NJIT CS 631

DATA MANAGEMENT SYSTEM DESIGN

THE WALLET PAYMENT NETWORK

DELIVERABLE 3

PROJECT GROUP 12

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Goal of this phase of the project

The goal of this part is to translating our Relational schema to a real-world database framework, populate the database, and create a website for Wallet.

Revisions made to the specifications described in Phase 2 Deliverable.

We added the following additional fields to the Relational Schema of Deliverable 2.
1. Bank balance for each of the additional bank accounts linked to a Wallet User.
2. is_primary flag for emails, to differentiate between a primary email and others in case a user has multiple emails linked.
3. Status attribute was added to Send and Request transactions table to record the status of the transaction (Completed, Pending or Failed).

Description of Implementation

Using Java programming language, we implemented frontend with the help of HTML, CSS, JavaScript and JSP, backend with the help of Servlets.

Tools that we use:
1. JDK 11.0.5
2. Eclipse IDE for Java EE Developers
3. Apache-tomcat v.9.0
4. Microsoft SQL Server Management Studio 18
5. Database Hosted – Microsoft Azure Cloud Services

Problems faced

1. We faced problem for making login sessions, as we needed to render SSN value of the login user at every page to execute queries for that particular person. As a solution, we used HTTP sessions.
2. While creating the table structures, cascade functionality couldn't be used to all foreign keys, since the tables were interlinked and using cascade for all foreign keys caused cascade operation to enter into an infinite loop. As a solution, we implemented cascade to all foreign keys possible and for the rest we made manual updates based on the requirement.

⊞ SQL command to create tables.

-- Elec_address Table--

```
SET ANSI_NULLS ON
GO

SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[elec_address](
        [identifier] nvarchar(30) NOT NULL,
        [verified] bit NOT NULL

        PRIMARY KEY (identifier)
        ) ON [PRIMARY]
GO


----------------------------------
-- Phone Table --

SET ANSI_NULLS ON
GO

SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[phone](
        [phone_no] nvarchar(30) NOT NULL

        PRIMARY KEY (phone_no)
        FOREIGN KEY (phone_no) REFERENCES elec_address(identifier)
        ON DELETE CASCADE ON UPDATE CASCADE
        ) ON [PRIMARY]
GO


----------------------------------
--Bank Account Table--

SET ANSI_NULLS ON
GO

SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[bank_account](
        [bank_id] varchar(20) NOT NULL,
        [ba_number] varchar(20) NOT NULL
        PRIMARY KEY (bank_id,ba_number)
) ON [PRIMARY]
GO


----------------------------------
```

```
--User Account Table--

SET ANSI_NULLS ON
GO

SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[user_account](
        [SSN] numeric(10,0) NOT NULL,
        [first_name] varchar(50) NOT NULL,
        [last_name] varchar(50) NULL,
        [phone_number] nvarchar(30) NULL,
        [balance] numeric(20,2) NULL,
        [bank_id] varchar(20) NULL,
        [ba_number] varchar(20) NULL,
        [ba_verified] bit NULL,
        [username] varchar(20) NOT NULL,
        [password] varchar(20) NOT NULL
        PRIMARY KEY (SSN),
        FOREIGN KEY (phone_number) REFERENCES phone(phone_no)
        ON DELETE SET NULL ON UPDATE CASCADE,
        FOREIGN KEY (bank_id,ba_number) REFERENCES bank_account(bank_id,ba_number)
        ON DELETE CASCADE ON UPDATE CASCADE
) ON [PRIMARY]
GO


----------------------------------
--HAS Additional Table--

SET ANSI_NULLS ON
GO

SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[has_additional](
        [SSN] numeric(10,0) NOT NULL,
        [bank_id] varchar(20) NOT NULL,
        [ba_number] varchar(20) NOT NULL,
        [balance] numeric(20,2) NULL,
        [verified] bit NULL
        PRIMARY KEY (SSN,bank_id,ba_number)
        FOREIGN KEY (SSN) REFERENCES user_account(SSN)
        ON DELETE CASCADE ON UPDATE CASCADE,
        FOREIGN KEY (bank_id,ba_number) REFERENCES bank_account(bank_id,ba_number)
) ON [PRIMARY]
GO


----------------------------------
--EMAIL Table--

SET ANSI_NULLS ON
GO
```

```
SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[email](
        [email_address] nvarchar(30) NOT NULL,
        [SSN] numeric(10,0) NOT NULL,
        [is_primary] bit NULL

        PRIMARY KEY (email_address)
        FOREIGN KEY (email_address) REFERENCES elec_address(identifier),
        FOREIGN KEY (SSN) REFERENCES user_account(SSN)
        ON DELETE CASCADE ON UPDATE CASCADE
        ) ON [PRIMARY]
GO


----------------------------------
--Send Transaction Table--

SET ANSI_NULLS ON
GO

SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[send_transaction](
        [STid] int identity(10000000, 1),
        [amount] numeric(10,2) NOT NULL,
        [datetime] datetime NOT NULL,
        [memo] nvarchar(50) NULL,
        [cancel_reason] nvarchar(50) NULL,
        [identifier] nvarchar(30) NOT NULL,
        [SSN] numeric(10,0) NOT NULL,
        [status] nvarchar(100) NULL

        PRIMARY KEY (STid),
        FOREIGN KEY (SSN) REFERENCES user_account(SSN)
        ON DELETE CASCADE ON UPDATE CASCADE
) ON [PRIMARY]
GO


----------------------------------
--Request Transaction Table--

SET ANSI_NULLS ON
GO

SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[request_transaction](
        [RTid] int identity(20000000, 1),
        [amount] numeric(10,2) NOT NULL,
        [datetime] datetime NOT NULL,
        [memo] nvarchar(50) NULL,
        [SSN] numeric(10,0) NOT NULL,
```

```
        [status] nvarchar(100) NULL

        PRIMARY KEY (RTid),
        FOREIGN KEY (SSN) REFERENCES user_account(SSN)
        ON DELETE CASCADE ON UPDATE CASCADE
) ON [PRIMARY]
GO


-----------------------------------
--Request Transaction Multiple Table--

SET ANSI_NULLS ON
GO

SET QUOTED_IDENTIFIER ON
GO

CREATE TABLE [dbo].[request_transaction_multiple](
        [RTid] int NOT NULL,
        [identifier] nvarchar(30) NOT NULL,
        [percentage] numeric(10,2) NOT NULL

        PRIMARY KEY (RTid,identifier)
) ON [PRIMARY]
GO


-----------------------------------
```

SQL command to populate tables.

- **Adding New User**

```
DECLARE
@SSN numeric(10,0) = '236744256',
@phone nvarchar(30) = '9734388344',
@email nvarchar(30) = 'sanjay.sajjan@gmail.com',
@fname nvarchar(30) = 'Sanjay',
@lname nvarchar(30) = 'Sajjan',
@username nvarchar(30) = 'sanjay',
@password nvarchar(30) = 'sanjay@123'

insert into [dbo].[elec_address](identifier,verified)
values(@phone,1),(@email,1)

insert into [dbo].[phone](phone_no)
values(@phone)

insert into
[dbo].[user_account](SSN,first_name,last_name,phone_number,balance,bank_id,ba_number,ba_verified,username,password)
values(@SSN,@fname,@lname,@phone,NULL,NULL,NULL,NULL,@username,@password)
```

```sql
insert into [dbo].[email](email_address,SSN,is_primary)
values(@email,@SSN,1)
```

- **Adding a New Bank Account**

```sql
DECLARE
@SSN numeric(10,0)= '160532258',
@bank_id varchar(20) = '6045789',
@ba_number varchar(20) = '214523698',
@balance numeric(20,2) = 6000,
@count1 numeric(10,0),
@count2 numeric(10,0)

select @count1 = count(1) from bank_account

insert into [dbo].[bank_account](bank_id,ba_number)
values(@bank_id,@ba_number)

select @count2 = count(1) from bank_account

if((@count2 - @count1) > 0)
BEGIN
        if((select bank_id from user_account where SSN = @SSN) is NULL)
                update user_account
                set bank_id = @bank_id,
                        ba_number = @ba_number,
                        ba_verified = 1,
                        balance = @balance
                where SSN = @SSN
        else
                insert into has_additional(SSN,bank_id,ba_number,balance,verified)
                values(@SSN,@bank_id,@ba_number,@balance,1)
END
```

- **Adding Additional Email**

```sql
--Adding Additional email to a user's account

insert into [dbo].[elec_address](identifier,verified)
values('dh23@njit.edu',1)

insert into [dbo].[email](email_address,SSN,is_primary)
values('dh23@njit.edu',845247856,0)
```

- **Modify Personal Details**

```sql
-- Modify personal details --

update user_account
set SSN = 123456789, --new SSN if change is required. Otherwise retain old value
        first_name = 'Akilesh R', -- new first name if change is required. Otherwise retain old value
        last_name = 'Kannamukkala', -- new last name if change is required. Otherwise retain old value
        username = 'akil' -- new username if change is required. Otherwise retain old value
where SSN = 852365794 --existing SSN number
```

- **Phone Number Related Queries**

  ```
  -- Adding a phone number

  insert into [dbo].[elec_address](identifier,verified)
  values('6467521957',1)

  insert into [dbo].[phone](phone_no)
  values('6467521957')

  update [dbo].[user_account]
  set phone_number = '6467521957'
  where SSN = 123456789


  -- Removing a phone number

  delete from [dbo].[elec_address]
  where identifier = '6467521957'

  -- Updating a phone number

  update [dbo].[elec_address]
  set identifier = '8088182888'
  where identifier = '6467521957'

  update [dbo].[send_transaction]
  set identifier = '8088182888'
  where identifier = '6467521957'

  update [dbo].[request_transaction_multiple]
  set identifier = '8088182888'
  where identifier = '6467521957'
  ```

- **Removing Bank Account**

  ```
  DECLARE
  @SSN numeric(10,0)= '123456789',
  @bank_id varchar(20) = '124567',
  @ba_number varchar(20) = '99883322'

  if((select bank_id from [dbo].[user_account] where SSN = @SSN) = @bank_id and
    (select ba_number from [dbo].[user_account] where SSN = @SSN) = @ba_number)
    BEGIN
    if((select count(1) from [dbo].[has_additional] where SSN = @SSN) > 0)
                    BEGIN
                    update user_account
                    set bank_id = (select top 1 bank_id from has_additional where SSN = @SSN),
                            ba_number = (select top 1 ba_number from has_additional where SSN = @SSN),
                            balance = (select top 1 balance from has_additional where SSN = @SSN)
                    where SSN = @SSN
                    delete from has_additional where bank_id = (select bank_id from user_account where SSN
  = @SSN) and
  ```

```sql
                                                                    ba_number =
(select ba_number from user_account where SSN = @SSN)
                    delete from bank_account where bank_id = @bank_id and ba_number = @ba_number
                    END
        else
                BEGIN
                update user_account
                set bank_id = NULL,
                            ba_number = NULL,
                            balance = 0
                where SSN = @SSN
                delete from bank_account where bank_id = @bank_id and ba_number = @ba_number
                END
        END
else
        BEGIN
        delete from has_additional where SSN = @SSN and bank_id = @bank_id and ba_number =
@ba_number
        delete from bank_account where bank_id = @bank_id and ba_number = @ba_number
        END
```

- **Removing Email**

```sql
--Removing an email from a user's account

DECLARE
@email nvarchar(50) = 'ark72@njit.edu',
@SSN numeric(10,0),
@new_email nvarchar(50)

select @SSN = SSN from email where email_address = @email
drop table if exists #t
select top 1 email_address into #t from email where SSN = @SSN and is_primary=0
select @new_email = email_address from #t

if((select is_primary from email where email_address = @email) = 1)
        BEGIN
                delete from [dbo].[email]
                where email_address = @email

                update email
                set is_primary = 1
                where email_address = @new_email
        END
else
delete from [dbo].[email]
where email_address = @email

delete from [dbo].[elec_address]
where identifier = @email
```

- **Request Transaction**

```sql
-- Request Money Transaction
```

```sql
DECLARE
@Requester_SSN numeric(10,0) = '322474129',
@amount numeric(10,2) = 130,
@Sender_phone nvarchar(30) = '6467521957',
@Sender_email nvarchar(30) = 'akilesh.5050@gmail.com',
@Memo nvarchar(50) = 'Headphones'


if exists (select * from elec_address where identifier = @Sender_phone)
BEGIN
        if ((select balance from user_account where phone_number = @Sender_phone) >= @amount)
        BEGIN
                insert into [dbo].[request_transaction](amount,datetime,memo,SSN,status)
                values(@amount,SYSDATETIME(),@Memo,@Requester_SSN,'Completed')

                insert into [dbo].[request_transaction_multiple](RTid,identifier,percentage)
                values((select max(RTid) from request_transaction),@Sender_phone,100)

                update user_account
                set balance = balance - @amount
                where phone_number = @Sender_phone

                update user_account
                set balance = balance + @amount
                where SSN = @Requester_SSN
        END
        else
        BEGIN
                insert into [dbo].[request_transaction](amount,datetime,memo,SSN,status)
                values(@amount,SYSDATETIME(),@Memo,@Requester_SSN,'Failed')

                insert into [dbo].[request_transaction_multiple](RTid,identifier,percentage)
                values((select max(RTid) from request_transaction),@Sender_phone,100)
        END
END
else
BEGIN
        insert into [dbo].[request_transaction](amount,datetime,memo,SSN,status)
        values(@amount,SYSDATETIME(),@Memo,@Requester_SSN,'Pending')

        insert into [dbo].[request_transaction_multiple](RTid,identifier,percentage)
        values((select max(RTid) from request_transaction),@Sender_phone,100)
END
```

- **Search Transactions**

```sql
------------Search Transactions - Without filters--------------------
DECLARE
@SSN numeric(10,0) = 160532258

select a.STid as Transaction_ID,
        b.first_name+' '+b.last_name as Name,
    a.amount Amount,
        a.datetime "Date & Time",
        a.identifier as PhoneNumber,
```

```sql
                c.email_address as Email,
                a.status Status,
                'Send Transaction' as Transaction_Type,
                a.memo Memo
                from send_transaction a
                left join user_account b on a.identifier = b.phone_number
                left join email c on b.SSN = c.SSN and c.is_primary = 1
                where a.SSN = @SSN
union
select a.RTid as Transaction_ID,
                c.first_name+' '+c.last_name as Name,
          a.amount Amount,
                a.datetime "Date & Time",
                b.identifier as PhoneNumber,
                d.email_address as Email,
                a.status Status,
                'Request Transaction' as Transaction_Type,
                a.memo Memo
                from request_transaction a
                join request_transaction_multiple b on a.RTid = b.RTid
                left join user_account c on b.identifier = c.phone_number
                left join email d on c.SSN = d.SSN and d.is_primary = 1
                where a.SSN = @SSN


------------Search Transactions - Email Address-------------------
DECLARE
@email nvarchar(50) = 'akilesh@gmail.com',
@SSN numeric(10,0) = 485697523


select a.STid as Transaction_ID,
                b.first_name+' '+b.last_name as Name,
          a.amount Amount,
                a.datetime "Date & Time",
                a.identifier as PhoneNumber,
                c.email_address as Email,
                a.status Status,
                'Send Transaction' as Transaction_Type,
                a.memo Memo
                from send_transaction a
                left join user_account b on a.identifier = b.phone_number
                left join email c on b.SSN = c.SSN and c.is_primary = 1
                where c.email_address = @email and
                              a.SSN = @SSN
union
select a.RTid as Transaction_ID,
                c.first_name+' '+c.last_name as Name,
          a.amount Amount,
                a.datetime "Date & Time",
                b.identifier as PhoneNumber,
                d.email_address as Email,
                a.status Status,
                'Request Transaction' as Transaction_Type,
                a.memo Memo
                from request_transaction a
```

```sql
            join request_transaction_multiple b on a.RTid = b.RTid
            left join user_account c on b.identifier = c.phone_number
            left join email d on c.SSN = d.SSN and d.is_primary = 1
            where d.email_address = @email and
                            a.SSN = @SSN
```

------------Search Transactions - Phone Number-------------------

```sql
DECLARE
@phone nvarchar(50) = '6467521957',
@SSN numeric(10,0) = 485697523


select a.STid as Transaction_ID,
            b.first_name+' '+b.last_name as Name,
        a.amount Amount,
            a.datetime "Date & Time",
            a.identifier as PhoneNumber,
            c.email_address as Email,
            a.status Status,
            'Send Transaction' as Transaction_Type,
            a.memo Memo
            from send_transaction a
            left join user_account b on a.identifier = b.phone_number
            left join email c on b.SSN = c.SSN and c.is_primary = 1
            where b.phone_number = @phone and
                            a.SSN = @SSN
union
select a.RTid as Transaction_ID,
            c.first_name+' '+c.last_name as Name,
        a.amount Amount,
            a.datetime "Date & Time",
            b.identifier as PhoneNumber,
            d.email_address as Email,
            a.status Status,
            'Request Transaction' as Transaction_Type,
            a.memo Memo
            from request_transaction a
            join request_transaction_multiple b on a.RTid = b.RTid
            left join user_account c on b.identifier = c.phone_number
            left join email d on c.SSN = d.SSN and d.is_primary = 1
            where c.phone_number = @phone and
                            a.SSN = @SSN
```

------------Search Transactions - Type of Transaction-------------------

--for send transaction run the below query

```sql
DECLARE
@SSN numeric(10,0) = 485697523

select a.STid as Transaction_ID,
            b.first_name+' '+b.last_name as Name,
        a.amount Amount,
            a.datetime "Date & Time",
```

```sql
            a.identifier as PhoneNumber,
            c.email_address as Email,
            a.status Status,
            'Send Transaction' as Transaction_Type,
            a.memo Memo
            from send_transaction a
            left join user_account b on a.identifier = b.phone_number
            left join email c on b.SSN = c.SSN and c.is_primary = 1
            where a.SSN = @SSN


--for request transaction run the below query

select a.RTid as Transaction_ID,
            c.first_name+' '+c.last_name as Name,
        a.amount Amount,
            a.datetime "Date & Time",
            b.identifier as PhoneNumber,
            d.email_address as Email,
            a.status Status,
            'Request Transaction' as Transaction_Type,
            a.memo Memo
            from request_transaction a
            join request_transaction_multiple b on a.RTid = b.RTid
            left join user_account c on b.identifier = c.phone_number
            left join email d on c.SSN = d.SSN and d.is_primary = 1
            where a.SSN = @SSN



------------Search Transactions - Date Range-------------------
DECLARE
@start_date date = '2020-05-04',
@end_date date = '2020-05-04',
@SSN numeric(10,0) = 485697523


select a.STid as Transaction_ID,
            b.first_name+' '+b.last_name as Name,
        a.amount Amount,
            a.datetime "Date & Time",
            a.identifier as PhoneNumber,
            c.email_address as Email,
            a.status Status,
            'Send Transaction' as Transaction_Type,
            a.memo Memo
            from send_transaction a
            left join user_account b on a.identifier = b.phone_number
            left join email c on b.SSN = c.SSN and c.is_primary = 1
            where a.datetime >= @Start_date and
                a.datetime <= DATEADD(DAY,1,@End_date) and
                        a.SSN = @SSN
union
select a.RTid as Transaction_ID,
            c.first_name+' '+c.last_name as Name,
        a.amount Amount,
            a.datetime "Date & Time",
```

```sql
        b.identifier as PhoneNumber,
        d.email_address as Email,
        a.status Status,
        'Request Transaction' as Transaction_Type,
        a.memo Memo
        from request_transaction a
        join request_transaction_multiple b on a.RTid = b.RTid
        left join user_account c on b.identifier = c.phone_number
        left join email d on c.SSN = d.SSN and d.is_primary = 1
        where a.datetime >= @Start_date and
            a.datetime <= DATEADD(DAY,1,@End_date) and
                    a.SSN = @SSN
```

- **Send Transaction**

```sql
-- Send Money Transaction
DECLARE
@Sender_SSN numeric(10,0) = 160532258,
@amount numeric(10,2) = 1120 ,
@Receiver_phone nvarchar(30) = '9886524022',
@Receiver_email nvarchar(30) = 'anupbk.bk3@gmail.com',
@Sender_bank_id nvarchar(20) = '6045789',
@Sender_ba_number nvarchar(20) = '214523698',
@Memo nvarchar(50) = 'Electricity Bill'

if exists (select * from elec_address where identifier = @Receiver_phone)
BEGIN
        insert into [dbo].[send_transaction](amount,datetime,memo,identifier,SSN,status)
        values(@amount,SYSDATETIME(),@Memo,@Receiver_phone,@Sender_SSN,'Completed')
        if((select bank_id from [dbo].[user_account] where SSN = @Sender_SSN) = @Sender_bank_id and
          (select ba_number from [dbo].[user_account] where SSN = @Sender_SSN) =
@Sender_ba_number)
            BEGIN
                        update user_account
                        set balance = balance - @amount
                        where SSN = @Sender_SSN
            END
        else
                BEGIN
                        update has_additional
                        set balance = balance - @amount
                        where SSN = @Sender_SSN and
                                bank_id = @Sender_bank_id and
                                ba_number = @Sender_ba_number
                END
        update user_account
        set balance = balance + @amount
        where phone_number = @Receiver_phone
END
else
BEGIN
        insert into [dbo].[send_transaction](amount,datetime,memo,identifier,SSN,status)
        values(@amount,SYSDATETIME(),@Memo,@Receiver_phone,@Sender_SSN,'Pending')
END
```

- **Statement Functions**

```sql
-- Statement Functions

-- Total amount of money sent/received by a user in a range of dates.

DECLARE
@SSN numeric(10,0) = 123456789,
@Start_date date = '2020-05-04',
@End_date date = '2020-05-04'

--Total amount sent

select
(select ISNULL(SUM(amount),0) from send_transaction
where SSN = @SSN and
        status = 'Completed' and
        datetime >= @Start_date and
        datetime <= DATEADD(DAY,1,@End_date))
+
(select ISNULL(SUM(amount),0) from request_transaction A
join request_transaction_multiple B on A.RTid = B.RTid
where B.identifier = (select phone_number from user_account where SSN = @SSN) and
        A.status = 'Completed' and
        datetime >= @Start_date and
        datetime <= DATEADD(DAY,1,@End_date)) as Total_Amount_Sent

--Total amount received

select
(select ISNULL(SUM(amount),0) from request_transaction
where status = 'Completed' and
        SSN = @SSN and
        datetime >= @Start_date and
        datetime <= DATEADD(DAY,1,@End_date))
+
(select ISNULL(SUM(amount),0) from send_transaction
where identifier = (select phone_number from user_account where SSN = @SSN) and
        status = 'Completed' and
        datetime >= @Start_date and
        datetime <= DATEADD(DAY,1,@End_date)) as Total_Amount_Received


---------------------------------------------------------------------------

--Total/average amount of money sent and received by a user per month.

DECLARE
@SSN numeric(10,0) = 123456789,
@month int = 5

--Total/average amount sent

select
(select ISNULL(SUM(amount),0) from send_transaction
```

```sql
where SSN = @SSN and
        status = 'Completed' and
        MONTH(datetime) = @month)
+
(select ISNULL(SUM(amount),0) from request_transaction A
join request_transaction_multiple B on A.RTid = B.RTid
where B.identifier = (select phone_number from user_account where SSN = @SSN) and
        A.status = 'Completed' and
        MONTH(datetime) = @month) as Total_Amount_Sent,

((select ISNULL(CAST(AVG(amount) as numeric(10,2)),0) from send_transaction
where SSN = @SSN and
        status = 'Completed' and
        MONTH(datetime) = @month)
+
(select ISNULL(CAST(AVG(amount) as numeric(10,2)),0) from request_transaction A
join request_transaction_multiple B on A.RTid = B.RTid
where B.identifier = (select phone_number from user_account where SSN = @SSN) and
        A.status = 'Completed' and
        MONTH(datetime) = @month))/2 as Average_Amount_Sent



--Total amount received

select
(select ISNULL(SUM(amount),0) from request_transaction
where status = 'Completed' and
        SSN = @SSN and
        MONTH(datetime) = @month)
+
(select ISNULL(SUM(amount),0) from send_transaction
where identifier = (select phone_number from user_account where SSN = @SSN) and
        status = 'Completed' and
        MONTH(datetime) = @month) as Total_Amount_Received,

(select ISNULL(CAST(AVG(amount) as numeric(10,2)),0) from request_transaction
where status = 'Completed' and
        SSN = @SSN and
        MONTH(datetime) = @month)
+
(select ISNULL(CAST(AVG(amount) as numeric(10,2)),0) from send_transaction
where identifier = (select phone_number from user_account where SSN = @SSN) and
        status = 'Completed' and
        MONTH(datetime) = @month) as Average_Amount_Received

--------------------------------------------------------------------------

--The transactions with the maximum amount of money per month.
DECLARE
@month int = 5,
@SSN numeric(10,0) = 334455667

--Send Transactions
```

```sql
select a.STid,a.amount,a.datetime,a.memo,a.identifier,a.status, b.first_name+' '+b.last_name as Sent_to
from send_transaction a
join user_account b on a.identifier = b.phone_number
where amount = (select max(amount) from send_transaction
            where MONTH(datetime) = @month and
                                status = 'Completed') and
        MONTH(datetime) = @month and
        status = 'Completed' and
        a.SSN = @SSN

--Request Transactions
select a.RTid,a.amount,a.datetime,a.memo,b.identifier,a.status, c.first_name+' '+c.last_name as
Requested_from from request_transaction a
join request_transaction_multiple b on a.RTid = b.RTid
join user_account c on b.identifier = c.phone_number
where amount = (select MAX(amount) from request_transaction
                        where MONTH(datetime) = @month and
                            status = 'Completed') and
        MONTH(datetime) = @month and
        status = 'Completed' and
        a.SSN = @SSN

----------------------------------------------------------------------------

--The best users (users who have sent/received the maximum total amount of money)

DECLARE
@SSN numeric(10,0) = 160532258

--User who has received the maxium amount of money

select top 1 b.first_name+' '+b.last_name Name,sum(amount) Total_Amount_Received from
send_transaction a
left join user_account b on a.identifier = b.phone_number
where a.SSN = @SSN and status = 'Completed'
group by b.first_name+' '+b.last_name
order by sum(amount) desc

--User who has sent the maximum amount of money

select top 1 c.first_name+' '+c.last_name Name, sum(amount) Total_Amount_sent from request_transaction
a
join request_transaction_multiple b on a.RTid=b.RTid
left join user_account c on b.identifier = c.phone_number
where a.SSN = @SSN and status = 'Completed'
group by c.first_name+' '+c.last_name
order by sum(amount) desc
```

- **Statements**

```sql
-- Statements(total amount sent and received per month)

DECLARE
@SSN numeric(10,0) = 123456789,
```

```sql
@month int = 5

--Total amount sent
select
(select ISNULL(SUM(amount),0) from send_transaction
where SSN = @SSN and
        status = 'Completed' and
        MONTH(datetime) = @month)
+
(select ISNULL(SUM(amount),0) from request_transaction A
join request_transaction_multiple B on A.RTid = B.RTid
where B.identifier = (select phone_number from user_account where SSN = @SSN) and
        A.status = 'Completed' and
        MONTH(datetime) = @month) as Total_Amount_Sent

--Total amount received
select
(select ISNULL(SUM(amount),0) from request_transaction
where status = 'Completed' and
        SSN = @SSN and
        MONTH(datetime) = @month)
+
(select ISNULL(SUM(amount),0) from send_transaction
where identifier = (select phone_number from user_account where SSN = @SSN) and
        status = 'Completed' and
        MONTH(datetime) = @month) as Total_Amount_Received
```

Source Code

Java Resources
- src
  - (default package)
    - adrm_email.java
    - amountmonth.java
    - bstur.java
    - dis_bankacc.java
    - dis_bankbal.java
    - dis_email.java
    - dis_phn.java
    - login.java
    - lrgtrans.java
    - reqmonbank.java
    - reqmoney.java
    - searchtrans.java
    - sendmon.java
    - signout.java
    - signup.java
    - sortdate.java
    - unlk_bankacc.java
    - upd_phn.java
    - userinfo.java
    - valibank.java
    - valibank2.java

- WEB-INF
  - accinfo.jsp
  - amtmonth.jsp
  - bankacc.jsp
  - bestuser.jsp
  - homepage.jsp
  - largetrans.jsp
  - loginpage.jsp
  - modemail.jsp
  - modphn.jsp
  - requestmoney.jsp
  - search.jsp
  - sendmoney.jsp
  - signup.html
  - sortdaterange.jsp
  - style.css

Glimpse of our Code for Wallet Application
Homepage.jsp

```jsp
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
    pageEncoding="ISO-8859-1"%>

<!doctype html>
<html lang="en">
<head>
<link rel="stylesheet" href="style.css">
<meta name='viewport' content='width=device-width, initial-scale=1'>
<script src='https://kit.fontawesome.com/a076d05399.js'></script>

    <!-- IE6-8 support of HTML5 elements --> <!--[if lt IE 9]>
    <script src="//html5shim.googlecode.com/svn/trunk/html5.js"></script>
    <![endif]-->

</head>
<body>
<div class="wallet homepage">
    <div class="container">
      <%
            out.println("<nav id=\"nav\">");
            out.println("    <ul id=\"navigation\">");
            out.println("        <li><a href=\"#\" class=\"active\">Home</a></li>");
            out.println("        <li><a href=\"#\">Profile and Settings
&raquo;</a>");
            out.println("            <ul>");
            out.println("            <li><a
href=\"http://localhost:8080/project/userinfo\">Account Information</a></li>");
            out.println("            <li><a href=\"#home\">Modify Personal Details
&raquo;</a>");
            out.println("                <ul>");
            out.println("                <li><a
href=\"http://localhost:8080/project/dis_bankacc\">Link/Unlink Bank
Account</a></li>");
            out.println("                    <li><a
href=\"http://localhost:8080/project/dis_email\">Add/remove email address</a></li>");
            out.println("                    <li><a
href=\"http://localhost:8080/project/dis_phn\">Update phone number</a></li>");
            out.println("                    </ul>");
            out.println("                </li>");
            out.println("            </ul>");
            out.println("            </li>");
            out.println("        <li><a href=\"#\">Payments &raquo;</a>");
            out.println("            <ul>  ");
            out.println("                <li><a
href=\"http://localhost:8080/project/valibank\">Send Money</a></li>");
            out.println("                    <li><a
href=\"http://localhost:8080/project/valibank2\">Request Money</a></li>");
            out.println("                    <li><a
href=\"search.jsp\">Search Transactions</a></li>");
            out.println("                    </ul>");
            out.println("                </li>");
```

```
            out.println("                    <li><a href=\"#\">Statement &raquo;</a>");
            out.println("                        <ul>");
            out.println("                            <li><a href=\"sortdaterange.jsp\">Sort
By Date Range</a></li>");
            out.println("                            <li><a
href=\"amtmonth.jsp\">Transactions per month</a></li>");
            out.println("                            <li><a href=\"largetrans.jsp\">Large
Transactions</a></li>");
            out.println("                            <li><a href=\"bestuser.jsp\">Best
Users</a></li>");
            out.println("                        </ul>");
            out.println("                  </li>");
            out.println("<button class=\"signoutbtn\"
onclick=\"window.location.href='http://localhost:8080/project/signout'\">Sign Out <i
class='fas fa-sign-out-alt'></i></button>");
            out.println("        </ul>");
            out.println("</nav>");
    %>
    <%

    String ssn = (String)request.getAttribute("ssn");
    String name = (String)request.getAttribute("name");
    String msg = (String)request.getAttribute("msg");
    String msgerr = (String)request.getAttribute("msgerror");

            out.println("<div style=\"padding-left:16px;\">");
            out.println("<br><br><h2 style=\"text-align: center;\">Welcome
"+name+"</h2>");
        //System.out.print(msg);
            if(msg != null){
                out.println("<h3><font color=\"green\">"+msg+"</font></h3> ");
            }
            if(msgerr != null){
                out.println("<h3><font color=\"red\">"+msgerr+"</font></h3> ");
            }
            out.println("</div>");
    %>

</div>
</div>

</body>
    </html>
```

Login.java
```
import java.io.IOException;
import java.io.PrintWriter;
import java.sql.*;

import javax.servlet.ServletException;
import javax.servlet.annotation.WebServlet;
import javax.servlet.http.Cookie;
```

```java
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import javax.servlet.http.HttpSession;

@WebServlet("/login")
public class login extends HttpServlet {
 private static final long serialVersionUID = 1L;
   public login() {
      super();
  }
 protected void doGet(HttpServletRequest request,
                HttpServletResponse response) throws ServletException, IOException {
        //response.getWriter().append("Served at: ").append(request.getContextPath());
}

 protected void doPost(HttpServletRequest request,
                HttpServletResponse response) throws ServletException, IOException {
        //doGet(request, response);
        response.setContentType("text/html");
    PrintWriter out = response.getWriter();

    String user = request.getParameter("user");
    String pwd = request.getParameter("pwd");

        String userid = null;
        String password = null;
        String fname = null;
        String ssn = null;
        float bal = 0;

    try {
        Class.forName("com.microsoft.sqlserver.jdbc.SQLServerDriver");
        String connectionUrl = "jdbc:sqlserver://wallet.database.windows.net:1433;"
                + "database=wallet;"
                + "user=akilesh123@wallet;"
                + "password=DBMSproject123*;"
                + "encrypt=true;"
                + "trustServerCertificate=false;"
                + "hostNameInCertificate=*.database.windows.net;"
                + "loginTimeout=30";
```

```java
        Connection con = DriverManager.getConnection(connectionUrl);
    Statement stmt = con.createStatement();

    String sql = "Select username, password, first_name,balance, SSN from
user_account where username ='"+ (String)user + "'";
    ResultSet rs = stmt.executeQuery(sql);
    //System.out.println(sql);
    while ( rs.next()) {
      userid = (String)rs.getString(1);
      password = (String)rs.getString(2);
      fname = (String)rs.getString(3);
      bal = (float)rs.getFloat(4);
      ssn = (String)rs.getString(5);
    }
            con.close();

            if (user.equals(userid) && pwd.contentEquals(password)) {
                    //System.out.println("user :: "+ fname);
                    //System.out.println("ssn ::"+ ssn);

                    HttpSession session = request.getSession();
                    session.setAttribute("name", fname);
                    session.setAttribute("ssn", ssn);

                    request.setAttribute("message","pass");
            request.setAttribute("name", fname);
            request.setAttribute("bal", bal);
            request.setAttribute("ssn", ssn);
            request.getRequestDispatcher("homepage.jsp").forward(request,
response);
            }else {
                    request.setAttribute("loginmessage","fail");
                    request.getRequestDispatcher("loginpage.jsp").forward(request,
response);
                    out.println("<br> <h1> Error </h1>");
            }
    }catch (Exception ex) {System.out.println(ex);}
 }
}
```
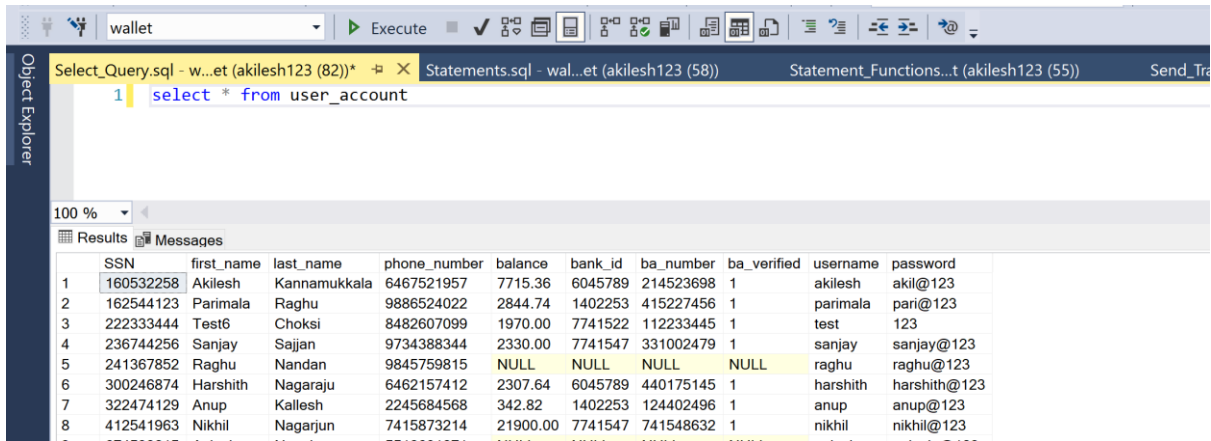
AccountInfo.jsp

```jsp
<%@ page language="java" contentType="text/html; charset=ISO-8859-1"
    pageEncoding="ISO-8859-1"%>
<%@ page import="java.util.*" %>


<!DOCTYPE html>
<html lang="en">
<head>
<link rel="stylesheet" href="style.css">
<meta name='viewport' content='width=device-width, initial-scale=1'>
<script src='https://kit.fontawesome.com/a076d05399.js'></script>


</head>
<body>
<div class="wallet homepage">
    <div class="container">
      <%
      out.println("<nav id=\"nav\">");
      out.println("    <ul id=\"navigation\">");
      out.println("        <li><a href=\"#\" >Home</a></li>");
      out.println("        <li><a href=\"#\" class=\"active\">Profile and Settings
&raquo;</a>");
      out.println("            <ul>");
      out.println("            <li><a
href=\"http://localhost:8080/project/userinfo\">Account Information</a></li>");
      out.println("            <li><a href=\"#home\">Modify Personal Details
&raquo;</a>");
      out.println("                <ul>");
      out.println("                 <li><a
href=\"http://localhost:8080/project/dis_bankacc\">Link/Unlink Bank
Account</a></li>");
      out.println("                    <li><a
href=\"http://localhost:8080/project/dis_email\">Add/remove email address</a></li>");
      out.println("                    <li><a
href=\"http://localhost:8080/project/dis_phn\">Update phone number</a></li>");
      out.println("                </ul>");
      out.println("                </li>");
      out.println("            </ul>");
      out.println("            </li>");
      out.println("        <li><a href=\"#\">Payments &raquo;</a>");
      out.println("            <ul>  ");
      out.println("                <li><a
href=\"http://localhost:8080/project/valibank\">Send Money</a></li>");
      out.println("                    <li><a
href=\"http://localhost:8080/project/valibank2\">Request Money</a></li>");
      out.println("                        <li><a href=\"search.jsp\">Search
Transactions</a></li>");
      out.println("                </ul>");
      out.println("            </li>");
      out.println("            <li><a href=\"#\">Statement &raquo;</a>");
      out.println("                <ul>");
```

```jsp
        out.println("                            <li><a href=\"sortdaterange.jsp\">Sort By
Date Range</a></li>");
        out.println("                            <li><a href=\"amtmonth.jsp\">Transactions per
month</a></li>");
        out.println("                            <li><a href=\"largetrans.jsp\">Large
Transactions</a></li>");
        out.println("                            <li><a href=\"bestuser.jsp\">Best
Users</a></li>");
        out.println("                        </ul>");
        out.println("                </li>");
        out.println("<button class=\"signoutbtn\"
onclick=\"window.location.href='http://localhost:8080/project/signout'\">Sign Out <i
class='fas fa-sign-out-alt'></i></button>");
        out.println("        </ul>");
        out.println("</nav>");
            %>
        <div style="padding-left:16px;margin-top: 85px;">
        <%
        String name = (String)request.getAttribute("name");
        Float bal = (Float)request.getAttribute("bal");
        String phn = (String)request.getAttribute("phn");

        out.println("<h3 style=\"text-align: center;\">Name : "+name+"</h3>");
        out.println("  <h3 style=\"text-align: center;\">Current Account Balance :
"+bal+"</h3>");
        out.println("  <h3 style=\"text-align: center;\">Phone Number :
"+phn+"</h3>");

        ArrayList<String> myemail =
(ArrayList<String>)request.getAttribute("arr_email");

        out.println("<fieldset>");
        out.println("<legend>Email Accounts Linked</legend>");
        out.println("<table id=\"email\">");
        out.println("  <tr>");
        out.println("    <th>Email Address</th>");
        out.println("  </tr>");

         for (int i=0; i<myemail.size(); i+=1) {
             out.println("<tr>");
             out.println("<td>"+ myemail.get(i) +"</td>");
             out.println("</tr>");
         }

        out.println("</table>");
        out.println("</fieldset>");

            ArrayList<String> arr = (ArrayList<String>)request.getAttribute("arr");
            out.println("<fieldset style=\"margin: 15px 0;\">");
            out.println("<legend>Bank Accounts Linked</legend>");
            out.println("<table id=\"bankacc\">");
            out.println("  <tr>");
            out.println("    <th>Bank ID</th>");
            out.println("    <th>Bank Account Number</th>");
            out.println("    <th>Bank Balance</th> ");
```

```
            out.println("  </tr>");
            for (int i=0; i<arr.size(); i+=3) {
                    out.println("<tr>");
                    out.println("<td>"+ arr.get(i) +"</td>");
                    out.println("<td>"+ arr.get(i+1) +"</td>");
                    out.println("<td>"+ arr.get(i+2) +"</td>");
                    out.println("</tr>");
            }
            out.println("</table>");
            out.println("</fieldset>");
            out.println("</div>");
    %>
    </div>
</div>
</div>

</body>
    </html>
    UserInfo.java
    import java.io.IOException;
    import java.io.PrintWriter;
    import java.sql.Connection;
    import java.sql.DriverManager;
    import java.sql.ResultSet;
    import java.sql.Statement;
    import java.util.ArrayList;

    import javax.servlet.ServletException;
    import javax.servlet.annotation.WebServlet;
    import javax.servlet.http.HttpServlet;
    import javax.servlet.http.HttpServletRequest;
    import javax.servlet.http.HttpServletResponse;
    import javax.servlet.http.HttpSession;

    @WebServlet("/userinfo")
    public class userinfo extends HttpServlet {
     private static final long serialVersionUID = 1L;
       public userinfo() {
          super();
       }
     protected void doGet(HttpServletRequest request, HttpServletResponse response)
    throws ServletException, IOException {
            //response.getWriter().append("Served at:
    ").append(request.getContextPath());
            response.setContentType("text/html");
```

```java
        PrintWriter out = response.getWriter();
        HttpSession session = request.getSession(false);

        String ssn =(String)session.getAttribute("ssn");
        String name= (String)session.getAttribute("name");


        try {
            Class.forName("com.microsoft.sqlserver.jdbc.SQLServerDriver");
            String connectionUrl = "jdbc:sqlserver://wallet.database.windows.net:1433;"
                    + "database=wallet;"
                    + "user=akilesh123@wallet;"
                    + "password=DBMSproject123*;"
                    + "encrypt=true;"
                    + "trustServerCertificate=false;"
                    + "hostNameInCertificate=*.database.windows.net;"
                    + "loginTimeout=30";
            Connection con = DriverManager.getConnection(connectionUrl);
            Statement stmt = con.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE,
                    ResultSet.CONCUR_READ_ONLY,
                    ResultSet.HOLD_CURSORS_OVER_COMMIT);

        ResultSet rs = null;

        float bal = 0;
        String phn = null;
        //System.out.println("Selecting bal, phn");
        String sql = "Select balance, phone_number from user_account where SSN ='"+
ssn + "'";
        rs = stmt.executeQuery(sql);
        //System.out.println(sql);
        while ( rs.next()) {
          bal = (float)rs.getFloat(1);
          phn = (String)rs.getString(2);
          //System.out.println("Selecting bal, phn");
        }

        //System.out.println("Selecting bankid");
        ArrayList<String> myarray = new ArrayList<String>();
        String sql2 = "select bank_id, ba_number, balance from user_account where SSN
= '"+ ssn +"'";
```

```java
        String sql3 = "select bank_id, ba_number, balance from has_additional where
SSN = '"+ ssn +"'";
        String sql4 = sql2 +" union " + sql3;
        rs = null;
        rs = stmt.executeQuery(sql4);

        while ( rs.next()) {
           for(int q = 1; q < 4; q++) {
                   myarray.add(rs.getString(q));
                   //System.out.println("Selecting bankid");
            }
        }

        //System.out.println("selecting email");
        ArrayList<String> myemail = new ArrayList<String>();
        String s2 = "select email_address from email where SSN = '"+ ssn +"'";
        rs = null;
        rs = stmt.executeQuery(s2);

        while ( rs.next()) {
                   myemail.add(rs.getString(1));
                   //System.out.println("selecting email");
        }
        request.setAttribute("arr_email", myemail);
        request.setAttribute("arr", myarray);
        request.setAttribute("name", name);
          request.setAttribute("bal",bal );
          request.setAttribute("phn",phn );
                   request.getRequestDispatcher("accinfo.jsp").forward(request,
response);
        con.close();

    }catch (Exception ex) {System.out.println(ex);}

        }
 protected void doPost(HttpServletRequest request, HttpServletResponse response)
throws ServletException, IOException {
        //doGet(request, response);
 }
}
```
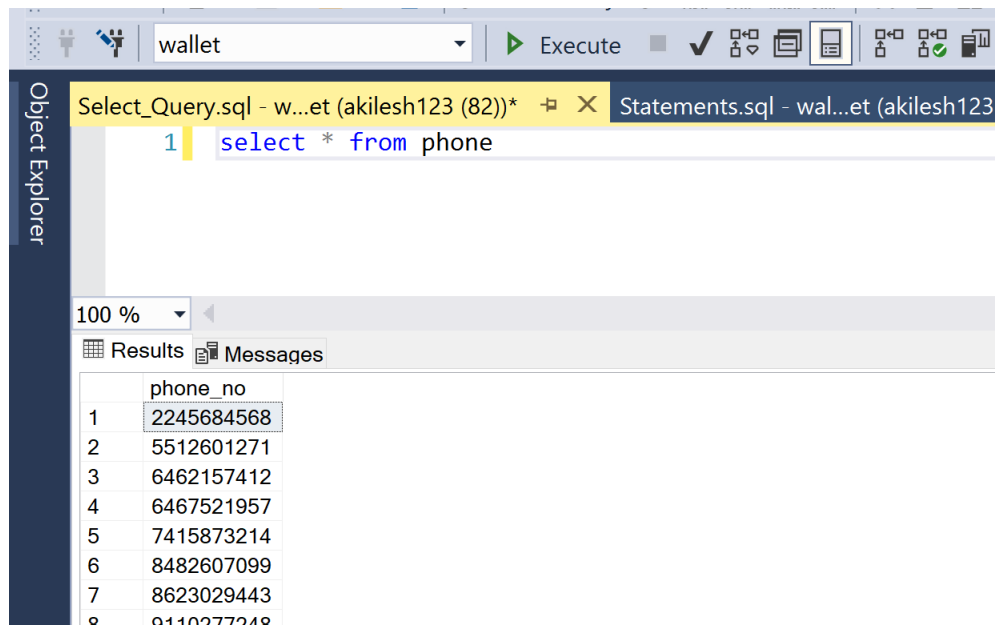
🔹 Screenshots of the Program

Figure 1 User_account table with data

Figure 2 Phone table with data

Figure 3 Email table with data

Figure 4 Bank Account table with data

Figure 5 Has Additional table with data

Figure 6 Elec Address table with data

Figure 7 Send Transaction table with data

Figure 8 Request Transaction Multiple table with data

Figure 9 Request Transaction table with data

Figure 10 Login Page
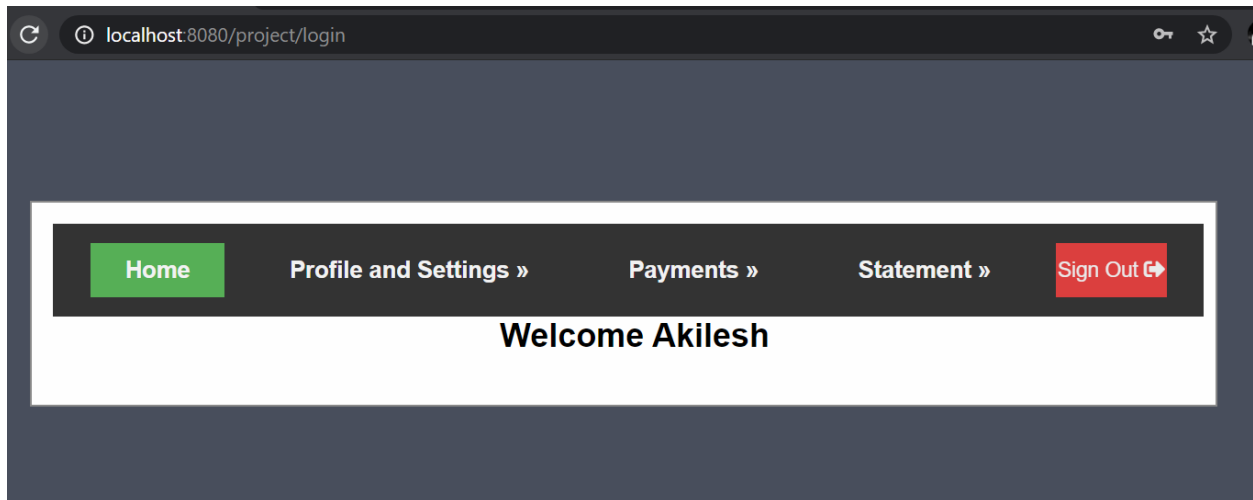
Figure 11 Home Page
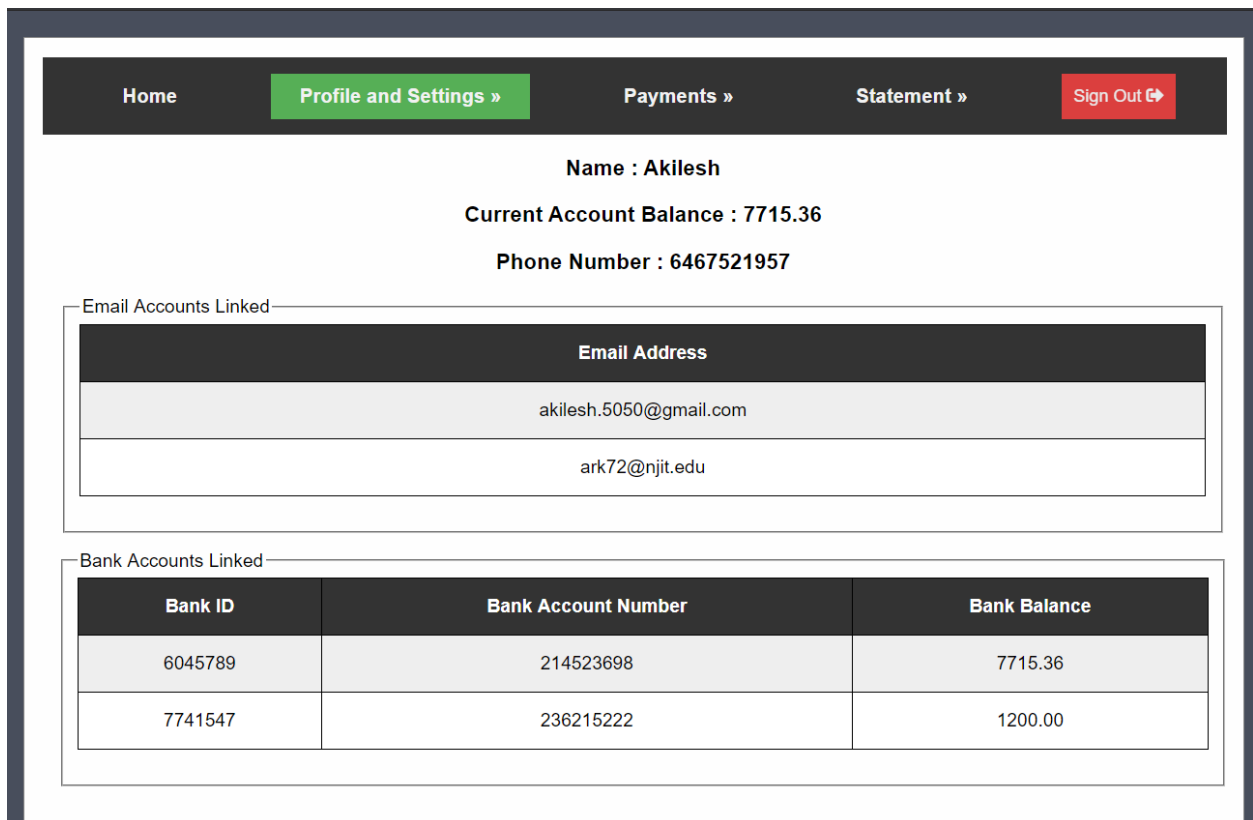
Figure 12 User Account Info

Figure 13 Link/Unlink Bank Account

Figure 14 Add/Remove Bank Account

Figure 15 Update Phone Number

Figure 16 Send Money

Request Money through Wallet

Please fill in this form to Request money.

Enter phone number

8482607099

User Email Address

saumyachoksi@gmail.com

Amount

200

Memo

Food Bill of last night dinner.

Cancel	Request Money

Figure 17 Request Money

Figure 18 Search Transactions

Figure 19 Search All Transactions

Figure 20 Search Transaction by Email

Figure 21 Search Transaction by Phone Number

Figure 22 Search Transaction based on Sent/Receive Option

Figure 23 Search Transaction based on Date Range

Figure 24 Search Transaction by Phone number

Figure 25 View Statement Options

Figure 26 View Statement based on Date Range

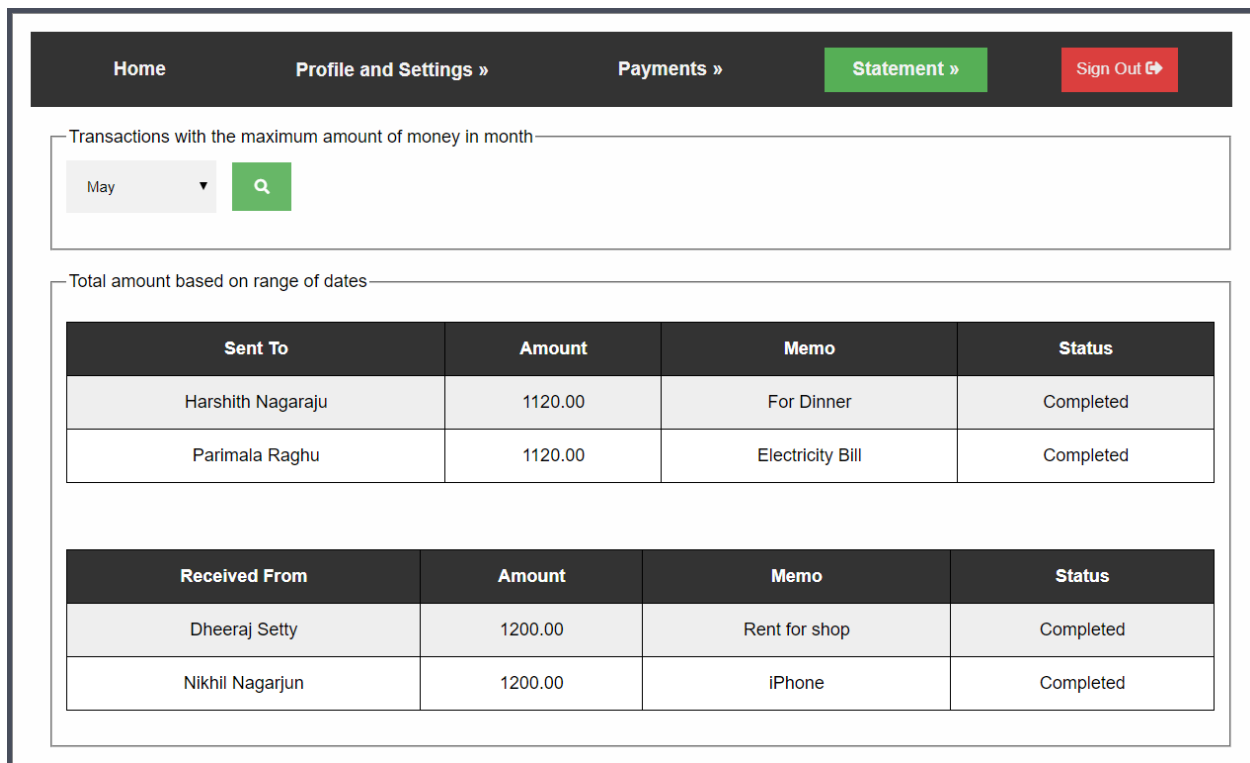

Figure 27 View Statement based on Month Range

Figure 28 View Statement based on Maximum Amount Transaction

Figure 29 Best User