

“HireTrends”

*A project report submitted in partial fulfillment of the requirements
for the Award of Degree,*

Bachelor of Technology
in
Computer Science & Engineering
With Specialization in Open Source Software and Open Standards

By

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College of Engineering Studies
Centre for Information Technology
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Bidholi, Via Prem Nagar, Dehradun, Uttarakhand
March – 2015



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CANDIDATE’S DECLARATION

We hereby certify that the project work entitled “ **HireTrends.com**“ in partial fulfilment of the requirements for the award of the Degree of BACHELOR OF TECHNOLOGY in COMPUTER SCIENCE AND ENGINEERING with specialization in Open Source Softwares and Open Standards and submitted to the Department of Computer Science & Engineering at Center for Information Technology, University of Petroleum & Energy Studies, Dehradun, is an authentic record of our work carried out during a period from **August, 2014** to **December, 2014** under the supervision of **Mr. Pratyush Kumar Deka, Assistant Professor, CIT.**

The matter presented in this project has not been submitted by me/ us for the award of any other degree of this or any other University.

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This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

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ABSTRACT

HireTrends.com is a web based application which uses the recruitment data extracted from LinkedIn to analyze and represent the current industry hiring trends on the basis of:

- **Skill Set** || Since^[1] there are thousands of individual skills that you could list on ones LinkedIn profile, the first thing we did was group these skills into meaningful categories, in order to give us the best chance of making sense of all the data.
- **Educational Institution** || The Institution and the qualification of the candidate who has been approached by the recruiter.
- **Location** || The Geo-Location of the candidate who has been recruited.

The profile information is extracted form LinkedIn using Python scripts which contains various functions to specifically extract the Skills, Educational Institution and Location. The functions make use of Regular Expressions to extract the desired text from the regular string. Then the desired text is stored in database.

For the Analysis we have chosen 10 IT companies namely:

- Google
- Facebook
- Microsoft
- IBM
- Infosys
- Wipro
- Adobe
- Oracle
- Amazon
- Apple

These companies are the most desirable and highest recruiters in the IT industry.

Keywords: HireTrends, HR Analytics, Recruitment Analysis, Hiring Trends, Top Companies, Skill Analysis, Recruitment portal, Learn Skills, College Recruitment.

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INTRODUCTION



History:

Recruitment^[3] can be defined as the search and selection process to find qualified candidates for job openings within organizations. Trends in the industry not only affect recruiting organizations, but hiring organizations as well. Understanding trends in the industry aids recruiting professionals in allocating resources effectively, staying competitive and continuing to successfully fill job openings.

- **Short-Term Trends** || Short-term^[4] trends are typically based on current economic conditions that often result in more or fewer available qualified candidates for different industries. For recruiting firms in a niche industry, economic conditions that affect the industry can lead to less work and less profitability. Since 2008, The Bureau of Labour Statistics reports, the manufacturing industry continues to show the highest unemployment claims. Recruiting professionals who understand these trends can start new initiatives to recruit in other industries, as well as to assist their employers or clients in preparing for potential economic downturns. This can include helping employees who may be laid off to find other employment opportunities or learn new skills.

- **Long-Term Trends** || Long-term trends often stem from employer surveys, educational statistics and long-term government initiatives. These three factors have created job growth in industries such as health care, engineering and technology, all of which are expected to continue to grow through at least 2018. Demands in the health care occupations is expected to increase due to a lower percentage of students enrolling in related programs, the increased need to care for an elderly population.

Literature Review:

LinkedIn ^[5] is a business-oriented social networking service. Founded in December 2002 and launched on May 5, 2003 it is mainly used for professional networking. As of 2013, LinkedIn has more than 300 million members in over 200 countries and territories. It is significantly ahead of its competitors Viadeo (50 million) and XING (10 million). The membership grows by approximately two new members every second. With 20 million users, India has the fastest-growing network of users as of 2013. From September 2012, LinkedIn allows users to endorse each other's skills. This feature also allows users to efficiently provide commentary on other user profiles – network building is reinforced.

Currently there are various job portals which reflect the current need of the industry but do not analyze the recruitment trends. Other Websites which analyze Recruitment Patterns:

- analysisRecruitment.com
- citehr.com

These websites work on the data acquired from surveys and old databases which lead to biased results which cannot be trusted.

The ^[2] results of this analysis represent the world seen through the lens of LinkedIn data. As such, it is influenced by how members choose to use the site, which can vary based on professional, social, and regional culture, as well as overall site availability and accessibility. These variances were not accounted for in the analysis. Massive data, insight and long term partnerships between

public authorities, educational institutions and companies is necessary to ensure the most optimal match between skills and Company Demand.

Technology Structure

Python [6] is a widely used general-purpose, high-level programming language.



Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C++ or Java. The language provides constructs intended to enable clear programs on both a small and large scale.

Chart.js [7] is a JavaScript charting framework which uses HTML5 canvas element to give the user 6 different ways to show the statistical representation of the data with easy customization. Chart.js makes responsive graphs which provides perfect scale granularity. It is Modular and provides Interactive and provides interactive canvas tooltips



jQuery [8] is a fast, small, and feature-rich JavaScript library. It makes things like HTML document traversal and manipulation, event handling, animation, and Ajax much simpler with an easy-to-use API that works across a multitude of browsers. With a combination of versatility and extensibility, jQuery has changed the way that millions of people write JavaScript.



Ajax ^[9] (short for **asynchronous JavaScript** and **XML**) is a group of interrelated Web development techniques used on the client-side to create asynchronous Web applications. With Ajax, web applications can send data to and retrieve from a server asynchronously (in the background) without interfering with the display and behavior of the existing page. Data can be retrieved using the XMLHttpRequest object. Despite the name, the use of XML is not required (JSON is often used in the AJAX variant), and the requests do not need to be asynchronous.



HTML 5, CSS 3 & JavaScript:



HTML5 ^[10] is a core technology markup language of the Internet used for structuring and presenting content for the World Wide Web. As of October 2014 this is the final and complete fifth revision of the HTML standard of the World Wide Web Consortium (W3C). The previous version, HTML 4, was standardized in 1997.

Its core aims have been to improve the language with support for the latest multimedia while keeping it easily readable by humans and consistently understood by computers and devices (web browsers, parsers, etc.).

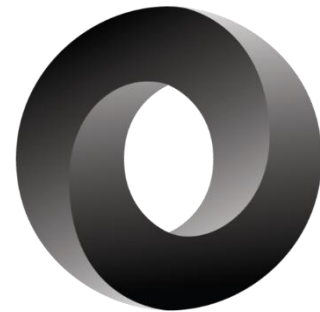
Cascading Style Sheets (CSS) ^[11] is a style sheet language used for describing the look and formatting of a document written in a markup language. While most often used to change the style of web pages and user interfaces written in HTML and XHTML, the language can be applied to any kind of XML document, including plain XML, SVG and XUL. Along with HTML and JavaScript, CSS is a cornerstone technology used by most websites to create visually engaging webpages, user interfaces for web applications, and user interfaces for many mobile applications.

JavaScript (JS) ^[12] is a dynamic computer programming language. It is most commonly used as part of web browsers, whose implementations allow client-side scripts to interact with the user, control the browser, communicate asynchronously, and alter the document content that is displayed. It is also used in server-side network programming with frameworks such as Node.js, game development and the creation of desktop and mobile applications.

JSON or JavaScript Object Notation ^[13] is an open standard format that uses human-readable text to transmit data objects consisting of attribute–value pairs. It is used primarily to transmit data between a server and web application, as an alternative to XML.

Although originally derived from the JavaScript scripting language, JSON is a language-independent data format. Code for parsing and generating JSON data is readily available in a large variety of programming languages.

The JSON format was originally specified by Douglas Crockford. It is currently described by two competing standards, RFC 7159 and ECMA-404. The ECMA standard is minimal, describing only the allowed grammar syntax, whereas the RFC also provides some semantic and security considerations. The official Internet media type for JSON is application/json. The JSON filename extension is .json.



PHP ^[14] is a server-side scripting language designed for web development but also used as a general-purpose programming language. As of January 2013, PHP was installed on more than 240 million websites (39% of those sampled) and 2.1 million web servers. Originally created by Rasmus



Lerdorf in 1994, the reference implementation of PHP (powered by the **Zend Engine**) is now produced by The PHP Group. While PHP originally stood for Personal Home Page, it now stands for PHP: Hypertext Preprocessor, which is a recursive backronym.

OBJECTIVE

Main Objective:

To Develop a Web Based Application to present the current recruitment trends of various organizations using LinkedIn Data on the basis of personalized skill-sets of individuals, educational institutions and location.

Sub Objectives:

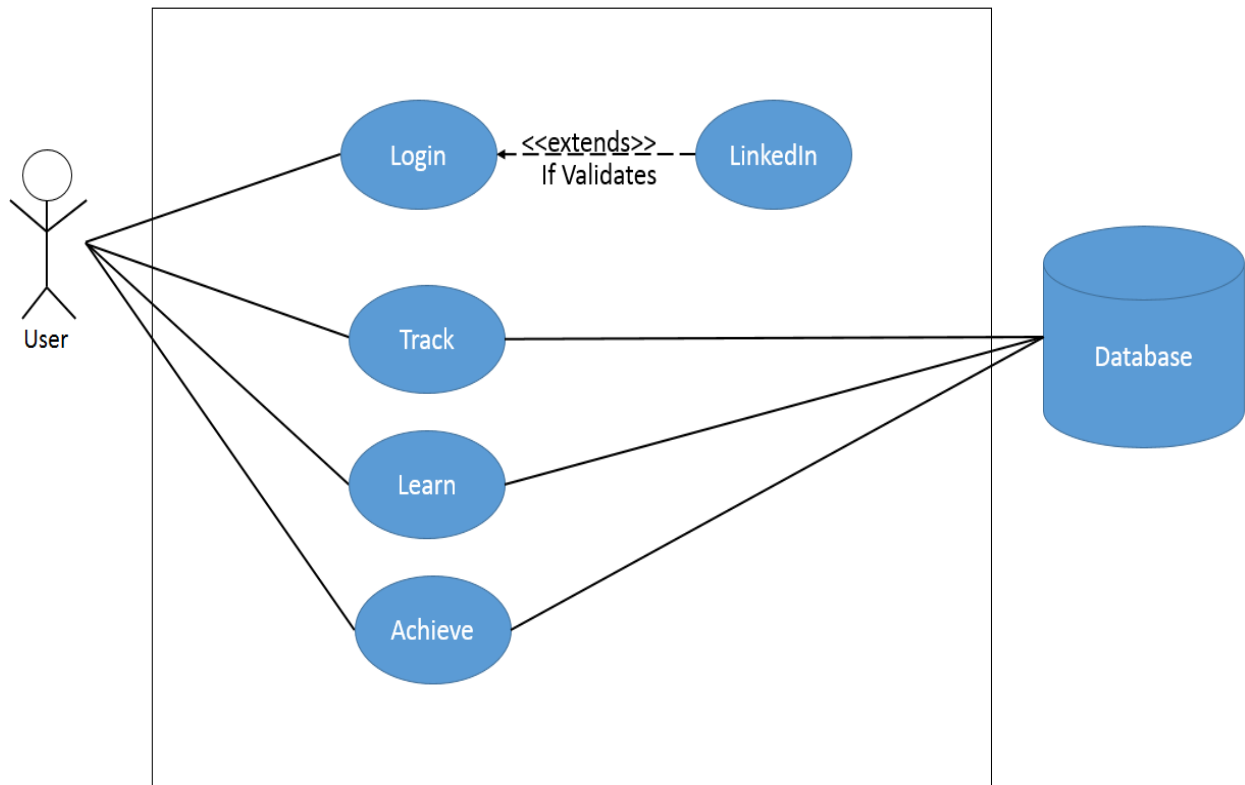
To develop a Web Based Application that is able to represent hiring trends on the basis of data gathered from the various online resources such that one can predict the skill set required for recruitment in the coming years.



DESIGN

Modules & Workflows:

Use Case Diagram



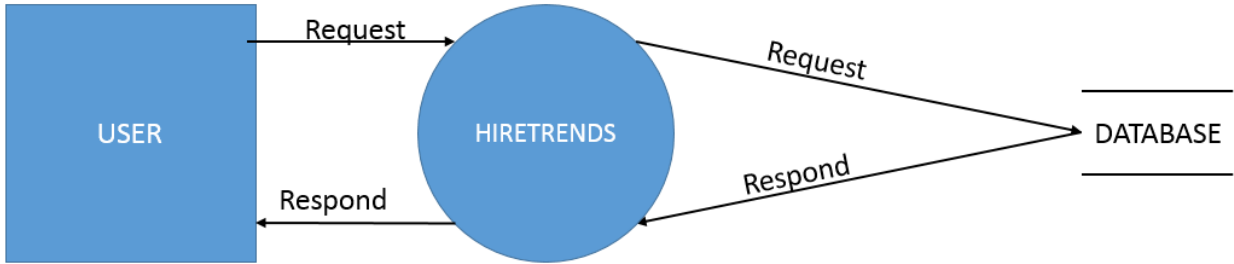
Use Case Diagram Fig. 1

A Use Case Diagram is the simplest representation of the user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved in. A use case diagram can identify the different types of users of a system.

This Use Case Diagram identifies 2 acting entities i.e. the user and the database. The user can perform certain functions such as Track Learn and achieve for which the user interacts with the Database. For getting access to this information the user needs to login first. The login module is accessed by the user directly and the login

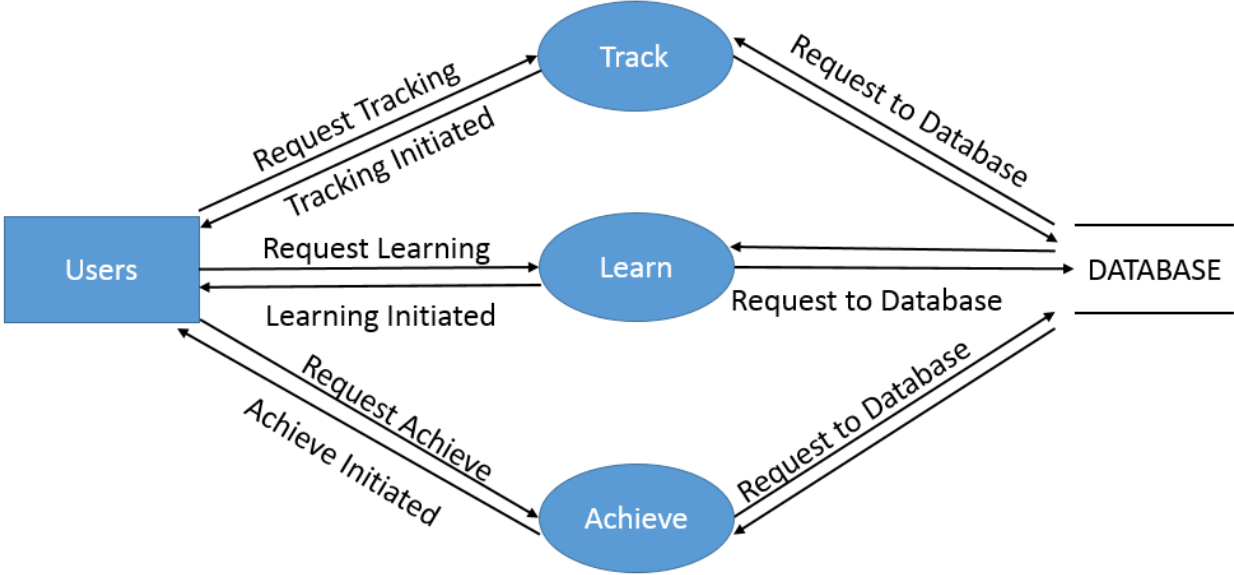
Data Flow Diagram

Context-level data flow diagram



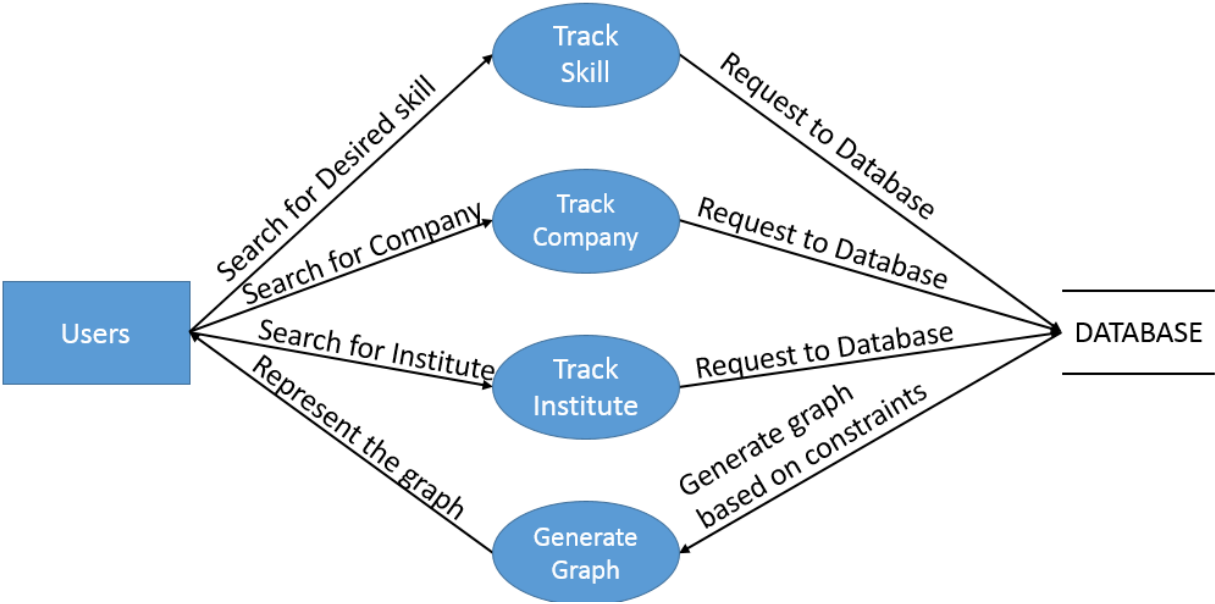
Context Level Diagram Fig. 2

Level-1 Data Flow Diagram



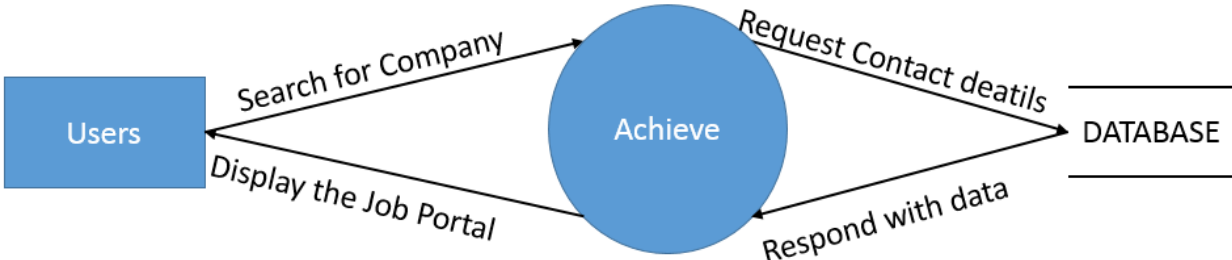
Level-1 Data Flow Diagram Fig. 3

Level-1.1 Data Flow Diagram



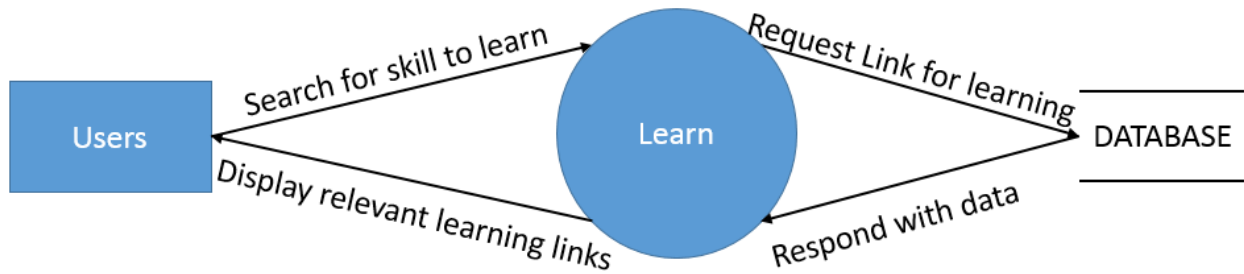
Level 1.1 Data Flow Diagram Fig. 4

Level 1.2 Data Flow Diagram



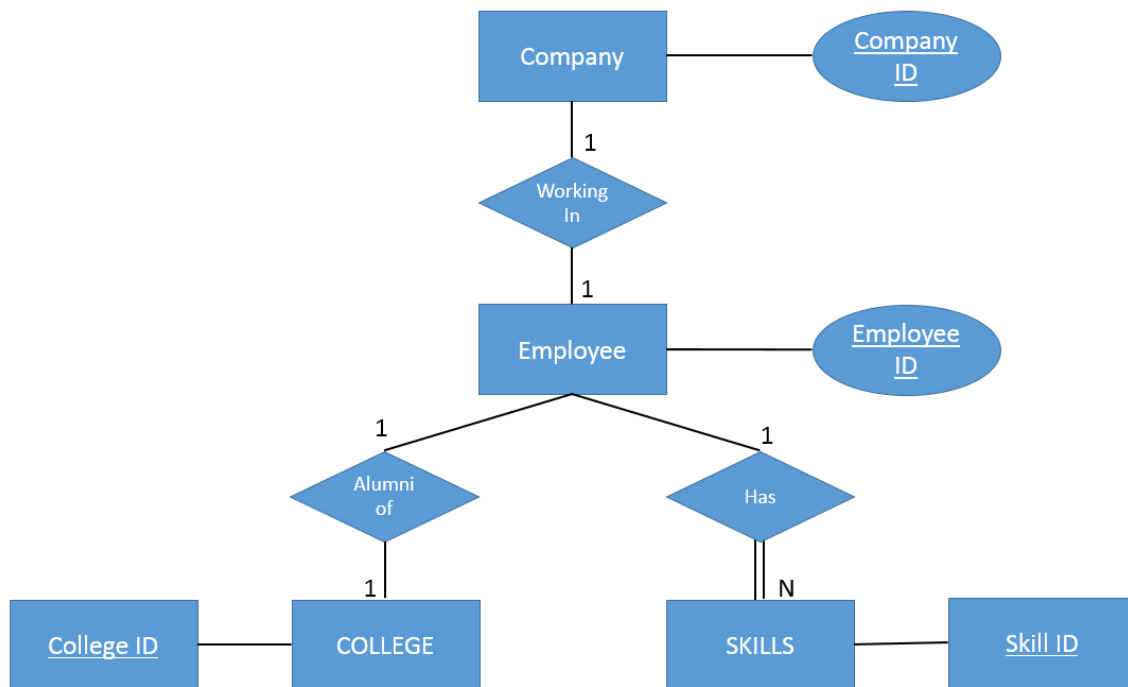
Level 1.2 Data Flow Diagram Fig. 5

Level 1.3 Data Flow Diagram



Level 1.2 Data Flow Diagram Fig. 5

Entity Relationship Diagram



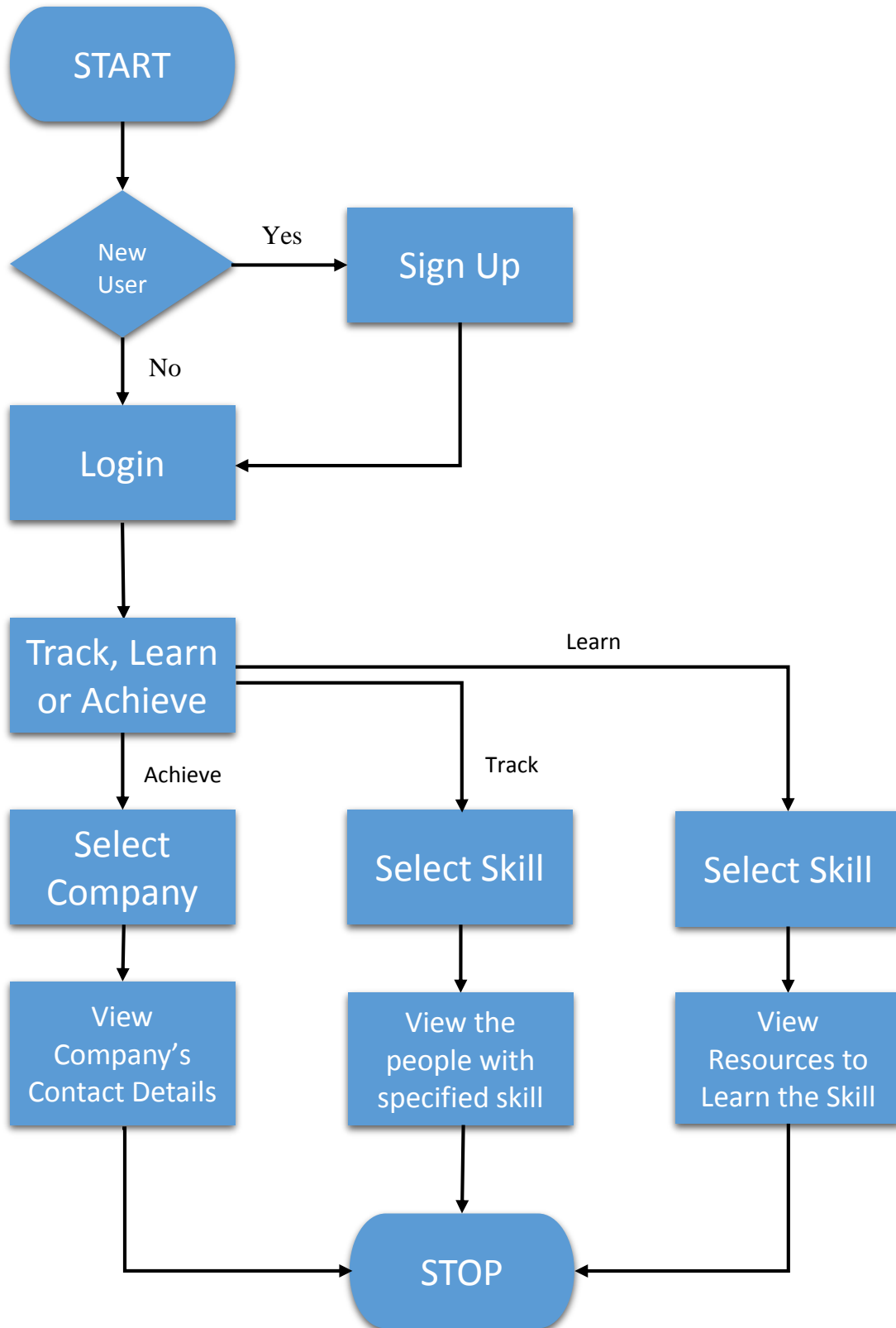
ER Diagram Fig. 6

Entity Relationship Diagram a graphical representation of entities and their relationships to each other, typically used in computing in regard to the organization of data within databases or information systems. An entity–relationship model is a systematic way of describing and defining a business process. The process is modeled as components (entities) that are linked with each other by relationships that express the dependencies and requirements between them.

The Employee entity has the attribute Employee ID which is the primary key of the table. The Employee related to associated company having a One to One relationship. The Employee is also having a One to One relation with the College from which the Employee graduated. Lastly the Employee is in a One to Many Relationship with skill.

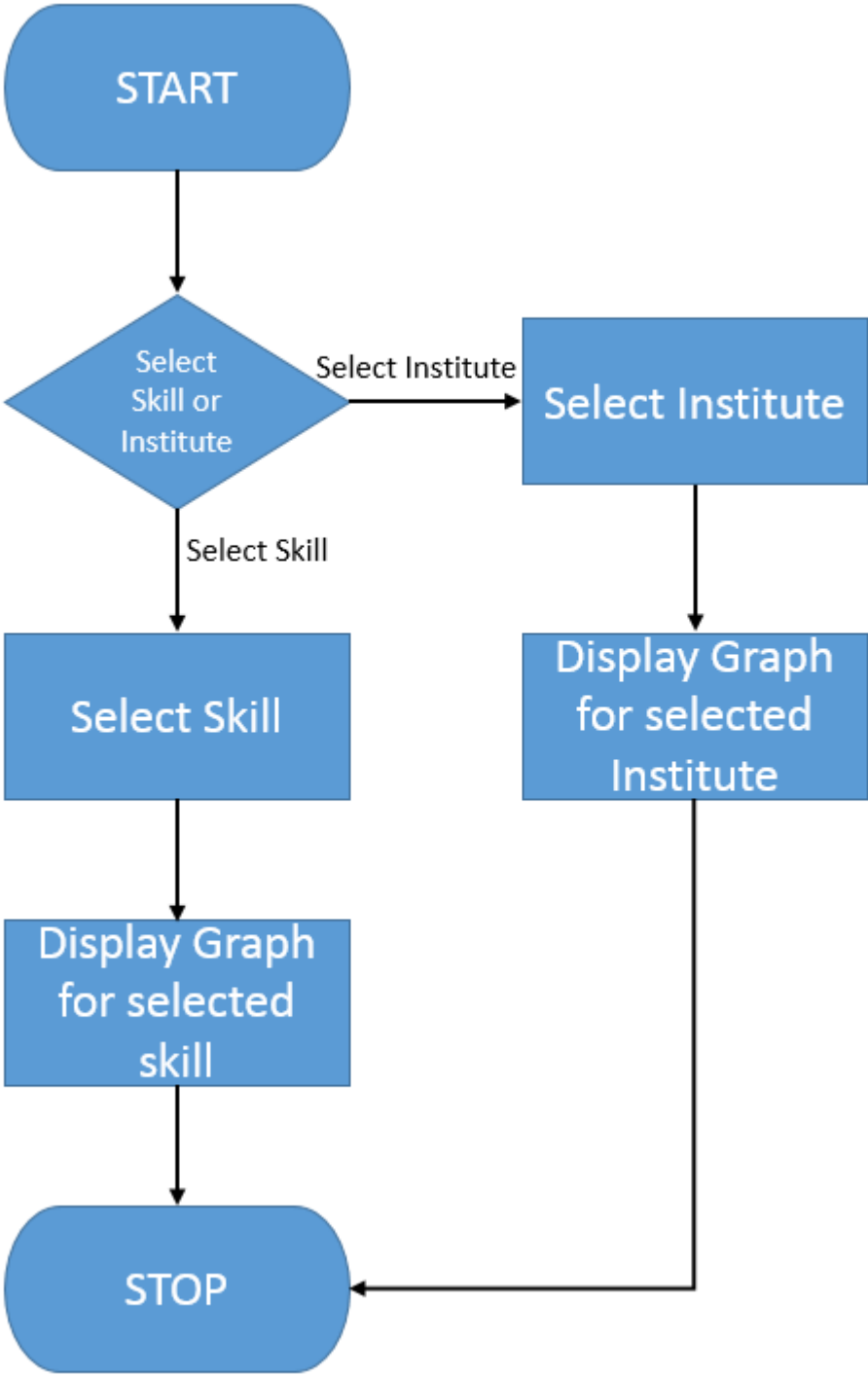
College has College ID as the primary key.

Activity Diagram



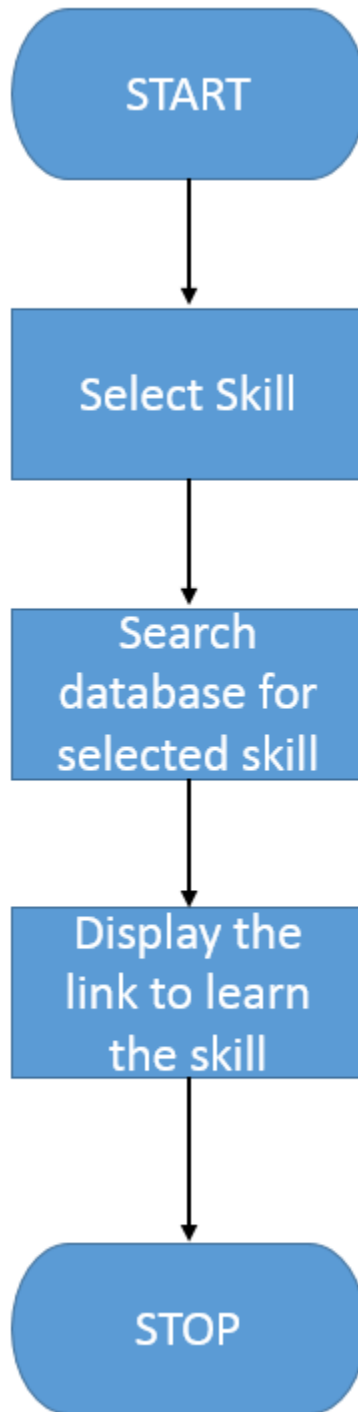
HireTrends Activity Diagram Fig. 7

Track



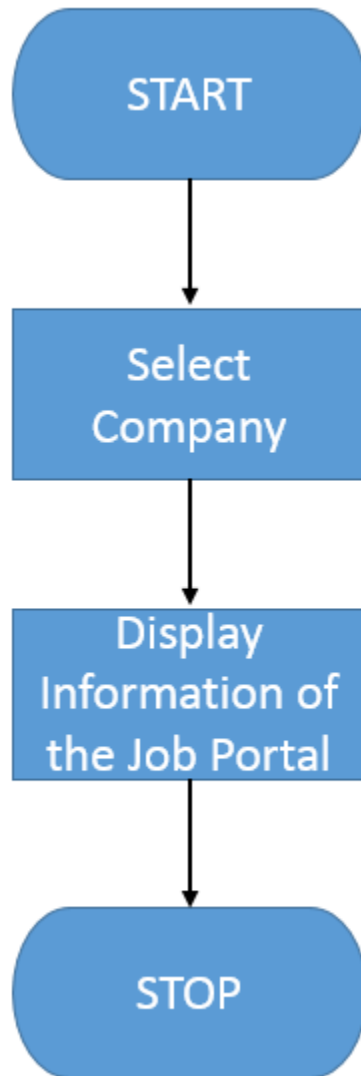
Track Activity Diagram Fig. 8

Learn



Learn Activity Diagram Fig. 9

Achieve



Achieve Activity Diagram Fig. 10

The Activity Diagram is the graphical representation of the workflows of stepwise activities and actions with support for the choice iteration concurrency. This activity diagram shows the flow user through different modules. The user first chooses between the three available modules.

- Track
- Learn
- Achieve

Then after choosing the module one we can query the module with the constraints.

Track module consists of tracking the skill and its presence in the companies. This means using the database to access the information of the entered skill and in which companies it is present. This leads to a resultant donut graph which represents the abundance of the skill in the company. Moreover the user gets an option between skill and Institute. The user can access the database to look into the institutes from which

Learn module deals with the secondary aim of HireTrends i.e. availability of a medium to learn the skill that is in the desired company. For this the user can see list of top 50 most searched skills on the website and link/access to learn the particular skill.

Achieve module consists of the end product which the user gets after he is able to track the skills he needs to enter the company and he is able to **Learn** the skill that is required by the company. The user can access the job portals where the user can upload his/her Resume to apply in a particular company for a particular post of his dream job.

Algorithms:

An algorithm ^[15] is a procedure for solving a problem in terms of the actions to be executed and the order in which those actions are to be executed. An algorithm is merely the sequence of steps

taken to solve a problem. The steps are normally "sequence", "selection", "iteration" and a case-type statement.

Data Extraction

FETCH the link to the company URL on the specified website.

STORE each Link (URL) of the particular company in the array.

FOR each entry in the array

 GET_Profile_Details of each entry in the list (array).

ENDFOR

GET_Profile_Details

FETCH Link of each Profile

STORE details of the employee in an array

TRANSFER details of the employee to the database

Identify Colleges with Respect to Companies

FETCH Employee ID of a selected company

FETCH Name of College of the selected Employee

While College names are in list

IF College is existing

Increment the counter for the Company

ELSE

Add the College in the database and increment the counter

Identify Skills with Respect to Company

FETCH Employee ID of a selected company

FETCH Skills of the selected Employee

While Skill names are in list

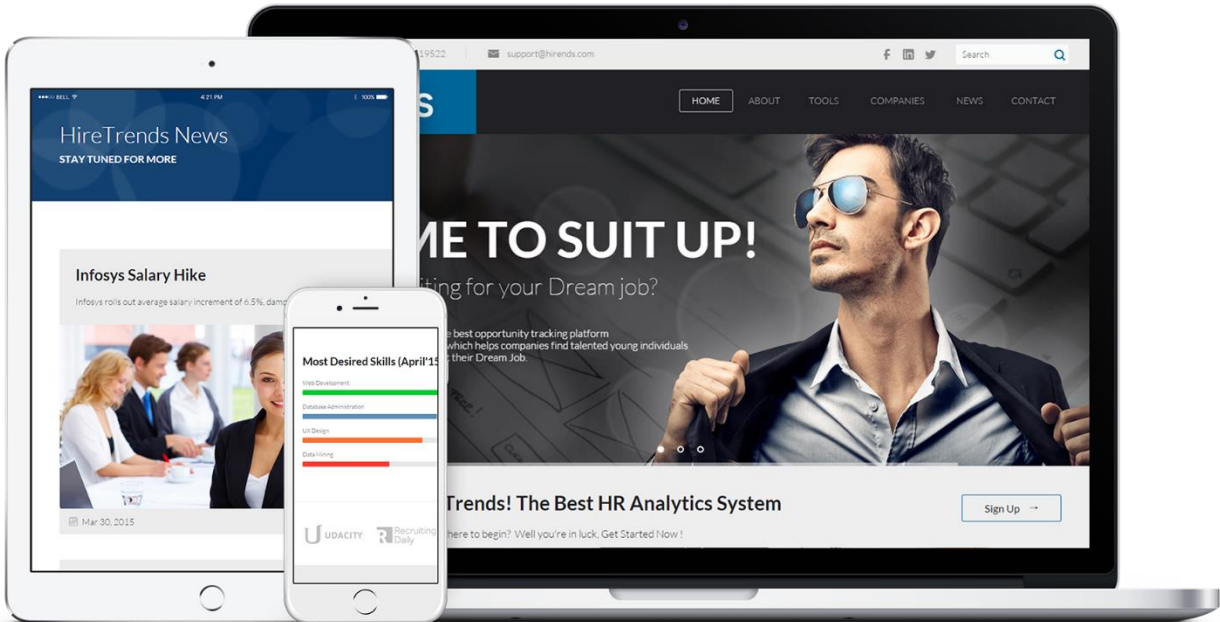
IF Skills is existing

Increment the counter for the Skill

ELSE

Add the Skill in the database and increment the counter

SCREENSHOTS



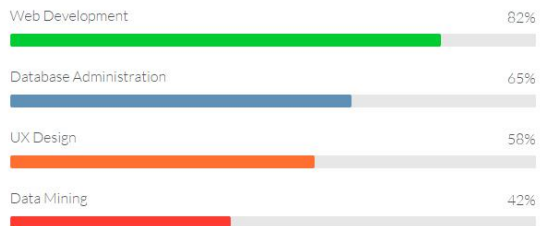
Testimonials

Curabitur fringilla ipsum id quam lacinia venenatis vitae. Suspendisse potenti. Nunc sodales dolor at justo posuere vitae pretium magna rhoncus. Curabitur fringilla ipsum id quam lacinia venenatis. Suspendisse potenti. Nunc sodales dolor at justo posuere vitae pretium magna rhoncus. Curabitur fringilla ipsum id quam lacinia venenatis vitae.



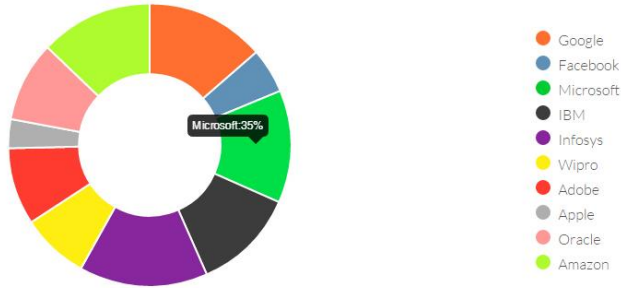
Franck Southbird
Sunspot Networks

Most Desired Skills (April '15)



SCREENSHOTS

Java



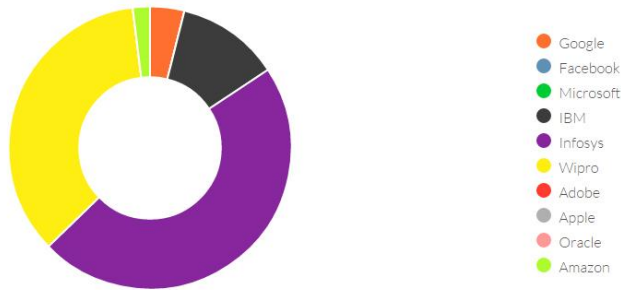
3 Steps to Success

TRACK	The Tracking Tool is one of the best features of our
LEARN	application. It lets you track

Top Tracked Skills



University of Petroleum and Energy Studies



3 Steps to Success

TRACK	The Tracking Tool is one of the best features of our
LEARN	application. It lets you track

Top Tracked Institutes



SCREENSHOTS



- Stanford University
- University of California, Berkeley
- University of Texas
- San Jose State University
- University of Waterloo
- York University
- Indian School of Business
- University of Michigan
- Cornell University
- University of Southern California

Top 10 Employee Skills



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Email (Required)

Subject

Your Message

Contact Details

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Dehradun

Email support@hirends.com

Skype HireTrends
hirends_support

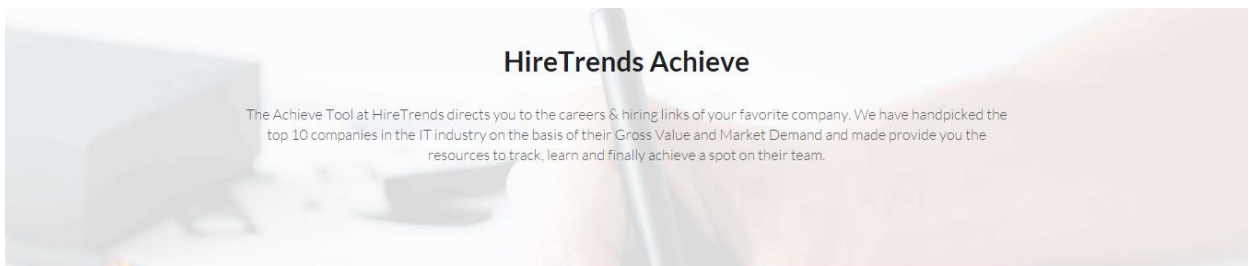
Submit

SCREENSHOTS



Resource Directory

HireTrends Skill	Provider	Online Resource
Java	Courseera	https://www.coursera.org/course/initprogjava
Python	Courseera	https://www.coursera.org/course/interactivepython
Linux	Courseera	https://www.coursera.org/course/os
C++	Courseera	https://www.coursera.org/course/cplusplus4c
C	Courseera	https://www.coursera.org/course/c



Resource Directory

The Top Grossing	The Desirable 5
Microsoft	Google
Oracle	Adobe
Infosys	Apple
IBM	Wipro
Facebook	Amazon

CONCLUSION

During the due course of this project we learnt a lot, starting from understanding the Data extraction concepts and implementing it using Python scripts. Then moving over to backend integration storing the fetched data into the. Also because of the vast scope of this project we had to analyze a bulk of data, which created issues like redundancies and garbage values. Therefore various data cleaning measures had to be implemented to ensure accurate results.

In this project we also paid special attention to the User Experience and Interface Development, so that the users of our application can get the best out of it with no hassle at all. HireTrends utilizes the best and the latest JavaScript Frameworks to generate intuitive graphs for the users.

All in all, this project helped us to understand various web development and data handling technologies, and also made us realize the importance of Planning, Dedication and Teamwork in building a successful product.

Future Scope

The project can further be implemented into practical use for larger number of companies and job seekers to find their future employees and dream jobs respectively. Moreover the portal can extend to expanded learning platform for students through interactive University tutorials and the Skills taught in a particular Institute can also be recorded and represented on the portal. Further a Hybrid Mobile Application for the user to track his skills on the go. Over that a personalized interactive portal for users to track their progress to achieve their goals using HireTrends as a Learning and Career counselling tool. Finally artificial intelligence can be used to improve users experience and add additional features.

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Web Links

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6. <https://www.python.org/about/>
7. <http://www.chartjs.org/>
8. <https://jquery.com>
9. http://en.wikipedia.org/wiki/Ajax_%28programming%29
10. <http://en.wikipedia.org/wiki/HTML>
11. www.w3schools.com/css/
12. <http://www.w3schools.com/js/>
13. <http://json.org/>
14. <http://php.net/docs.php>
15. <http://www.unf.edu/~broggio/cop2221/2221pseu.htm>