Abstract­ –

Many individuals like working professionals, students, and house makers often find lack of time and time management as problems for successful task accomplishment. One of the key reasons for failure in task accomplishment is improper and under optimized planning of the tasks. There are many task management and to do list applications in the today app market, but most of them will not advise on optimal task management and guidance for optimal performance. This problem has driven us to contribute to a task recommender system which suggests a specific type of tasks for a user based on his previous history of tasks and based on the factors at that particular time. This system not only suggests a specific type of task for the user but also collects feedback from the user to make the recommender system learn on how to provide useful recommendations thus making the users time much productive.

Introduction –

Striving to be productive remains a challenge for many workers, professionals and students alike. Various researches and surveys state the following statistics:

* 23% of workers say they are **dissatisfied** with their work/life balance, up from 18% in 2008. Harris Interactive for CareerBuilder, 11/2009
* 70% of employees **work beyond scheduled time and on weekends**; more than half cited "self-imposed pressure" as the reason.   
  Society for Human Resource Management, Spring 2009
* Senior executives polled said the **average length of a lunch break was 35 minutes**. They worked through lunch an average of three times per week.  
  Office Team, "Table for None," 9/17/2008
* The survey, conducted by Greenfield Online, found that nearly half of college students (47 percent) feel their high school did not prepare them with the organizational skills required to do well in college. And 54 percent felt they would get better grades if they "got organized and stayed organized."
* Same survey states that 87 percent of students say that better time management and organization skills would help them get better grades.
* 40% of adults say **if they had more time**, they would **spend it with family**, Day Runner Survey

Due to this reason many individuals are facing stress related problems, various researches provide us following statistics:

* **71% of white-collar workers feel stressed** about the amount of information they must process and act on while doing business; 60% feel overwhelmed.   
  Institute of the Future, Menlo Park, CA
* At the Mayo Clinic **80 to 85% of patients were ill**, directly or indirectly **because of mental stress**.   
  Mayo Clinic study

To recover from these sort of problems, spending time in organizing daily tasks would be helpful. Research says that:

* For **every hour of planning**, **3 to 4 hours are saved** from redundancy, waiting for information, not being prepared and poorly managed tasks (<https://www.simplyproductive.com/2012/03/time-management-statistics/>)
* 10-12 minutes invested in planning your day will save at least 2 hours of wasted time and effort throughout the day - from "Eat the Frog" by Brian Tracy.

With new age advancements in information technology, we have lot of applications which focus on time and task management. Task and time management tools such as Todoist [3]  
Wunderlist [4] allow users to add and track tasks. However, these tools do not have a mechanism for suggesting tasks to be done at a specific time. Hence, users are left on their own to plan their daily schedule. Further, these tools have implemented some visual analytics to help users to understand their productivity, and how it changes over time.

Driven by the importance of time and task management and lack of the tools which suggest a specific task for specific time, we are inspired by the research question: “Based on the user’s history of completed tasks, can we recommend certain task types to be done at certain days of  
the week and/or times of day to increase user’s productivity?”. To answer this question we contribute TaskDo(*working title*) a task recommender system which suggests a specific task to be done on certain days of the week and/or at certain times of the day. In generating the recommendations, the system will rely upon the history of user’s task completion. For  
example, since the system has observed that Adam tends to complete his chores at a shorter time on weekends in the morning, the system will recommend to Adam that he does his  
chores in the morning on weekends. This is a simple case, but it illustrates the point of the system learning about user’s habits of task completion, and suggesting what is believed to best the best time for a specific type of task. Our initial thought is that the recommendations of task types will be affected by many variables such as day of the week, time of day, whether the task is done indoors or outdoors, whether the task is intellectual or physical, and so on.

Related Work:

The related work can be divided into two segments 1) Task Management applications and 2) Recommender Systems

1. Task Management Applications:

Many task and time management tools allow users to manage their tasks and times. These tools operate based on the simple idea of allowing users to add tasks, set due dates to them, and complete them when they can. However, these tools do not assist users in planning their daily or weekly schedule with tasks that users may be able to complete to increase productivity. There are some popular task management applications such as Wunderlist (<https://www.wunderlist.com/>) which focuses on organization of tasks into folders, hosting communication for tasks which involve multiple people, Adding remainders, setting due dates and related notifications and so on. There is one more popular application called Todoist (<https://en.todoist.com/>) which has most of the functions of Wunderlist and it has additional features like organizing tasks into separate projects, and tracking user’s productivity with help of various types of visual analytics which demonstrate task progress, task completion and pending tasks with help of bar graphs, pie charts and so on. However these tools do not recommend users suitable type of tasks for a specific day and time.

Timeful [5] was an application that aimed at understanding users’ habits and schedules by asking users how often and when they want to do things. The system then assists users with planning their schedule. The idea seems promising, but the application is currently unavailable, which makes it hard to evaluate the accuracy of the application.

1. Recommender Systems:

Recommender systems are used to filter out user relevant data from enormous amount of data based on the ranking of recommendations. Using recommender systems can be beneficial for both producers and consumers because they filter out huge amount of irrelevant data which might use extra resources with no productivity. There are two main types of recommender systems used in most of the applications, the generic definitions for them are:

1) Collaborative Filtering: Collaborative filtering recommends items by identifying other users with similar taste (Isinkaye, F. et.al, 2015).

2) Content Based Filtering: Content based filtering recommends items based on the user profile, it does not take other users into consideration (Isinkaye, F. et.al, 2015).

Martínez, A. B., Arias, J. P., Vilas, A. F., Duque, J. G., & Nores, M. L have designed a system which recommends T.V shows for the users using both content based and collaborative filtering. They have implemented a hybrid model using both the techniques because to avoid the cold start problem (no recommendations when starting off) which is caused by collaborative filtering and to avoid over specialization problem (showing only very few items from user profile) caused by content-based filtering. (Martínez, A. B. et.al, 2009).

Bagher, R. C., Hassanpour, H., & Mashayekhi, H have defined a model to estimate user personal interests by using collaborative filtering. They have implemented profile matching and latent factors as two main approaches for modelling the user. They have built this using Bayesian non-parametric model, which provides as a framework for constructing an evolutionary model. (Bagher, R. C., Hassanpour, H., & Mashayekhi, H, 2017).

1. Design

Task Do (Working Title) is an application which provides recommendations for a specific user for a specific day and specific time of the day based on the user’s previous task history. In the process of constructing this task recommender system we found out that there are various dependent and independent variables. Inorder to explain this, the design of TaskDo(Working Title) can be divided into following subsystems.

1. System Architecture

Task DB

User Task preferences and completion feedback

Recommendations

Recommender System

UI

User Feedback

Analysis and Visualization

Reports and Productivity Feedback

Figure 1 shows the system architecture for TaskDo, task recommender system. Firstly, users enter their tasks and related variables (will be explained in detail in User task preferences) in to the system for some time. Later, after the completion of task the system will ask user to record feedback on task completion satisfaction. Eventually after recording many number of tasks for a certain time period, the recommender system starts giving recommendations for example, if the user records successful completion of chores in short duration in the weekday early mornings frequently, The recommender system will recommend the same on weekday early mornings. Once when the recommendations are provided to the user, the recommender system collects feedback on whether the provided recommendations were helpful or not and later, the system again provides the recommendations based on the updated feedback. Eventually after providing so many recommendations the system will provide the user visual analytics and reports which shows his progress and productivity statistics. The following sub sections will briefly explain how various subsystems work together in providing task recommendations.

Task Preferences and user feedback:

During the process of building this system, we recognized that there are wide range of tasks and we need to organize the user’s tasks into different categories. Firstly, we narrowed down the scope of the tasks and divided all the tasks into the following categories.

|  |  |
| --- | --- |
| Task Type | Task Category |
| Studying, Reading, Homework, Writing, etc. | Intellectual |
| House Maintenance, Gardening, etc. | Physical |
| Prayers, Meditation, etc. | Spiritual |
| Swimming, Jogging, Workout, etc. | Fitness & Health |
| Kids, Parents, Friends, etc. | Social |
| Pay Bills, Shopping, Go to Post Office, etc. | Errands |
| Cooking, Cleaning, Laundry etc. | Chores |

Later, we discovered that there are some dependent variables which can influence on user’s productivity such as Day type(ref), Time of the day(ref), Duration of tasks(ref) and Task location. Therefore, we organized those variables into different categories as listed below:

Type of the Day: Weekday / Weekend

Task Location: Indoor / outdoor

Time of the day:

|  |  |  |
| --- | --- | --- |
| Start Time | End Time | Task Category |
| 12:00AM | 3:59AM | Midnight |
| 4:00AM | 7:59AM | Early Morning |
| 8:00AM | 11:59AM | Morning |
| 12:00PM | 3:59PM | Afternoon |
| 4:00PM | 6:59PM | Evening |
| 7:00PM | 11:59PM | Night |

Task Duration:

|  |  |
| --- | --- |
| Task Duration | Task Category |
| <15 minutes | Short Task |
| 15 – 30 Minutes | Standard Task |
| 30 Minutes – 1 Hour | Long Task |
| 1 Hour + | Extended Task |

When a user enters his task into the system, he is also required to enter all the subcategories for the dependent variables regarding that specific task. After the task is completed (or the time allocated for the task is completed) the system collects feedback form the user regarding task completion. Eventually, after some amount of time each user has his own Database in the system (Task DB) which contains all his tasks with feedback and the recommender system provides recommendations based on the tasks and feedback recorded in Task DB. The problem that we faced in developing a recommender system is that, we don’t have the task DB of specific user prerecorded with us in order to develop and evaluate the recommendations. For this reason, we built a database using 10 volunteers in which we asked our volunteers to record their daily tasks with all the dependent variables using google forms. We asked them to rate their tasks based on the task completion after the time allocated for the recorded task is completed. We continued this process for two months and got Task DB’s of 10 users.