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Task 3 : Operation Analytics and Investigating Metric Spike

Analysis done on the following points:-

Case Study 1 : Job Data

A. **Number of jobs reviewed:** Amount of jobs reviewed over time.
   Your task: Calculate the number of jobs reviewed per hour per day for November 2020?
B. **Throughput:** It is the no. of events happening per second.
   Your task: Let's say the above metric is called throughput. Calculate 7 day rolling average of throughput? For throughput, do you prefer daily metric or 7-day rolling and why?
C. **Percentage share of each language:** Share of each language for different contents.
   Your task: Calculate the percentage share of each language in the last 30 days?
D. **Duplicate rows:** Rows that have the same value present in them.
   Your task: Let's say you see some duplicate rows in the data. How will you display duplicates from the table?

Software used : **MySQL Workbench 8.0 CE**

Case Study 2: Investigating metric spike

A. **User Engagement:** To measure the activeness of a user. Measuring if the user finds quality in a product/service.
   Your task: Calculate the weekly user engagement?

B. **User Growth:** Amount of users growing over time for a product.
   Your task: Calculate the user growth for product?

C. **Weekly Retention:** Users getting retained weekly after signing-up for a product.
   Your task: Calculate the weekly retention of users-sign up cohort?

D. **Weekly Engagement:** To measure the activeness of a user. Measuring if the user finds quality in a product/service weekly.
   Your task: Calculate the weekly engagement per device?

E. **Email Engagement:** Users engaging with the email service.
   Your task: Calculate the email engagement metrics?

Software Used : MySQL Workbench 8.0 CE

Job Data

Number of jobs reviewed: Amount of jobs reviewed over time.
Calculate the number of jobs reviewed per hour per day for November 2020?

To find the number of jobs reviewed per hour per day of November 2020:

1. We will use the data from **job_id** columns of the job_data table.
2. Then we will divide the total count of job_id (distinct and non-distinct) by (30 days * 24 hours)for finding the number of jobs reviewed per day

Program/Query (non_distinct_job_id):

```
select
count(job_id)/(30*24) as number_of_jobs_reviewed_per_day_non_distinct
from job_data;
```

Output /Result

number_of_jobs_reviewed_per_day_non_distinct
0.0111

Job Data

Number of jobs reviewed: Amount of jobs reviewed over time.
Calculate the number of jobs reviewed per hour per day for November 2020?

Program/Query (distinct_job_id):

```
select
count(distinct job_id)/(30*24) as number_of_jobs_reviewed_per_day_distinct
from job_data;
```

Output /Result

number_of_jobs_reviewed_per_day_distinct
0.0083

Job Data

Throughput: It is the no. of events happening per second.

Let's say the above metric is called throughput. Calculate 7 day rolling average of throughput? For throughput, do you prefer daily metric or 7-day rolling and why?

For calculating the throughput we will be using the 7-day rolling because 7-day rolling gives us the average for all the days right from day 1 to day 7 Whereas daily metric gives us average for only that particular day itself.
For calculating the 7-day rolling daily metric average of throughput:-

1. We will be first taking the count of job_id(distinct and non-distinct) and ordering them w.r.t ds (date of interview)
2. Then by using the ROW function we will be considering the rows between 6 preceding rows and the current row
3. Then we will be taking the average of the jobs_reviewed

Job Data

Throughput: It is the no. of events happening per second.

Let's say the above metric is called throughput. Calculate 7 day rolling average of throughput? For throughput, do you prefer daily metric or 7-day rolling and why?

Program/Query (distinct_job_id):

```
SELECT ds as date_of_review, jobs_reviewed, AVG(jobs_reviewed)
OVER(ORDER BY ds ROWS BETWEEN 6 PRECEDING AND CURRENT ROW) AS
throughput_7_rolling_average
FROM
(
SELECT ds, COUNT( DISTINCT job_id) AS jobs_reviewed
FROM job_data
GROUP BY ds ORDER BY ds
) a;
```

Output /Result

date_of_review	jobs_reviewed	throughput_7_rolling_average
25-11-2020	1	1
26-11-2020	1	1
27-11-2020	1	1
28-11-2020	2	1.25
29-11-2020	1	1.2
30-11-2020	2	1.3333

Job Data

Throughput: It is the no. of events happening per second.

Let's say the above metric is called throughput. Calculate 7 day rolling average of throughput? For throughput, do you prefer daily metric or 7-day rolling and why?

Program/Query (non_distinct_job_id):

```
SELECT ds as date_of_review, jobs_reviewed, AVG(jobs_reviewed)
OVER(ORDER BY ds ROWS BETWEEN 6 PRECEDING AND CURRENT ROW) AS
throughput_7_rolling_average_non_distinct_job_id
FROM
(
SELECT ds, COUNT(job_id) AS jobs_reviewed
FROM job_data
GROUP BY ds ORDER BY ds
) a;
```

Output /Result

date_of_review	jobs_reviewed	throughput_7_rolling_average_non_distinct_job_id
25-11-2020	1	1
26-11-2020	1	1
27-11-2020	1	1
28-11-2020	2	1.25
29-11-2020	1	1.2
30-11-2020	2	1.3333

Job Data

Percentage share of each language: Share of each language for different contents.

Calculate the percentage share of each language?

To calculate the percentage share of each language (distinct and non-distinct):-

1. We will first divide the total number of languages (distinct/non-distinct) by the total number of rows presents in the table
2. Then we will do the grouping based on the languages.

Program/Query (non_distinct_language):

```
select

job_data.job_id, job_data.language,
count(job_data.language) as total_of_each_language,
((count(job_data.language)/(select count(*) from job_data))*100) as
percentage_share_of_each_language

from job_data
group by job_data.language;
```

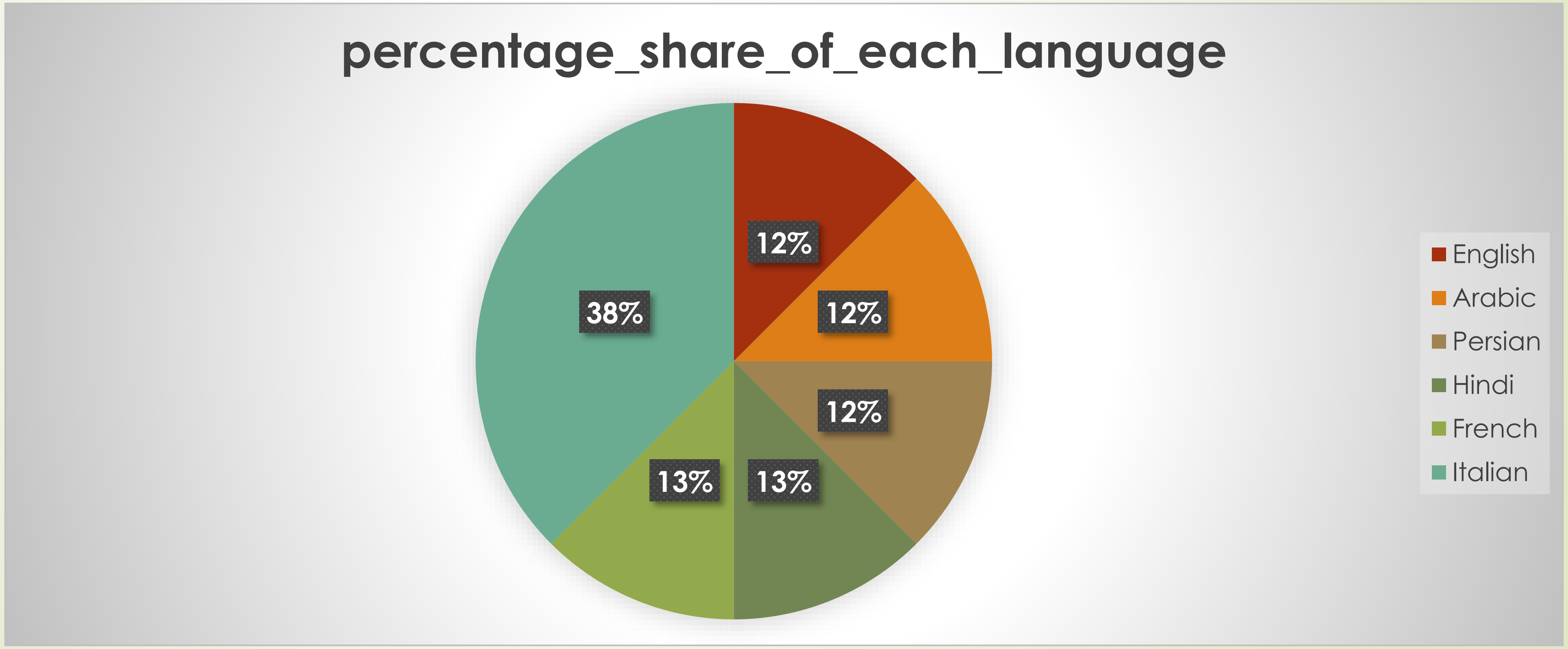
Job Data

Percentage share of each language: Share of each language for different contents.

Calculate the percentage share of each language?

Output /Result

job_id	language	total_of_each_language	percentage_share_of_each_language
21	English	1	12.5
22	Arabic	1	12.5
23	Persian	3	37.5
25	Hindi	1	12.5
11	French	1	12.5
20	Italian	1	12.5



Job Data

Percentage share of each language: Share of each language for different contents.

Calculate the percentage share of each language?

Program/Query (distinct_language):

```
select

job_data.job_id, job_data.language,
count(distinct job_data.language) as total_of_each_language,
((count(job_data.language)/(select count(*) from job_data))*100) as
percentage_share_of_each_distinct_language

from job_data
group by job_data.language;
```

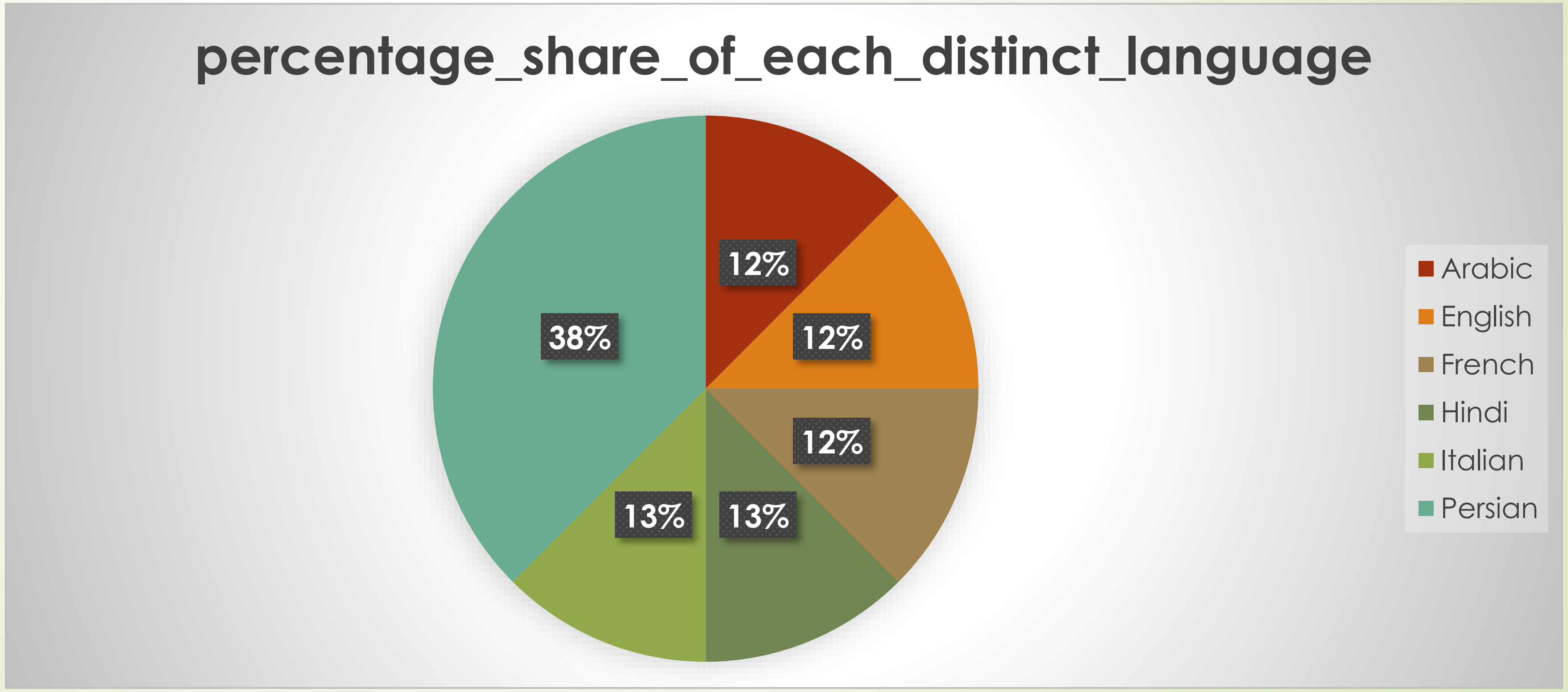
Job Data

Percentage share of each language: Share of each language for different contents.

Calculate the percentage share of each language?

Output /Result

job_id	language	total_of_each_language	percentage_share_of_each_distinct_language
22	Arabic	1	12.5
21	English	1	12.5
11	French	1	12.5
25	Hindi	1	12.5
20	Italian	1	12.5
23	Persian	1	37.5



Job Data

Duplicate rows: Rows that have the same value present in them.

Let's say you see some duplicate rows in the data. How will you display duplicates from the table?

To view the duplicate rows having the same value we will:-

1. First decide in which do we need to find the duplicate row values
2. After deciding the column(parameter) we will use the ROW_NUMBER function to find the row numbers having the same value
3. Then we will portioning the ROW_NUMBER function over the column (parameter) that we decided i.e. job_id
4. Then using the WHERE function we will find the row_num having value greater than 1 i.e. row_num > 1 based on the occurrence of the job_id in the table.

Job Data

Duplicate rows: Rows that have the same value present in them.

Let's say you see some duplicate rows in the data. How will you display duplicates from the table?

Program/Query :

```
SELECT *
FROM
(
SELECT *, ROW_NUMBER()OVER(PARTITION BY job_id) AS row_num
FROM job_data
) a
WHERE row_num>1;
```

Output /Result

ds	job_id	actor_id	event	language	time_spent	org	row_num
28-11-2020	23	1005	transfer	Persian	22	D	2
26-11-2020	23	1004	skip	Persian	56	A	3

GitHub Link for Query of Case Study 1 :
Trainity_Data_Analytics_Trainee/Trainity_Data_Analytics_Trainee_task_3.sql at main · ADVAIT135/Trainity_Data_Analytics_Trainee (github.com)

Investigating Metric Spike

User Engagement: To measure the activeness of a user. Measuring if the user finds quality in a product/service.

Your task: Calculate the weekly user engagement?

To find the weekly user engagement:-

1. We will extract the week from the occurred_at column of the events table using the **EXTRACT** function and **WEEK** function
2. Then we will be counting the number of distinct user_id from the events table
3. Then we will use the **GROUP BY** function to group the output w.r.t **week from occurred_at**

Program/Query :

```
SELECT
  extract (week from occurred_at) as week_number,
  count(distinct user_id) as number_of_users
FROM
  tutorial.yammer_events
group by
  week_number;
```

Investigating Metric Spike

User Engagement: **To measure the activeness of a user. Measuring if the user finds quality in a product/service.**

Your task: Calculate the weekly user engagement?

Output /Result

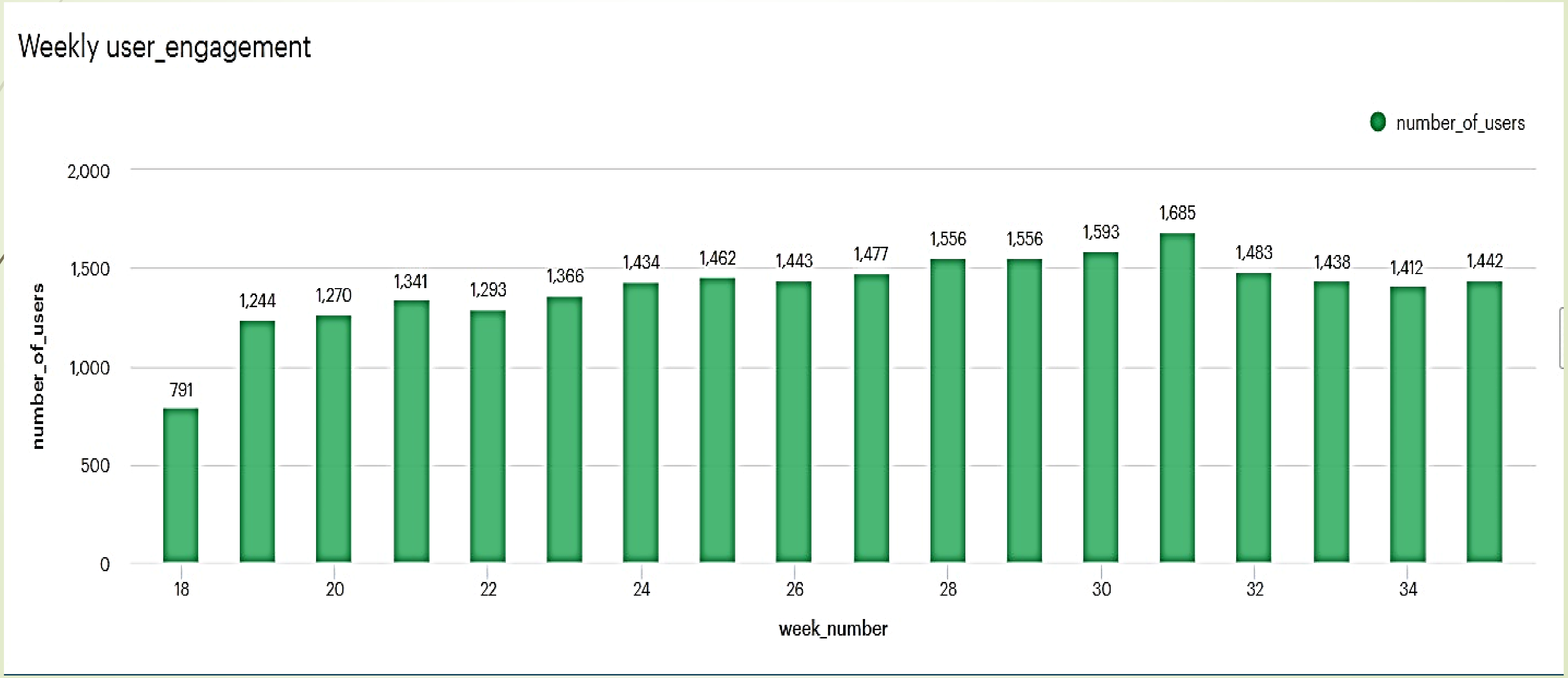
week_number	number_of_users
18	791
19	1244
20	1270
21	1341
22	1293
23	1366
24	1434
25	1462
26	1443
27	1477
28	1556
29	1556
30	1593
31	1685
32	1483
33	1438
34	1412
35	1442

Investigating Metric Spike

User Engagement: **To measure the activeness of a user. Measuring if the user finds quality in a product/service.**

Your task: Calculate the weekly user engagement?

Output /Result



Investigating Metric Spike

User Growth: Amount of users growing over time for a product.

Your task: Calculate the user growth for product?
User Growth = Number of active users per week

To find the user growth (number of active users per week):-

1. First we will the extract the year and week for the **occurred_at** column of the **users** table using the **extract, year and week** functions
2. Then we will group the extracted week and year on the basis of year and week number
3. Then we ordered the result on the basis of year and week number
4. Then we will find the cumm_active_users using the **SUM, OVER** and **ROW** function **between unbounded preceding and current row**

Investigating Metric Spike

User Growth: Amount of users growing over time for a product.
Your task: Calculate the user growth for product?
User Growth = Number of active users per week

Program/Query :

```
 select
  year_num,
  week_num,
  num_active_users,
  SUM(num_active_users)OVER(ORDER BY year_num, week_num ROWS BETWEEN
UNBOUNDED PRECEDING AND CURRENT ROW) AS cum_active_users
from
(
select
  extract (year from a.activated_at) as year_num,
  extract (week from a.activated_at) as week_num,
  count(distinct user_id) as num_active_users
from
  tutorial.yammer_users a
WHERE
  state = 'active'
group by year_num,week_num
order by year_num,week_num
) a;
```

Investigating Metric Spike

User Growth: Amount of users growing over time for a product.
Your task: Calculate the user growth for product?
User Growth = Number of active users per week

Output /Result

year_num	week_num	num_active_users	cum_active_users
2013	1	67	67
2013	2	29	96
2013	3	47	143
2013	4	36	179
2013	5	30	209
2013	6	48	257
2013	7	41	298
2013	8	39	337
2013	9	33	370
2013	10	43	413
2013	11	33	446
2013	12	32	478
2013	13	33	511
2013	14	40	551
2013	15	35	586
2013	16	42	628
2013	17	48	676
2013	18	48	724
2013	19	45	769
2013	20	55	824
2013	21	41	865
2013	22	49	914
2013	23	51	965
2013	24	51	1016
2013	25	46	1062
2013	26	57	1119
2013	27	57	1176
2013	28	52	1228
2013	29	71	1299
2013	30	66	1365
2013	31	69	1434
2013	32	66	1500
2013	33	73	1573
2013	34	70	1643
2013	35	80	1723
2013	36	65	1788
2013	37	71	1859
2013	38	84	1943
2013	39	92	2035
2013	40	81	2116
2013	41	88	2204
2013	42	74	2278
2013	43	97	2375
2013	44	92	2467
2013	45	97	2564
2013	46	94	2658
2013	47	82	2740
2013	48	103	2843
2013	49	96	2939
2013	50	117	3056
2013	51	123	3179
2013	52	104	3283
2014	1	91	3374
2014	2	122	3496
2014	3	112	3608
2014	4	113	3721
2014	5	130	3851
2014	6	132	3983
2014	7	135	4118
2014	8	127	4245
2014	9	127	4372
2014	10	135	4507
2014	11	152	4659
2014	12	132	4791
2014	13	151	4942
2014	14	161	5103
2014	15	166	5269
2014	16	165	5434
2014	17	176	5610
2014	18	172	5782
2014	19	160	5942
2014	20	186	6128
2014	21	177	6305
2014	22	186	6491
2014	23	197	6688
2014	24	198	6886
2014	25	222	7108
2014	26	210	7318
2014	27	199	7517
2014	28	223	7740
2014	29	215	7955
2014	30	228	8183
2014	31	234	8417
2014	32	189	8606
2014	33	250	8856
2014	34	259	9115
2014	35	266	9381

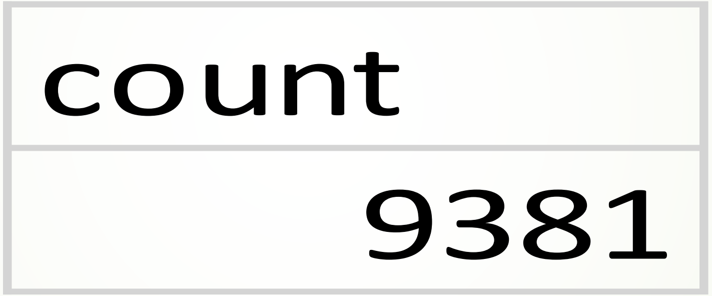
Investigating Metric Spike

User Growth: Amount of users growing over time for a product.
Your task: Calculate the user growth for product?
User Growth = Number of active users per week

Program/Query :

```
select count(*) from tutorial.yammer_users
where state = 'active';
```

Output /Result



count
9381

Hence, there are in total 9381 active users from 1st week of 2013 to the 35th week of 2014

Investigating Metric Spike

Weekly Retention: Users getting retained weekly after signing-up for a product.
Your task: Calculate the weekly retention of users-sign up cohort?

The weekly retention of users-sign up cohort can be calculated by two means i.e. either by specifying the week number (18 to 35) or for the entire column of occurred_at of the events table.

1. Firstly we will extract the week from occurred_at column using the **extract,week** functions
2. Then, we will select out those rows in which **event_type = 'signup_flow' and event_name = 'complete_signup'**
3. If finding for a spectifc week we will spectify the week number using the **extract** function
4. Then using the **left join** we will join the two tables on the basis of user_id where **event_type = 'engagement'**
5. Then we will use the **Group By** function to group the output table on the basis of user_id
6. Then we will use the **Order By** function to order the result table on the basis of user_id

Investigating Metric Spike

Weekly Retention: Users getting retained weekly after signing-up for a product.
Your task: Calculate the weekly retention of users-sign up cohort?

Program/Query(Without Specifying the week number) :

```
SELECT
distinct user_id,
COUNT(user_id),
SUM(CASE WHEN retention_week = 1 Then 1 Else 0 END) as per_week_retention
FROM
(
SELECT
a.user_id,
a.signup_week,
b.engagement_week,
b.engagement_week - a.signup_week as retention_week
FROM
(
(SELECT distinct user_id, extract(week from occurred_at) as signup_week from tutorial.yammer_events
WHERE event_type = 'signup_flow'
and event_name = 'complete_signup'
)a
LEFT JOIN
(SELECT distinct user_id, extract (week from occurred_at) as engagement_week FROM tutorial.yammer_events
where event_type = 'engagement'
)b
on a.user_id = b.user_id
)
)d
group by user_id
order by user_id;
```

Investigating Metric Spike

Weekly Retention: **Users getting retained weekly after signing-up for a product.**
Your task: Calculate the weekly retention of users-sign up cohort?

Output /Result (Without Specifying week number)

Link for the saved result

Trainity_task_3_case_stuy_2_question_c.csv - Google Drive

Investigating Metric Spike

Weekly Retention: Users getting retained weekly after signing-up for a product.
Your task: Calculate the weekly retention of users-sign up cohort?

Program/Query(Specifying the week number as 18) :

```
SELECT
distinct user_id,
COUNT(user_id),
SUM(CASE WHEN retention_week = 1 Then 1 Else 0 END) as per_week_retention
FROM
(
SELECT
a.user_id,
a.signup_week,
b.engagement_week,
b.engagement_week - a.signup_week as retention_week
FROM
(
(SELECT distinct user_id, extract(week from occurred_at) as signup_week from tutorial.yammer_events
WHERE event_type = 'signup_flow'
and event_name = 'complete_signup’
and extract(week from occurred_at) = 18
)a
LEFT JOIN
(SELECT distinct user_id, extract (week from occurred_at) as engagement_week FROM tutorial.yammer_events
where event_type = 'engagement'
)b
on a.user_id = b.user_id
)
)d
group by user_id
order by user_id;
```

Investigating Metric Spike

Weekly Retention: Users getting retained weekly after signing-up for a product.
Your task: Calculate the weekly retention of users-sign up cohort?

Output /Result (Specifying week number as 18)

Trainity_task_3_case_stuy_2_question_c_18_week.csv - Google Drive

Investigating Metric Spike

Weekly Engagement: To measure the activeness of a user. Measuring if the user finds quality in a product/service weekly.
Your task: Calculate the weekly engagement per device?

To find the weekly user engagement per device:-

1. Firstly we will extract the year_num and week_num from the occurred_at column of the events table using the **extract, year** and **week** function
2. Then we will select those rows where **event_type = 'engagement'** using the **WHERE** clause
3. Then by using the **Group By** and **Order By** function we will group and order the result on the basis of year_num, week_num and device

Investigating Metric Spike

Weekly Engagement: To measure the activeness of a user. Measuring if the user finds quality in a product/service weekly.
Your task: Calculate the weekly engagement per device?

Program/Query :

```
SELECT
  extract(year from occurred_at) as year_num,
  extract(week from occurred_at) as week_num,
  device,
  COUNT(distinct user_id) as no_of_users
FROM
  tutorial.yammer_events
where event_type = 'engagement'
GROUP by 1,2,3
order by 1,2,3;
```

Output /Result question D weekly user engagement per device.csv - Google Drive

Investigating Metric Spike

Email Engagement: Users engaging with the email service.
Your task: Calculate the email engagement metrics?

To find the email engagement metrics(rate) of users:-

1. We will first categorize the action on the basis of **email_sent, email_opened** and **email_clicked** using the **CASE, WHEN, THEN** functions
2. Then we select the sum of category of **email_opened** divide by the sum of the category of **email_sent** and multiply the result by 100.0 and name is as **email_opening_rate**
3. Then we select the sum of category of **email_clicked** divide by the sum of the category of **email_sent** and multiply the result by 100.0 and name is as **email_clicking_rate**
4. **email_sent = ('sent_weekly_digest','sent_reengagement_email')**
5. **email_opened = 'email_open'**
6. **email_clicked = 'email_clickthrough'**

Investigating Metric Spike

Email Engagement: Users engaging with the email service.
Your task: Calculate the email engagement metrics?

Program/Query :

```
 SELECT
  100.0*SUM(CASE when email_cat = 'email_opened' then 1 else 0 end)/SUM(CASE when
email_cat = 'email_sent' then 1 else 0 end) as email_opening_rate,
  100.0*SUM(CASE when email_cat = 'email_clicked' then 1 else 0 end)/SUM(CASE when
email_cat = 'email_sent' then 1 else 0 end) as email_clicking_rate
FROM
(
SELECT
  *,
  CASE
    WHEN action in ('sent_weekly_digest','sent_reengagement_email')
      then 'email_sent'
    WHEN action in ('email_open')
      then 'email_opened'
    WHEN action in ('email_clickthrough')
      then 'email_clicked'
  end as email_cat
from tutorial.yammer_emails
) a;
```

Investigating Metric Spike

Email Engagement: **Users engaging with the email service.**
Your task: Calculate the email engagement metrics?

Output /Result Question E email_engagement_metrics.csv - Google Drive

Hence, all the questions given as part of Trainity Data Analytics Trainee Task 3 : Operation Analytics and Investigating Metric Spike
have been provided with answers along with graphs.

In this task all the basic as well as advanced concepts related to SQL in Data Analytics have been implemented using the MySQL workbench 8.0 CE

Case Study 1 Link for GitHub and Google Drive

Trainity_Data_Analytics_Trainee/Trainity_Data_Analytics_Trainee_task_3.sql at main · ADVAIT135/Trainity_Data_Analytics_Trainee (github.com)

Trainity_Data_Analytics_Trainee_task_3.sql - Google Drive

Case Study 2 Link for GitHub and Google Drive

Trainity_Data_Analytics_Trainee/task3_case_sudy_2_Investigating_Metric_Spike.sql at main · ADVAIT135/Trainity_Data_Analytics_Trainee (github.com)

task3_case_sudy_2_Investigating_Metric_Spike.sql - Google Drive