dataset formed by a set of job seekers profiles and a set of job vacancies collected from different job search engine sites; ii) put forward the proposal of a framework for job recommendation based on professional skills of job seekers; and iii) carried out an evaluation to quantify empirically the recommendation abilities of two state-of-the-art methods, considering different configurations, within the proposed framework. We thus present a general panorama of job recommendation task aiming to facilitate research and real-world application design regarding this important issue.

13.APPENDIX

13.1   Source Code

apply.html

```
<!DOCTYPE
html>
        <html lang="en">
        <head>
        <meta charset="UTF-8">
        <meta http-equiv="X-UA-Compatible" content="IE=edge">
        <meta name="viewport" content="width=device-width, initial-scale=1.0">
        <title>JOBPORTAL | APPLY</title>
        <!-- favicon -->
        <!-- <link rel="shortcut icon" href="/assets/img/favicon.ico" type="image/x-
        icon"> -->
        <!-- <link rel="icon" href="/assets/img/favicon.ico" type="image/x-icon"> -->
        <link rel="icon" type="image/png" sizes="16x16" href="/assets/img/favicon-
        32x32.png">
        <!-- bootstrap css cdn -->
        <link rel="stylesheet"
        href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/css/bootstrap.min.css"
        integrity="sha384-
        JcKb8q3iqJ61gNV9KGb8thSsNjpSL0n8PARn9HuZOnIxN0hoP+VmmDGMN5t9UJ0Z"
        crossorigin="anonymous">
        <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
```

awesome/4.7.0/css/font-awesome.css">

<!-- css stylesheet -->

<link rel="stylesheet" href="css/style.css">

<!-- font styles cdn -->

```html
<link rel="preconnect" href="https://fonts.gstatic.com">
<link href="https://fonts.googleapis.com/css2?family=Alegreya&display=swap"
rel="stylesheet">
<link
href="https://fonts.googleapis.com/css2?family=Alegreya:wght@600&display=swap"
rel="stylesheet">
</head>
<body>
<!-- bootstrap navbar -->
<div class="logo mt-3 text-center">
<a class="main-logo-img mt-5" href=".png"><img src="" alt="" height="50px"
width="180px">
<!-- <a class="navbar-brand" href="index.html">JobPortal</a> -->
</a>
</div>
<!-- navbar ends -->
<!-- Login form -->
<div class="login text-center mt-5">
<h2>Apply Now</h2>
<div class="msg">{{ msg }}</div>
<form action="/apply" method="post" class="mt-3">
<!-- <input type="text" placeholder="fullname" id="fullname"> </br></br> -->
<input type="text" name="username" placeholder="Enter Your Username"
id="username" required></br></br>
<input type="email" name="email" placeholder="Enter Your email" id="email"
required></br></br>
<input type="text" name="qualification" placeholder="Enter Your Qualification"
id="qualification" required></br></br>
<input type="text" name="skills" placeholder="Enter Your skills" id="skills"
required></br></br>


<select name ="s">
<option value ="PYTHON"> Python</option>
<option value ="ML"> ML</option>
<option value ="AI"> AI</option>
</select>
</br></br>
<button type="submit" id="button" class="btn btn-primary"> Submit</button>
</form>
</div>
```

```html
        <div class="note mt-3 text-center">

        <p> click here to go to dashboard <a href="dashboard">Dashboard! </a> </p>




        </div>


        </body>

        </html>
```

dashboard.html

```html
<!DOCTYPE
html>
        <html lang="en">

        <head>

        <meta charset="UTF-8">

        <meta http-equiv="X-UA-Compatible" content="IE=edge">

        <meta name="viewport" content="width=device-width, initial-scale=1.0">

        <title>JOBPORTAL | HOME</title>

        <meta charset="UTF-8">

        <!-- favicon -->
        <!-- <link rel="shortcut icon" href="/assets/img/favicon.ico" type="image/x-
        icon"> -->
        <!-- <link rel="icon" href="/assets/img/favicon.ico" type="image/x-icon"> -->
        <link rel="icon" type="image/png" sizes="16x16" href="/assets/img/favicon-
        32x32.png">
        <!-- bootstrap css cdn -->
        <link rel="stylesheet"
        href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/css/bootstrap.min.css"
        integrity="sha384-
        JcKb8q3iqJ61gNV9KGb8thSsNjpSL0n8PARn9HuZOnIxN0hoP+VmmDGMN5t9UJ0Z"
        crossorigin="anonymous">
        <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
        awesome/4.7.0/css/font-awesome.css">

        <!-- css stylesheet -->

        <link rel="stylesheet" href="css/style.css">

        <!-- font styles cdn -->

        <link rel="preconnect" href="https://fonts.gstatic.com">

        <link href="https://fonts.googleapis.com/css2?family=Alegreya&display=swap"
        rel="stylesheet">
```

```html
<link
href="https://fonts.googleapis.com/css2?family=Alegreya:wght@600&display=swap"
rel="stylesheet">
</head>

<body>

<!-- bootstrap navbar -->

<nav class="navbar sticky-top navbar-expand-lg navbar-light">

<div class="container-fluid">

<a class="main-logo-img mt-3" href="#"><img src="static/img/smartinternz.png"
alt="sheep-logo" height="50px" width="180px">

<!-- <a class="navbar-brand" href="index.html">JobPortal</a> -->

</a>

<button class="navbar-toggler" type="button" data-bs-toggle="collapse" data-bs-
target="#navbarSupportedContent" aria-controls="navbarSupportedContent" aria-
expanded="false" aria-label="Toggle navigation">

<span class="navbar-toggler-icon"></span>

</button>


<div class="row donate-sponsor">

<a type="button" class="btn btn-success mr-1" id="donate"
href="/logout">LOGOUT</a>

<a type="button" class="btn btn-warning mr-1" id="sponsor"
href="register">REGISTER</a>

<a type="button" class="btn btn-primary mr-1" id="sponsor" href="display">MY
JOBS</a>

</div>

</div>

</nav>

<!-- navbar ends -->


<!-- what we focus on -->

<section class="our-focus">

<div class="container">

<h2 class="text-center mt-3">Available Jobs</h2>

<div class="row ml-3 mt-3">

<div class="col-lg-3 mr-5" id="focus-first">

<div class="card" style="width: 19rem;">

<!-- <img src="assets/img/home kids.jpg" class="card-img-top" alt="..."> -->

<div class="card-body">

<h5 class="card-title">Python</h5>
```

```
<img src="https://s3.jp-tok.cloud-object-storage.appdomain.cloud/bu-123/chris-
ried-ieic5Tq8YMk-unsplash.jpg", width="200px", height="120px" />
<p class="card-text">Skills for python
</p>
<a href="apply" class="btn btn-primary">Apply Now</a>
</div>
</div>
</div>
<div class="col-lg-3 mr-5" id="focus-second">
<div class="card" style="width: 20rem;">
<!-- <img src="assets/img/friendship day.JPG" class="card-img-top" alt="..."> -
->
<div class="card-body">
<h5 class="card-title">Data Scientist</h5>
<img src="https://s3.jp-tok.cloud-object-storage.appdomain.cloud/bu-
123/stephen-dawson-qwtCeJ5cLYs-unsplash.jpg", width="200px", height="120px"/>
<p class="card-text">Skills for datascientist</p>
<a href="apply" class="btn btn-primary">Apply Now</a>
</div>
</div>
</div>
<div class="col-lg-3 ml-5" id="focus-third">
<div class="card" style="width: 20rem;">
<!-- <img src="assets/img/health camp.jpg" class="card-img-top" alt="..."> -->
<div class="card-body">
<h5 class="card-title">HR Manager</h5>
<img src="https://s3.jp-tok.cloud-object-storage.appdomain.cloud/bu-
123/campaign-creators-gMsnXqILjp4-unsplash.jpg", width="200px",
height="120px"/>
<p class="card-text">Skills for hr manager</p>
<a href="apply" class="btn btn-primary">Apply Now</a>
</div>
</div>
</div>


</div>
</div>
</section>
<!-- focus section ends -->
```

```html
            <!-- footer starts -->
            <!-- Site footer -->


            </body>
            </html>
```

display.html

```html
<!DOCTYPE
html>
            <html lang="en">
            <head>
            <meta charset="UTF-8">
            <meta http-equiv="X-UA-Compatible" content="IE=edge">
            <meta name="viewport" content="width=device-width, initial-scale=1.0">
            <title>JOBPORTAL | HOME</title>
            <meta charset="UTF-8">
            <!-- favicon -->
            <!-- <link rel="shortcut icon" href="/assets/img/favicon.ico" type="image/x-
            icon"> -->
            <!-- <link rel="icon" href="/assets/img/favicon.ico" type="image/x-icon"> -->
            <link rel="icon" type="image/png" sizes="16x16" href="/assets/img/favicon-
            32x32.png">
            <!-- bootstrap css cdn -->
            <link rel="stylesheet"
            href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/css/bootstrap.min.css"
            integrity="sha384-
            JcKb8q3iqJ61gNV9KGb8thSsNjpSL0n8PARn9HuZOnIxN0hoP+VmmDGMN5t9UJ0Z"
            crossorigin="anonymous">
            <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
            awesome/4.7.0/css/font-awesome.css">
            <!-- css stylesheet -->
            <link rel="stylesheet" href="css/style.css">
            <!-- font styles cdn -->
            <link rel="preconnect" href="https://fonts.gstatic.com">
            <link href="https://fonts.googleapis.com/css2?family=Alegreya&display=swap"
            rel="stylesheet">
            <link
            href="https://fonts.googleapis.com/css2?family=Alegreya:wght@600&display=swap"
            rel="stylesheet">
            </head>
            <body>
```

```html
<!-- bootstrap navbar -->

<nav class="navbar sticky-top navbar-expand-lg navbar-light">

<div class="container-fluid">

<a class="main-logo-img mt-3" href="#"><img src="static/img/smartinternz.png"
alt="sheep-logo" height="50px" width="180px">

<!-- <a class="navbar-brand" href="index.html">JobPortal</a> -->

</a>

<button class="navbar-toggler" type="button" data-bs-toggle="collapse" data-bs-
target="#navbarSupportedContent" aria-controls="navbarSupportedContent" aria-
expanded="false" aria-label="Toggle navigation">

<span class="navbar-toggler-icon"></span>

</button>


<div class="row donate-sponsor">
<a type="button" class="btn btn-success mr-1" id="donate"
href="/logout">LOGOUT</a>
<a type="button" class="btn btn-warning mr-1" id="sponsor"
href="register">REGISTER</a>
<a type="button" class="btn btn-primary mr-1" id="sponsor" href="display">MY
JOBS</a>
</div>

</div>

</nav>

<!-- navbar ends -->


<!-- what we focus on -->

<section class="our-focus">

<div class="container">

<h2 class="text-center mt-3">Available Jobs</h2>

<div class="row ml-3 mt-3">

<div class="col-lg-3 mr-5" id="focus-first">

<div class="card" style="width: 19rem;">

<!-- <img src="assets/img/home kids.jpg" class="card-img-top" alt="..."> -->

<div class="card-body">

<h5 class="card-title">Python</h5>

<img src="https://s3.jp-tok.cloud-object-storage.appdomain.cloud/bu-123/chris-
ried-ieic5Tq8YMk-unsplash.jpg", width="200px", height="120px" />

<p class="card-text">Skills for python

</p>

<a href="apply" class="btn btn-primary">Apply Now</a>
```

```html
</div>
</div>
</div>
<div class="col-lg-3 mr-5" id="focus-second">
<div class="card" style="width: 20rem;">
<!-- <img src="assets/img/friendship day.JPG" class="card-img-top" alt="...">
-->
<div class="card-body">
<h5 class="card-title">Data Scientist</h5>
<img src="https://s3.jp-tok.cloud-object-storage.appdomain.cloud/bu-
123/stephen-dawson-qwtCeJ5cLYs-unsplash.jpg", width="200px", height="120px"/>
<p class="card-text">Skills for datascientist</p>
<a href="apply" class="btn btn-primary">Apply Now</a>
</div>
</div>
</div>
<div class="col-lg-3 ml-5" id="focus-third">
<div class="card" style="width: 20rem;">
<!-- <img src="assets/img/health camp.jpg" class="card-img-top" alt="..."> -->
<div class="card-body">
<h5 class="card-title">HR Manager</h5>
<img src="https://s3.jp-tok.cloud-object-storage.appdomain.cloud/bu-
123/campaign-creators-gMsnXqILjp4-unsplash.jpg", width="200px",
height="120px"/>
<p class="card-text">Skills for hr manager</p>
<a href="apply" class="btn btn-primary">Apply Now</a>
</div>
</div>
</div>

</div>
</div>
</section>
<!-- focus section ends -->


<!-- footer starts -->
<!-- Site footer -->


</body>
</html>
```

register.html

```
<!DOCTYPE
html>
        <html lang="en">
        <head>
        <meta charset="UTF-8">
        <meta http-equiv="X-UA-Compatible" content="IE=edge">
        <meta name="viewport" content="width=device-width, initial-scale=1.0"
        <title>JOBPORTAL | LOGIN</title>
        <!-- favicon -->
        <!-- <link rel="shortcut icon" href="/assets/img/favicon.ico" type="i
        icon"> -->
        <!-- <link rel="icon" href="/assets/img/favicon.ico" type="image/x-ic
        <link rel="icon" type="image/png" sizes="16x16" href="/assets/img/fav
        32x32.png">
        <!-- bootstrap css cdn -->
        <link rel="stylesheet"
        href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/css/bootstra
        integrity="sha384-
        JcKb8q3iqJ61gNV9KGb8thSsNjpSL0n8PARn9HuZOnIxN0hoP+VmmDGMN5t9UJ0Z"
        crossorigin="anonymous">
        <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/f
        awesome/4.7.0/css/font-awesome.css">
        <!-- css stylesheet -->
        <link rel="stylesheet" href="css/style.css">
        <!-- font styles cdn -->
        <link rel="preconnect" href="https://fonts.gstatic.com">
        <link href="https://fonts.googleapis.com/css2?family=Alegreya&display
        rel="stylesheet">
        <link
        href="https://fonts.googleapis.com/css2?family=Alegreya:wght@600&disp
        rel="stylesheet">
        </head>
        <body>
        <!-- bootstrap navbar -->
        <div class="logo mt-3 text-center">
        <a class="main-logo-img mt-5" href="#"><img src="static/img/smartinte
        alt="sheep-logo" height="50px" width="180px">
        <!-- <a class="navbar-brand" href="index.html">JobPortal</a> -->
        </a>
```

```html
        </div>
        <!-- navbar ends -->
        <!-- Login form -->
        <div class="login text-center mt-5">
        <h2> Register Form </h2>
        <form action="/register" method="post">
        <div class="msg">{{ msg }}</div>
        <!-- <input type="text" placeholder="fullname" id="fullname"> </br></

        <input type="text" name="username" placeholder="Enter Your Username"
        id="username" required></br></br>
        <input type="email" name="email" placeholder="Enter Your Email ID" id
        required></br></br>
        <input type="password" name="password" placeholder="Enter Your Passwo
        id="password" required></br></br>

        </br>
        </br>
        <button type="submit" id="button" class="btn btn-primary" > Register
        </form>
        </div>

        <div class="note mt-3 text-center"> <!--Register form -->
        <p> already have an account ? please login <a href="/login">login! </

        </div>

        </body>
        </html>
```

style.css

```css
* {
    font-family: 'Alegreya', serif !important;

    }
```

```css
/* // Small devices (landscape phones, 576px and up) */
@media (min-width: 576px) {


}

/* // Medium devices (tablets, 768px and up) */
@media (min-width: 768px) {


}

/* // Large devices (desktops, 992px and up) */
@media (min-width: 992px) {
.navbar {
padding-top:15px;
padding-bottom:15px;
background-color: white;
}
.navbar-
brand{ padding-
left: 5px;
}
.navbar-nav
{ margin-left:
30px;
}
.nav-item
{ padding-
left:5px;
}
.donate-
sponsor{ margin-
right:10px;
}
#donate,#sponsor{
margin:5px;
padding: 5px 15px 5px 15px;
}
.homepage-header{
background: url('../img/group.JPG');
background-size: cover;
```

```css
background-position: center top;
padding: 0;
position: relative;
width: 100%;
overflow: hidden;
display: -webkit-flex;
display: -ms-flexbox;
display: flex;
height: 85vh;
}
.home-for-children
{ background-color:
#ffeeba;margin-top:0px;
padding-top:10px;
padding-bottom:30px;
}
.home-for-children h2 {
line-height: 2.5rem !important;
letter-spacing: 3px;
font-weight: 600;
}
.home-for-children h5
{line-height: 1.8rem;
}
.home-for-children .btn-success
{padding: 8px 25px;
font-size: large;
}
/* our focus */
.our-focus .container
{ margin-
top:3rem !important;
}

.our-focus .row{
margin-top:1.5rem !important;
}
.our-focus .card {
```

```css
border: none !important;
}
.our-focus #focus-first
{margin-right:80px;
}
.our-focus #focus-second
{margin-right:90px;
}
/* media */
.media .container{
margin-top: 3rem !important;
}
.media .row{
margin-top: 1.5rem !important;
}
/* footer */
.row-initiative
{margin-top:10px
}
.site-footer
{ margin-top:30px;
line-height:24px;
}
.footer-links
{ padding-left:0;
list-style: none;
}
.footer-links li
{display: block;
}
.footer-links.inline li
{display: inline-block;
}
.footer-links li
a{color: black;
}
.footer-logo img{
```

```css
  width: 100px;
}
.social-icons
{ text-align:
right;margin-
left:50px;
}
.social-icons
li{list-style:
none;
display: inline-block;
}
.social-icons li a
{border-radius: 50%;
margin-left:10px;
}
input
{ padding:10px
20px;
}
#button
{ border:none;
padding:10px 20px;
border-radius:10px;
animation:pulse 3s infinite ease-out;
}
}

/* // X-Large devices (large desktops, 1200px and up)
*/
@media (min-width: 1200px) {
.navbar-
brand{ padding-left:
10px;
}
}

/* // XX-Large devices (larger desktops, 1400px and up)
*/
@media (min-width: 1400px) {
.navbar-
brand{ padding-left:
```

15px;

```
                }
                }
```

app.py

```python
from
collectio
ns import
UserDict
        from flask import Flask,render_template,request,redirect,url_for,session
        import ibm_db
        import re


        app =Flask(__name__)
        app.secret_key='a'

        conn=ibm_db.connect("DATABASE=bludb;HOSTNAME=19af6446-6171-4641-8aba-
        9dcff8e1b6ff.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud;PORT=30699;SECURITY=SSL;SSLSer
        Mcd7x6",'','')
        @app.route('/')
        def home():
        return render_template('home.html')


        @app.route('/login',methods =['GET','POST'])
        def login():
        global userid
        msg=''

        if request.method=='POST':
        username =request.form['username']
        password=request.form['password']
        sql="SELECT * FROM users WHERE username =? AND password=?"
        stmt =ibm_db.prepare(conn,sql)
        ibm_db.bind_param(stmt,1,username)
        ibm_db.bind_param(stmt,2,password)
        ibm_db.execute(stmt)
        account=ibm_db.fetch_assoc(stmt)
```

```python
print(account)
if account:
session['loggedin']=account['USERNAME']
session['id']=account['USERNAME']
userid=account['USERNAME']
session['username']=account['USERNAME']
msg= 'logged in succesfully !!!'


return render_template('dashboard.html',msg=msg)


else:
msg='incorrect'


return render_template('login.html',msg=msg)
@app.route('/register',methods=['GET','POST'])
def register():
msg=''
if request.method =='POST':
username =request.form['username']
email=request.form['email']
password=request.form['password']
sql="SELECT * FROM users WHERE username =?"
stmt=ibm_db.prepare(conn,sql)
ibm_db.bind_param(stmt,1,username)
ibm_db.execute(stmt)
account=ibm_db.fetch_assoc(stmt)
print(account)
if account:
msg='Account already exist'
elif not re.match(r'[^@]+@[^@]+\.[^@]+',email):
msg='invalid email address !'
elif not re.match(r'[A-Za-z0-9]+',username):
msg='Name must contain char and number'
else:
insert_sql="INSERT INTO users VALUES (?,?,?)"
prep_stmt=ibm_db.prepare(conn,insert_sql)
ibm_db.bind_param(prep_stmt,1,username)
```

```python
        ibm_db.bind_param(prep_stmt,2,email)
        ibm_db.bind_param(prep_stmt,3,password)
        ibm_db.execute(prep_stmt)
        msg='you have successfully registered '
    elif request.method =='POST':
        msg="Please fill out the form"
    return render_template('register.html',msg=msg)


@app.route('/dashboard')
def dash():
    return render_template('dashboard.html')


@app.route('/apply',methods=['GET','POST'])
def apply():
    msg=''
    if request.method =='POST':
        username =request.form['username']
        email=request.form['email']
        qualification=request.form['qualification']
        skills =request.form['skills']
        jobs=request.form['s']
        sql='SELECT * FROM users WHERE username =?'
        insert_sql="INSERT INTO job VALUES (?,?,?,?,?)"
        prep_stmt=ibm_db.prepare(conn,insert_sql)
        ibm_db.bind_param(prep_stmt,1,username)
        ibm_db.bind_param(prep_stmt,2,email)
        ibm_db.bind_param(prep_stmt,3,qualification)
        ibm_db.bind_param(prep_stmt,4,skills)
        ibm_db.bind_param(prep_stmt,5,jobs)
        ibm_db.execute(prep_stmt)
        msg='you have successfully applied for job '
        session['loggedin']=True
    elif request.method =='POST':
        msg="Please fill out the form"
    return render_template('apply.html',msg=msg)


@app.route('/display')
```

```python
def display():
print(session["username"],session["id"])
cursor=mysql.connection.cursor()
cursor.execute('SELECT * FROM job WHERE userid = %s',(session['id']))
account=cursor.fetchone()
print("accountdisplay",account)


return render_template('display.html',account=account)


@app.route('/logout')
def logout():
session.pop('loggedin',None)
session.pop('id',None)
session.pop('username',None)


return render_template('home.html')


if___name__=='__main__':
app.run(host='0.0.0.0')
```

deployment.yaml

```yaml
apiVersion:
apps/v1
kind: Deployment
metadata:
name: job
spec:
replicas: 3
selector:
matchLabels:
app: job
template:
metadata:
labels:
app: job
spec:
```

```
        containers:
        - name: job
        image: karolinpreethy/jobportal11
        imagePullPolicy: Always
        ports:
        - containerPort: 5000
```

service.yaml

```
ap
iV
er
si
o
n:
v1
    kind: Service
    metadata:
    name: job
    spec:
    ports:
    - port: 5000
    targetPort: 5000
    selector:
    app: job
```

13.2 Github Link