Profile My Announcements View Offers Commissions Logout



Ata Öğün

atagunz

atagun@gmail.com

Change profile picture Browse

Customer

★★★★★

Balance: \$0

Discard Save

Reviews by Professionals:



Camsilen

★★★★★

Hard customer to work with. He is a really bad communicator and keeps changing the requirements of the job.

★★★★★

After logging in, the customer will be redirected to his profile. Here, he will be able to access the My Announcements, View Offers, Commissions, Publish Job, Add Balance, Edit Profile, and Logout pages. Editing is same as the professional profile edit. Also, the customer can see the reviews that he got from the professionals upon completion of a job.

6.6. Deposit Screen

The screenshot shows a modal window titled "Add Balance". The window contains five input fields: "Card Holder's Name:", "Card Number:", "Verification Number:", "Expiry Date:", and "Balance to Add: \$". Below the input fields are two buttons: "Add" (green) and "Cancel" (white). At the top of the window, there is a header bar with the text "Welcome to BilinkedIn, professional denizs" and navigation links: Profile, Offers Made, Commissions, Jobs for You, and Logout.

Welcome to BilinkedIn, professional denizs

Profile Offers Made Commissions Jobs for You Logout

Add Balance

Card Holder's Name:

Card Number:

Verification Number:

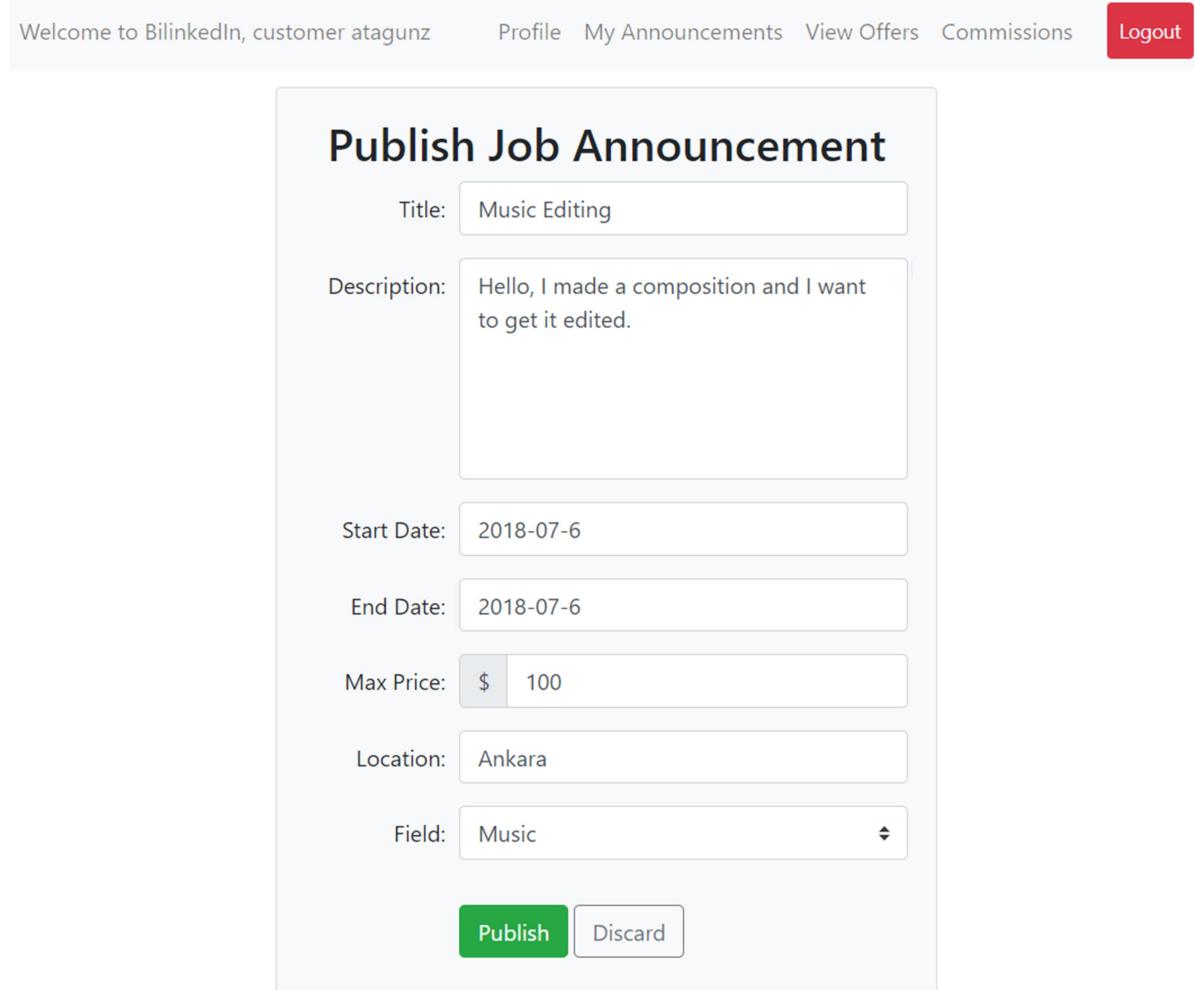
Expiry Date:

Balance to Add: \$

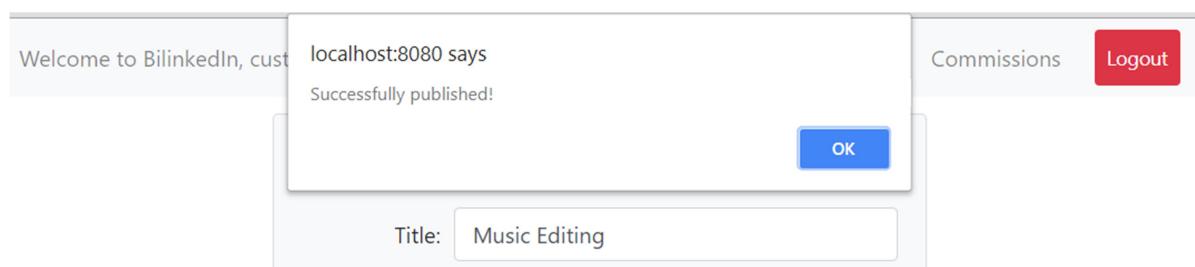
Add Cancel

Both the customer and professional can add balance to their accounts using the Add Balance page. Here, the user will enter the Card Holder's Name, Card Number, Verification Number, Expiry Date and the amount of Balance to Add in order to Add Balance. The balance is used for money transactions between the customers and professionals.

6.7. Customer Publish Job Announcement Screen



The screenshot shows the 'Publish Job Announcement' form. At the top, there is a navigation bar with links: 'Welcome to BilinkedIn, customer atagunz', 'Profile', 'My Announcements', 'View Offers', 'Commissions', and a red 'Logout' button. The main form has fields for 'Title' (Music Editing), 'Description' (Hello, I made a composition and I want to get it edited.), 'Start Date' (2018-07-6), 'End Date' (2018-07-6), 'Max Price' (\$ 100), 'Location' (Ankara), and 'Field' (Music). Below the form are two buttons: a green 'Publish' button and a white 'Discard' button.



The customer can publish Job Announcements using the Publish Job button in his profile. Here, he needs to enter the Job Title, Description, Start and End dates, Maximum Price, Location and the field of the job. After entering the necessary information, the Announcement can be published or discarded. After publishing, if the announcement is published successfully, the user will be notified.

6.8. Available Jobs Screen

Welcome to BilinkedIn, professional denizs

Profile Offers Made Commissions Jobs for You Logout

Jobs for You

Music Editing

Description: I made a composition and I need to get it edited.

Earliest start date: 2018-06-07

Latest end date: 2018-06-07

Max price: \$100

Location: Ankara

Field: Music

Announced by:


atagunz



[Make offer](#)

The professional can see offers made by the customers that are included the fields that the professional is experienced in. Here, the professional can see the rating of the customer that posts the announcement and make an offer.

6.9. Professional Make Offer Screen



Making offer for:

Music Editing

Description: I made a composition and I need to get it edited.

Earliest start date: 2018-06-07

Latest end date: 2018-06-07

Max price: \$100

Location: Ankara

Field: Music

Announced by:



atagunz



Offer description:

Hello! I am experienced in editing. I can start in the given time and \$100 is fine for me.

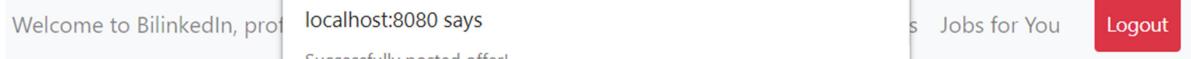
Start Date: 2018-06-07

End Date: 2018-06-07

Price: \$ 100

Discard

Make offer



Making

localhost:8080 says

Successfully posted offer!

OK

Here, the professional can make an offer to a job announcement. He can enter the offer description, start and end dates and the price that he wants to work for, and make the offer. If the offer is successful, the user is notified.

6.10. Customer View Offers Screen

Welcome to BilinkedIn, customer atagunz Profile My Announcements View Offers Commissions Logout

Offers for: Music Editing

Offer: Hello! I am experienced in editing. I can start in the given time and \$100 is fine for me.

Start date: 2018-07-06

End date: 2018-07-06

Price: \$100

Offer by:



dsipahi



Chat

Accept

Dismiss

Welcome to BilinkedIn, customer atagunz Profile My Announcements View Offers Commissions Logout

Music Editing

Start date: 2018-07-06

End date: 2018-07-06

Price: \$100

Location: Ankara

Offer by:



dsipahi



Chat

See Details

Here, the customer can see the offers made by the professionals, and accept or decline them. The customer can see the offer details of the job announcement, and the rating of the professional. He can also chat with the professional.

6.11. Professional View Offers

Welcome to BilinkedIn, professional dsipahi Profile Offers Made Commissions Jobs for You Logout

Your offers for: Music Editing

Offer: Hello! I am experienced in editing. I can start in the given time and \$100 is fine for me.

Start date: 2018-07-06

End date: 2018-07-06

Price: \$100

Offer by:

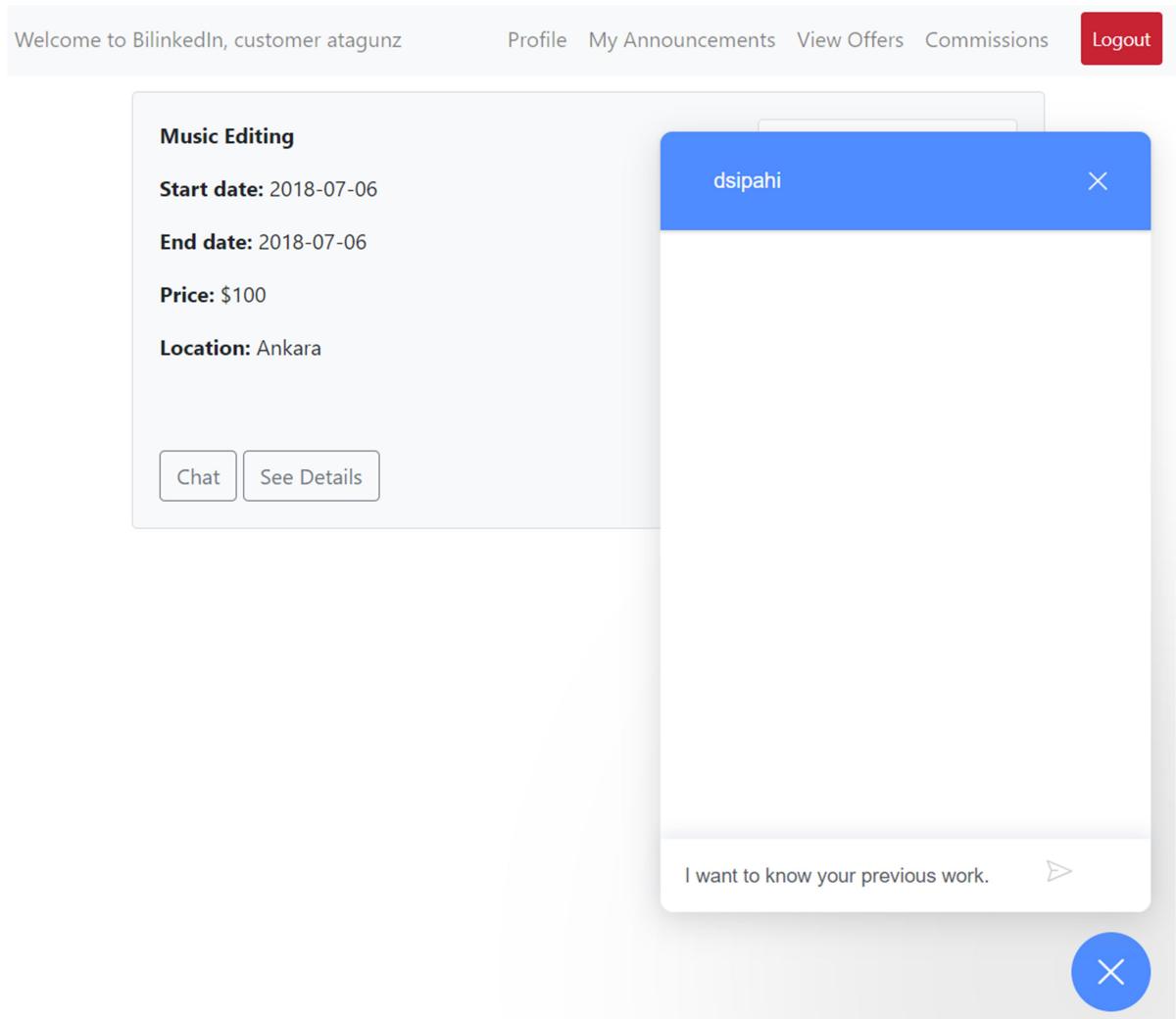

atagunz

★★★☆☆

Chat **Retract**

The professional is able to see the offers he made to the job announcements. He can retract if he wants to, or chat with the customer about the job.

6.12. Customer Offer Chat Screen



The customer can start a chat with the professional regarding the offer that the professional made.

6.13. Professional Offer Chat Screen

The professional can start a chat with the customer regarding the job announcement the customer made, and the offer that the professional made. The UI is same with 6.12. Customer Offer Chat Screen.

6.14. Professional Ongoing Commissions Screen

The screenshot shows a professional's dashboard with a specific job listing. At the top, there's a navigation bar with 'Welcome to BilinkedIn, professional dsipahi' and links for Profile, Offers Made, Commissions, Jobs for You, and Logout. The main content area displays a job offer for 'Music Editing'. The offer details are as follows:

- Status:** active
- Start date:** 2018-07-06
- End date:** 2018-07-06
- Price:** \$100
- Location:** Ankara

To the right of the details is a box labeled 'Offer by:' containing a small image of a kitten and the username 'atagunz'. Below this is a rating section with four blue stars.

At the bottom of the card are two buttons: 'Chat' and 'See Details'.

After the customer accepts the offer that the professional made, the professional can see the On-going Commissions from the Commissions tab. Here, the professional can start a chat or see the details of the job.

6.15. Customer On-going Commissions Screen

After the customer accepts the offer that the professional made, the customer can see the On-going Commissions from the Commissions tab. The UI is same with the 6.14. Professional On-going Commissions Screen.

6.16. Customer Commission Details Screen

Welcome to BilinkedIn, customer atagunz Profile My Announcements View Offers Commissions [Logout](#)

Music Editing

Status: active

Start date: 2018-07-06

End date: 2018-07-06

Price: \$100

Location: Ankara

Offer by:



dsipahi



[Chat](#) [See Details](#)

Start date: 2018-05-01

End date: 2018-06-01

Cost: \$50

Location: Ankara

Offer Text: I am great at editing. I am a wizard. Trust me.

The customer can see the offer details that the professional has made from the See Details button.

6.17. Professional Commission Details Screen

Welcome to BilinkedIn, professional dsipahi Profile Offers Made Commissions Jobs for You Logout

Music Editing

Status: active

Start date: 2018-07-06

End date: 2018-07-06

Price: \$100

Location: Ankara

Offer by:


atagunz



[Chat](#) [See Details](#)

Start date: 2018-05-01

End date: 2018-06-01

Cost: \$50

Location: Ankara

Offer Text: I am great at editing. I am a wizard. Trust me.

The professional can see the details of the commission from the See Details button. This view is very similar to the 6.17. Customer Commission Details Screen view.

6.18. Rate and Review Screen – Customer View

Welcome to BilinkedIn, customer Ali

Profile My Announcements View Offers Commissions Logout

Window Cleaning Job

Status: Complete

Start date: 2018-05-14

End date: 2018-05-18

Price: \$200

Location: Düzce

Offer by:


Camsilen

★★★★★

Chat See Details

Rate and review:

Great windows cleaning! I appreciate the work!

Post Review

After a job is completed, the customer can review the work that the professional did by rating the work, and leaving a review.

6.19. Rate and Review Screen – Professional View

After a job is completed, the professional can review the customer regarding his attitude, payment etc. by rating the customer and leaving a review. The UI is similar to 6.18. Rate and Review Screen – Customer View.

6.20. Job Search Result Screen

Welcome to BilinkedIn, professional dsipahi

Profile Offers Made Commissions Jobs for You Logout

Jobs for You

Search jobs Music **Search**

Showing job results for "Music":

Music Editing

Description: HELP! Edit my music.

Earliest start date: 2018-07-06

Latest end date: 2018-07-06

Max price: \$100

Location: Ankara

Field: Music

Announced by: 

atagunz

★★★☆☆

Make offer

The professionals can search for jobs that are in their fields by entering the keywords they want to in the “Search jobs” search bar.

6.21. Console Outputs of Reports

```
ulkud4s@ulkud4s:~/PycharmProjects/bilinkedin/server$ python3 reports.py

AVG of commission costs since 2018-01-01: 201$
MAX of commission costs since 2018-01-01: 1302$
MIN of commission costs since 2018-01-01: 1$

AVG_DURATION of offers this month: 11.5 days

FIELD #Announcements
Graphic Design 4
Writing & Translation 6
Video & Animation 1
Programming & Tech 23
Consultancy 4
Music 0
Cleaning 12
Cooking 34
```

The sample output of the reports can be seen above.

7. CODE

8. Website

The project information is available at:
<https://github.com/dsipahioglu/bilinkedin>