# MRP - Project

# Design, Development and Evaluation of Domain-Specific Topic Models and Classifiers for Public Health Using Big Social Data

# Kumara Prasanna Jayaraju

In [126…

In [12]:

```
from IPython.core.display import display, HTML
display(HTML("<style>.container { width:75% !important; }</style>"))
display(HTML("<style>.output_result { max-width:100% !important; }</style>"))
display(HTML("<style>.prompt { display:none !important; }</style>"))
```

## Collection for Data

In [2]:

```
#!pip install praw
import praw
import pandas as pd
from datetime import datetime

# Acessing the reddit api
reddit = praw.Reddit(client_id = 'zMDhIYLH8MvxtA',
                     client_secret = 'a-uC9UvzWZouvMvM0fOunIH2dk4SWg',
                     user_agent = 'MRP_Learning',
                     username = 'Kumara-stu',
                     password = 'T@shi2021')     # your reddit password
```

```
Version 7.2.0 of praw is outdated. Version 7.4.0 was released Friday July 30,
2021.
```

In [4]:

```
print("My username on Reddit:", reddit.user.me())
```

```
My username on Reddit: Kumara-stu
```

# Collecting the data from subreddits via Reddit API

In [6]:

```
# make a list of subreddits you want to scrape the data from
sub = ['worldnews','vaxxhappened','VACCINES', 'VaccineDiscussion', 'Vaccine',
       'vaccinationpics', 'VaccinatedLansing', 'TrueAntiVaccination',
       'toronto', 'reddit.com', 'Quebec', 'pregnant',
       'ontario', 'medicine', 'Health', 'epidemic',
       'DebateVaccine', 'CovidVaccine', 'CovidVaccinatedUncut',
       'covidlonghaulers', 'CovIdiots', 'COVID19positive',
       'COVID19_support', 'coronavirusme',
       'CoronavirusCanada', 'conspiracy', 'CanadaCoronavirus',
       'Canada']

# Chosing the subreddit
print("List of Subreddits:")
for s in sub:
    print("Subreddit:", s)
    subreddit = reddit.subreddit(s)


#Creating dictionary to store the data which will be converted to a dataframe

# Scraping is done using a search with following keyword
    query = ['COVID','COVID-19', 'Corona','Corona virus', 'corona','corona vi
             'Covaxin','covishield', 'UK Variant', 'indian Variant', 'vaccine
             'Moderna vaccine', 'AstraZeneca', 'BioNTech vaccine', 'Johnson &

    for item in query:
        post_dict = {
            "title" : [],
            "score" : [],
            "id" : [],
            "url" : [],
            "comms_num": [],
            "created" : [],
            "body" : [],
            "author": [],
            "upvote_ratio":[],
            "permalink":[],
            "subreddit_id":[],

        }
        for submission in subreddit.search(item,sort = "top",limit = 10000):
            post_dict["title"].append(submission.title)
            post_dict["score"].append(submission.score)
            post_dict["id"].append(submission.id)
            post_dict["url"].append(submission.url)
            post_dict["comms_num"].append(submission.num_comments)
            post_dict["created"].append(datetime.fromtimestamp(submission.cre
            post_dict["body"].append(submission.selftext)
            post_dict["author"].append(submission.author)
            post_dict["upvote_ratio"].append(submission.upvote_ratio)
            post_dict["permalink"].append(submission.permalink)
            post_dict["subreddit_id"].append(submission.subreddit_id)

            post_data = pd.DataFrame(post_dict)
            post_data.to_csv(s+"_"+ item +"df_subreddit_MRP.csv")
        #print(post_data)
```

```
Subreddit: worldnews
Subreddit: vaxxhappened
Subreddit: VACCINES
Subreddit: VaccineDiscussion
Subreddit: Vaccine
Subreddit: vaccinationpics
Subreddit: VaccinatedLansing
Subreddit: TrueAntiVaccination
Subreddit: toronto
Subreddit: reddit.com
Subreddit: Quebec
Subreddit: pregnant
Subreddit: ontario
Subreddit: medicine
Subreddit: Health
Subreddit: epidemic
Subreddit: DebateVaccine
Subreddit: CovidVaccine
Subreddit: CovidVaccinatedUncut
Subreddit: covidlonghaulers
Subreddit: CovIdiots
Subreddit: COVID19positive
Subreddit: COVID19_support
Subreddit: coronavirusme
Subreddit: CoronavirusCanada
Subreddit: conpiracy
Subreddit: CanadaCoronavirus
Subreddit: Canada
```

## Combining the data from all the subreddits

In [4]:

```
import os
import pandas as pd
cwd = os.path.abspath('/Users/kumaraprasannajayaraju/MRP_DataSet/Prazzy/Raw_F
files = os.listdir(cwd)
```

In [5]:

```
cwd
```

Out[5]:

```
'/Users/kumaraprasannajayaraju/MRP_DataSet/Prazzy/Raw_Files'
```

In [6]:

```
df = pd.DataFrame()
for file in files:
    df = df.append(pd.read_csv(cwd+'/'+file, index_col=0), ignore_index = Fal
```

In [7]:

```
df.head()
```

Out[7]:

| | title | score | id | url | comms_num |
|---|---|---|---|---|---|
| **0** | UK nearing it's highest ever COVID-19 infectio... | 459 | oogbz7 | https://www.reddit.com/r/medicine/comments/oog... | 175 |
| **1** | New Covid-19 strain in UK | 106 | kgzi9m | https://www.reddit.com/r/medicine/comments/kgz... | 30 |
| **2** | Delta Variant | 35 | ob80cz | https://www.reddit.com/r/medicine/comments/ob8... | 18 |
| **3** | Megathread #58: SARS-CoV-2/COVID-19. Month of ... | 32 | lbaesm | https://www.reddit.com/r/medicine/comments/lba... | 185 |
| **4** | You've had both your Moderna/Pfizer Covid vacc... | 9 | lh3gzk | https://www.reddit.com/r/medicine/comments/lh3... | 25 |

In [8]:

```
df.shape
```

Out[8]:

```
(30694, 11)
```

In [9]:

```
df.reset_index(drop=True, inplace=True)
```

## Exploratory Data Analysis

In [10]:

```
df.isnull().sum()
```

Out[10]:

```
title               0
score               0
id                  0
url                 0
comms_num           0
created             0
body            16605
author              0
upvote_ratio        0
permalink           0
subreddit_id        0
dtype: int64
```

In [11]:

```
df = df.drop(df[df['body'].isnull()].index.tolist())
```

In [12]:

```
df.head()
```

Out[12]:

| | title | score | id | url | comms_num |
|---|---|---|---|---|---|
| **0** | UK nearing it's highest ever COVID-19 infectio... | 459 | oogbz7 | https://www.reddit.com/r/medicine/comments/oog... | 175 |
| **1** | New Covid-19 strain in UK | 106 | kgzi9m | https://www.reddit.com/r/medicine/comments/kgz... | 30 |
| **2** | Delta Variant | 35 | ob80cz | https://www.reddit.com/r/medicine/comments/ob8... | 18 |
| **3** | Megathread #58: SARS-CoV-2/COVID-19. Month of ... | 32 | lbaesm | https://www.reddit.com/r/medicine/comments/lba... | 185 |
| **4** | You've had both your Moderna/Pfizer Covid vacc... | 9 | lh3gzk | https://www.reddit.com/r/medicine/comments/lh3... | 25 |

In [13]:

```
df.isnull().sum()
```

Out[13]:

```
title           0
score           0
id              0
url             0
comms_num       0
created         0
body            0
author          0
upvote_ratio    0
permalink       0
subreddit_id    0
dtype: int64
```

In [14]:

```
df.count()
```

Out[14]:

```
title           14089
score           14089
id              14089
url             14089
comms_num       14089
created         14089
body            14089
author          14089
upvote_ratio    14089
permalink       14089
subreddit_id    14089
dtype: int64
```

In [ ]:

```

```

In [15]:

```
df.head()
```

Out[15]:

| | title | score | id | url | comms_num |
|---|---|---|---|---|---|
| **0** | UK nearing it's highest ever COVID-19 infectio... | 459 | oogbz7 | https://www.reddit.com/r/medicine/comments/oog... | 175 |
| **1** | New Covid-19 strain in UK | 106 | kgzi9m | https://www.reddit.com/r/medicine/comments/kgz... | 30 |
| **2** | Delta Variant | 35 | ob80cz | https://www.reddit.com/r/medicine/comments/ob8... | 18 |
| **3** | Megathread #58: SARS-CoV-2/COVID-19. Month of ... | 32 | lbaesm | https://www.reddit.com/r/medicine/comments/lba... | 185 |
| **4** | You've had both your Moderna/Pfizer Covid vacc... | 9 | lh3gzk | https://www.reddit.com/r/medicine/comments/lh3... | 25 |

## Feature Engineering

In [16]:

```
## working on created(Date and Time) column.
```

In [17]:

```
weekDays = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday
```

In [18]:

```
df['Month'] = pd.DatetimeIndex(df['created']).month
df['DayOfWeek'] = pd.DatetimeIndex(df['created']).dayofweek
df['HourofDay'] = pd.DatetimeIndex(df['created']).hour
df['Day'] = pd.DatetimeIndex(df['created']).day
df['Year'] = pd.DatetimeIndex(df['created']).year
```

In [19]:

```
#Adding Columns ['coder1_label', 'description1', 'coder2_label', 'description
df = df.assign(coder1_label='', description1= '', coder2_label='', descriptio
               consensus='', reaction='')
```

In [20]:

```
df.columns
```

```
Out[20]: Index(['title', 'score', 'id', 'url', 'comms_num', 'created', 'body', 'author'
         ,
                'upvote_ratio', 'permalink', 'subreddit_id', 'Month', 'DayOfWeek',
                'HourofDay', 'Day', 'Year', 'coder1_label', 'description1',
                'coder2_label', 'description2', 'consensus', 'reaction'],
               dtype='object')
```

```
In [21]: ##Re-Arranging columns

         df= df[['created', 'Day', 'Month', 'Year','HourofDay','DayOfWeek',
                 'body', 'coder1_label', 'description1', 'coder2_label',
                 'description2', 'consensus', 'reaction','score', 'id', 'url', 'comms_n
                 'upvote_ratio', 'permalink', 'subreddit_id']]
```

## Data export and Import

```
In [22]: ### Exporting Clean Data set
             #df.to_csv("Clean_dataset.csv", index = False)
```

```
In [23]: ### Importing Clean Data set
             #df1 = pd.read_csv("Clean_dataset.csv")
```

## Exploration of the cleaned dataset

```
In [24]: df.head()
```

Out[24]:

| | created | Day | Month | Year | HourofDay | DayOfWeek | body |
|---|---|---|---|---|---|---|---|
| **0** | 2021-07-20 21:55:47 | 20 | 7 | 2021 | 21 | 1 | It feels like the sub is done with COVID-19, a... |
| **1** | 2020-12-20 13:41:32 | 20 | 12 | 2020 | 13 | 6 | https://www.cnn.com/2020/12/20/uk/uk-coronavir... |
| **2** | 2021-06-30 18:18:52 | 30 | 6 | 2021 | 18 | 2 | Why do we think that the delta variant is mor... |
| **3** | 2021-02-02 18:59:58 | 2 | 2 | 2021 | 18 | 1 | COVID-19 Megathread #58\n\nThis is a megathrea... |
| **4** | 2021-02-10 15:49:05 | 10 | 2 | 2021 | 15 | 2 | I think the title says it all but here it is, ... |

5 rows × 21 columns

In [25]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 14089 entries, 0 to 30691
Data columns (total 21 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   created       14089 non-null  object 
 1   Day           14089 non-null  int64  
 2   Month         14089 non-null  int64  
 3   Year          14089 non-null  int64  
 4   HourofDay     14089 non-null  int64  
 5   DayOfWeek     14089 non-null  int64  
 6   body          14089 non-null  object 
 7   coder1_label  14089 non-null  object 
 8   description1  14089 non-null  object 
 9   coder2_label  14089 non-null  object 
 10  description2  14089 non-null  object 
 11  consensus     14089 non-null  object 
 12  reaction      14089 non-null  object 
 13  score         14089 non-null  int64  
 14  id            14089 non-null  object 
 15  url           14089 non-null  object 
 16  comms_num     14089 non-null  int64  
 17  author        14089 non-null  object 
 18  upvote_ratio  14089 non-null  float64
 19  permalink     14089 non-null  object 
 20  subreddit_id  14089 non-null  object 
dtypes: float64(1), int64(7), object(13)
memory usage: 2.4+ MB
```

In [26]:

```
df["created"] = pd.to_datetime(df["created"])
```

In [27]:

```
max(df['created'])
```

Out[27]:

```
Timestamp('2021-08-25 12:01:38')
```

In [28]:

```
min(df['created'])
```

Out[28]:

```
Timestamp('2009-07-09 02:02:41')
```

In [29]:

```
df.count()
```

Out[29]:

```
created         14089
Day             14089
Month           14089
Year            14089
HourofDay       14089
DayOfWeek       14089
body            14089
coder1_label    14089
description1    14089
coder2_label    14089
description2    14089
consensus       14089
reaction        14089
score           14089
id              14089
url             14089
comms_num       14089
author          14089
upvote_ratio    14089
permalink       14089
subreddit_id    14089
dtype: int64
```

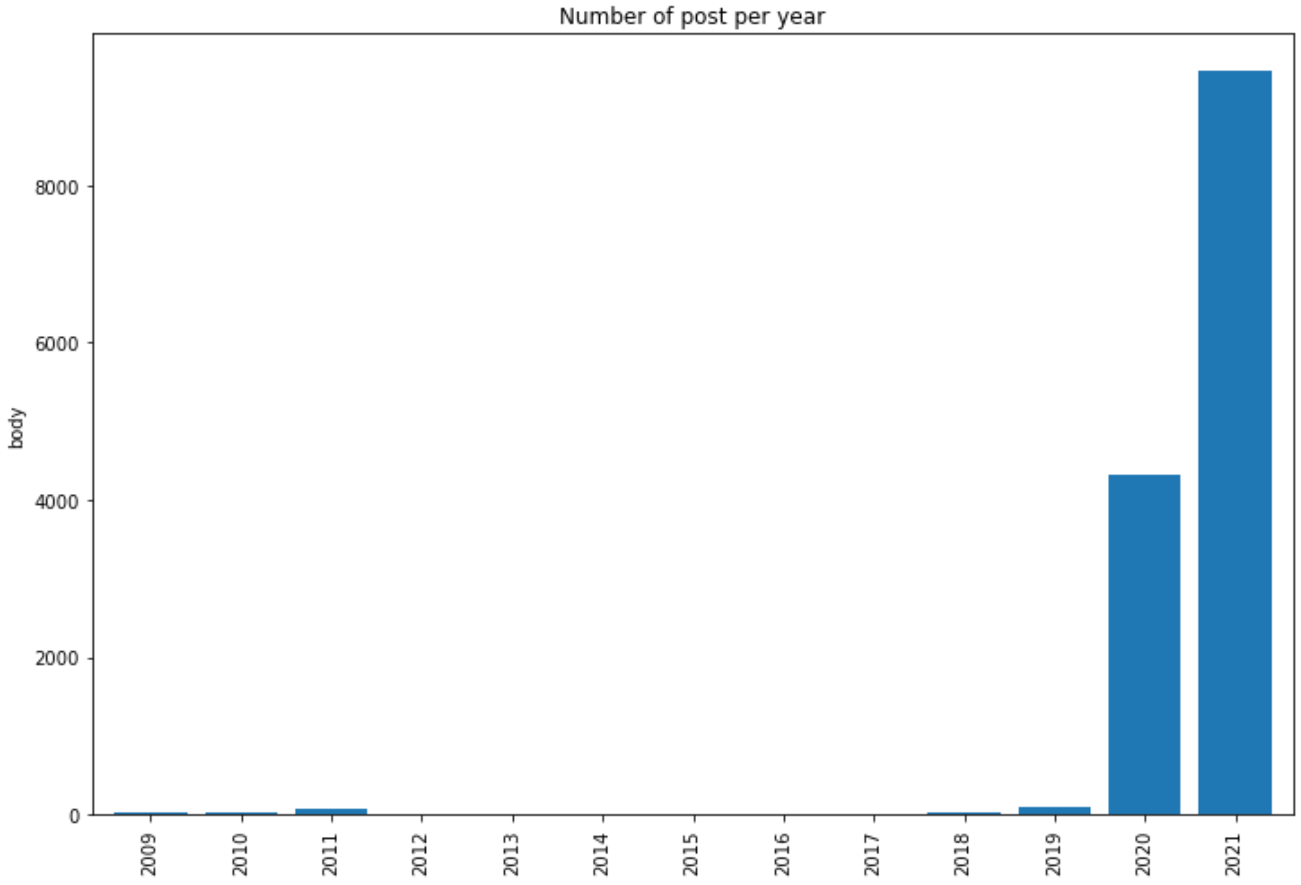
## Data Visualization

In [30]:

```
import matplotlib.pyplot as plt
```

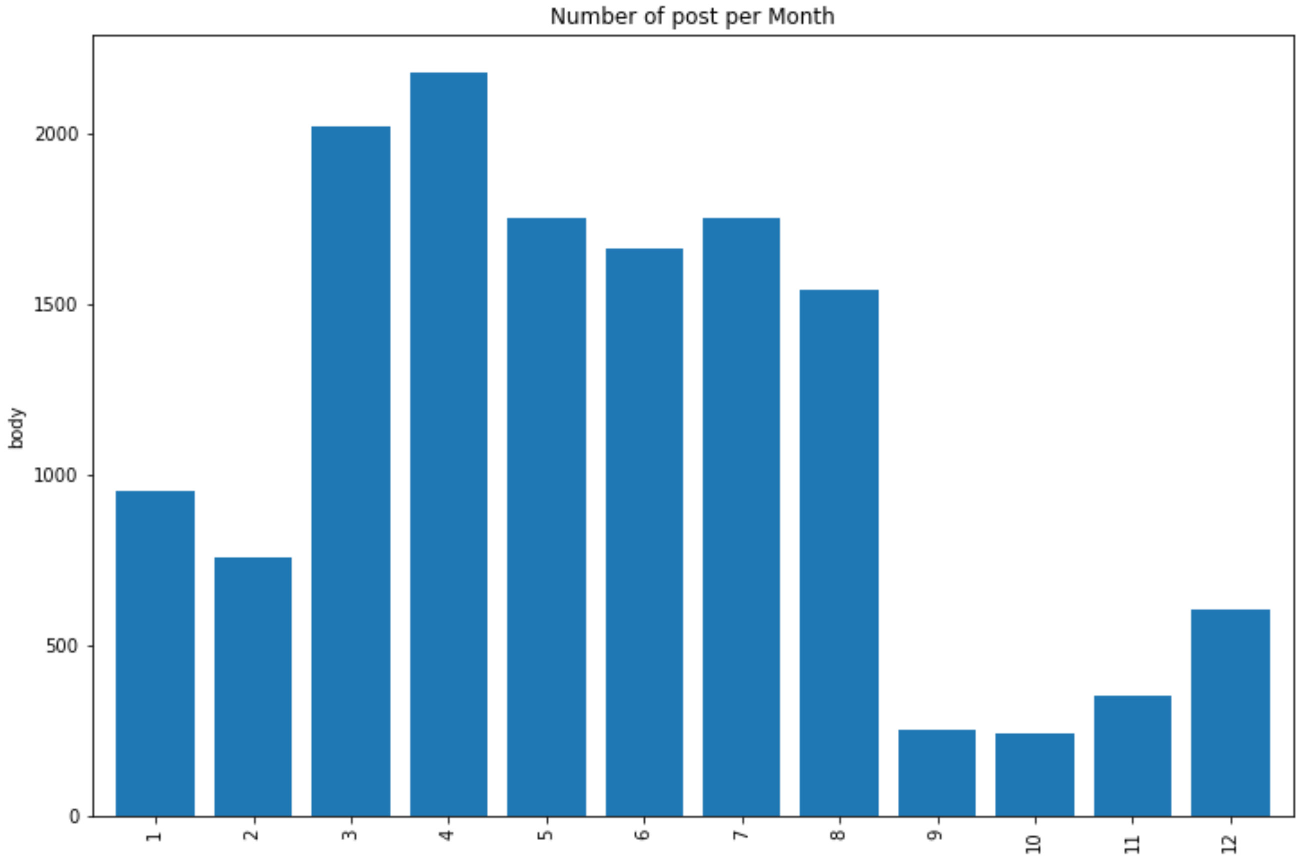
In [31]:

```
# Based on the year
plt.rcParams["figure.figsize"] = (12,8)
ax = df["Year"].groupby(df["Year"]).count().plot(kind="bar", width=0.8)
ax.set(xlabel="", ylabel="body", title="Number of post per year")
#plt.xticks(range(7), DayOfWeek)
plt.show()
```



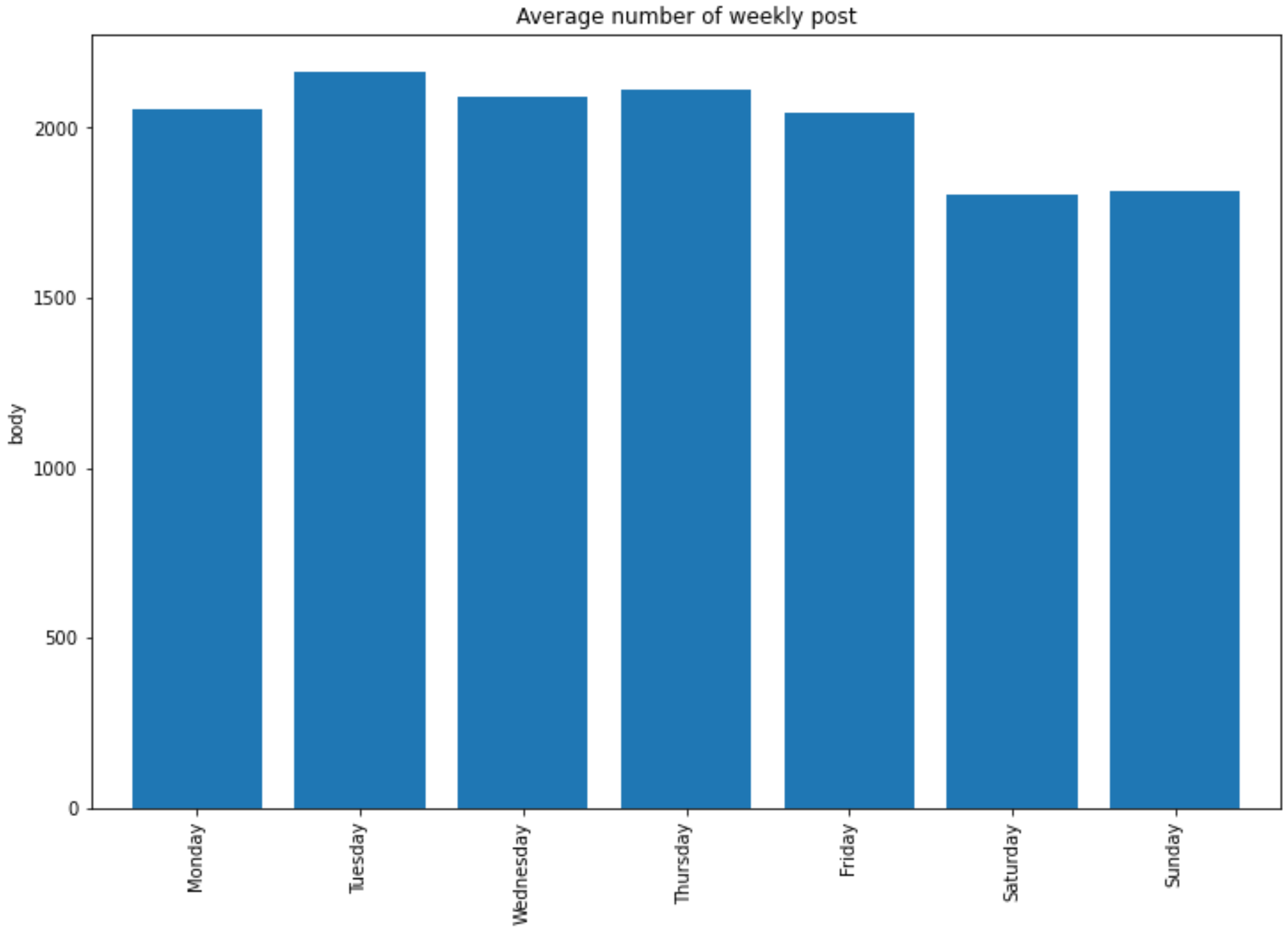
In [32]:

```
# Based on the Month
plt.rcParams["figure.figsize"] = (12,8)
ax = df["Month"].groupby(df["Month"]).count().plot(kind="bar", width=0.8)
ax.set(xlabel="", ylabel="body", title="Number of post per Month")
#plt.xticks(range(7), DayOfWeek)
plt.show()
```



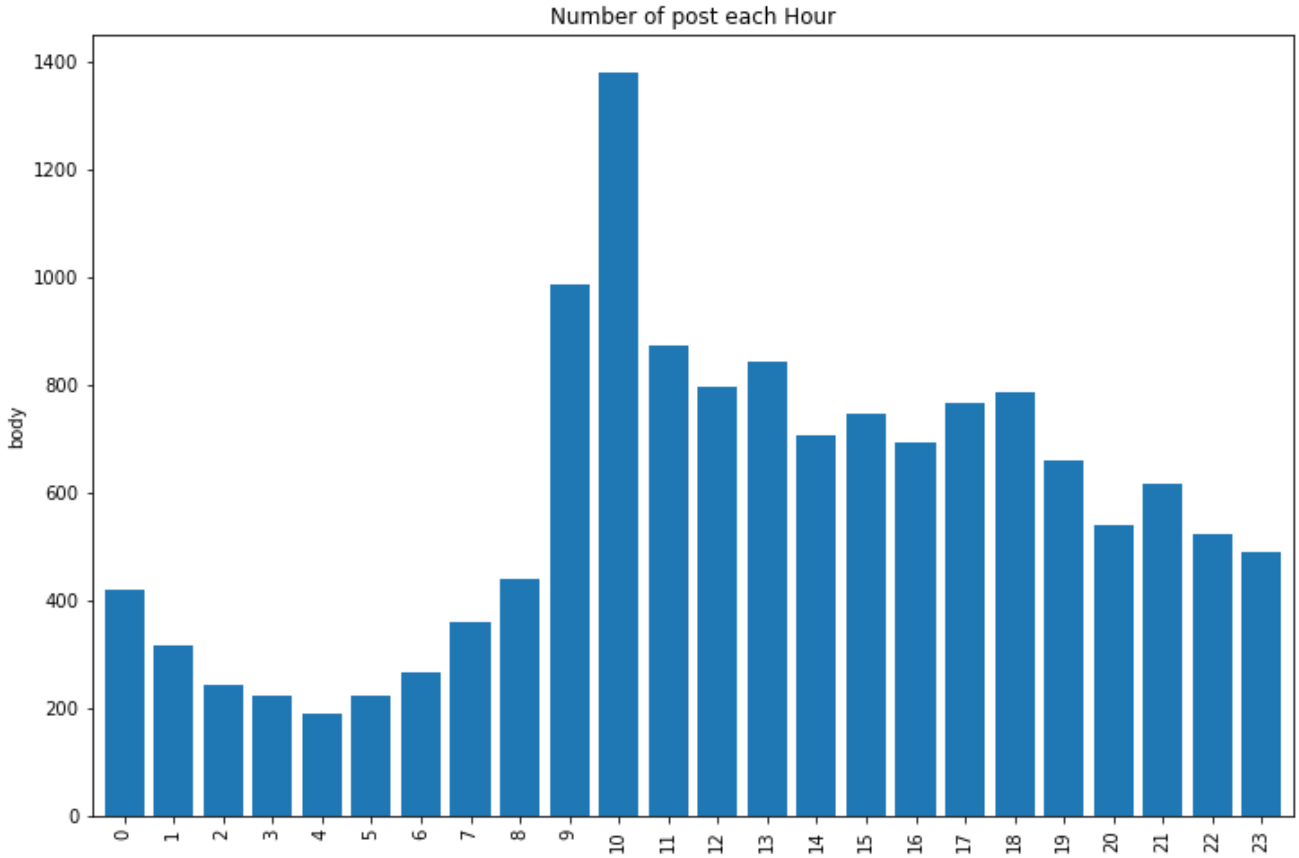
In [33]:

```
# Based on the day of the week
plt.rcParams["figure.figsize"] = (12,8)
ax = df["DayOfWeek"].groupby(df["DayOfWeek"]).count().plot(kind="bar", width=
ax.set(xlabel="", ylabel="body", title="Average number of weekly post")
plt.xticks(range(7), weekDays)
plt.show()
```



In [34]:

```
# Based on the time of the day
ax = df["HourofDay"].groupby(df["HourofDay"]).count().plot(kind="bar", width=
ax.set(xlabel="", ylabel="body", title="Number of post each Hour") # Default
plt.rcParams["figure.figsize"] = (12,8)
plt.show()
```



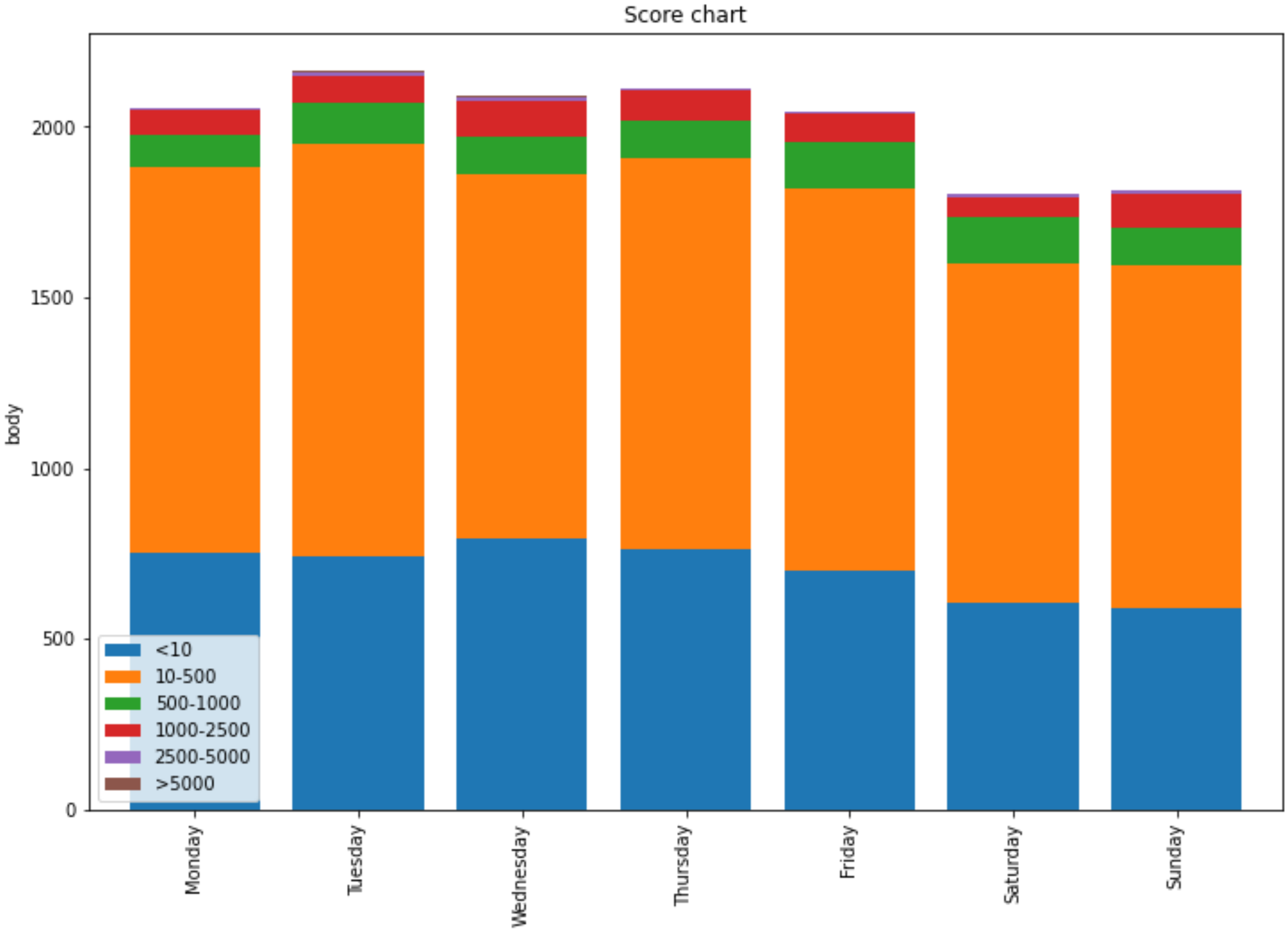
In [35]:

```
# Based on the day of the week, but segmented into upvote count groups
minscr = df["score"].min()
maxscr = df["score"].max()
print("Upvote range:", minscr, maxscr)

# Manually determine certain segmentation
dfseg = pd.DataFrame(index=range(7), columns=[])
dfseg["<10"] = df[df["score"]<=10]["DayOfWeek"].groupby(df["DayOfWeek"]).coun
dfseg["10-500"] = df[(df["score"]>10) & (df["score"]<=500)]["DayOfWeek"].grou
dfseg["500-1000"] = df[(df["score"]>500) & (df["score"]<=1000)]["DayOfWeek"].
dfseg["1000-2500"] = df[(df["score"]>1000) & (df["score"]<=2500)]["DayOfWeek"
dfseg["2500-5000"] = df[(df["score"]>2500) & (df["score"]<=5000)]["DayOfWeek"
dfseg[">5000"] = df[df["score"]>5000]["DayOfWeek"].groupby(df["DayOfWeek"]).c

ax = dfseg.plot(kind="bar", stacked=True, width=0.8)
ax.set(xlabel="", ylabel="body", title="Score chart")
plt.xticks(range(7), weekDays)
plt.rcParams["figure.figsize"] = (12,8)
plt.show()
```

```
Upvote range: 0 8575
```



In [145…

```
# Common post title words
freq = pd.Series(' '.join(df['body']).split()).value_counts()[:20]
freq
```

Out[145…

```
the      131008
and      107990
to       107716
*        100644
I         89576
of        88458
in        67479
a         66442
/         63348
-         55736
is        37622
my        36387
that      35062
for       33840
with      33470
have      32256
are       31178
last      29587
on        28180
was       26538
dtype: int64
```

In [146…

```
# Uncommon post title words
freq =  pd.Series(' '.join(df['body']).split()).value_counts()[-20:]
freq
```

```
Out[146… lower.)
         1
         6:40
         1
         STATEMENT
         1
         (Seulement
         1
         evolved,
         1
         ivy,
         1
         Wonky
         1
         https://beta.ctvnews.ca/local/toronto/2021/1/22/1_5279068.html
         1
         https://news.gov.bc.ca/releases/2021HLTH0035-000923
         1
         Nebraska-Lincoln
         1
         Vice.
         1
         Samsel*](https://archive.fo/o/meDSY/https://www.researchgate.net/publication/3
         16601847_Glyphosate_pathways_to_modern_diseases_VI_Prions_amyloidoses_and_auto
         immune_neurological_diseases)    1
         Stigma:
         1
         Fest**](https://www.reddit.com/r/Torontoevents/comments/4tgwo4/left_2016_film_
         fest_with_10_premieres_aug_57/)
         1
         giant,
         1
         amateurs.
         1
         vent..
         1
         DOI:
         1
         superstore
         1
         /u/hulkange
         1
         dtype: int64
```

```
In [ ]:
```