1. INTRODUCTION

1.1 Overview

The web is home to massive amounts of data, with more being created every day. Organizations can harness this constant stream of information to gain understanding, plan strategies, and find opportunities. Enriched news data can help your application make dynamic connections across current events faster. In this project news mining web application will be developed using Node-RED / Python Web App and the IBM Watson Discovery Service. The user interacts with the created app UI to request relevant news content.

1.2 Purpose

Nowadays, news plays an important role in getting the knowledge about all the incidents in the world. News is the only way to know about current situation in world during lockdown due to coronavirus pandemic. But there are lot of contents available on internet about any topic. Time will be wasted in searching most relevant news in large database. Our news search app will provide top relevant news along with their sentiment. Total sentiment is also provided so that one can decide about the sentiment of the news. This app will fulfil all these requirements.

2. LITERATURE SURVEY

2.1 Existing problem

Nowadays, news plays an important role in day-to-day life. There are lots of sources to get news i.e. TV, internet, etc. News can be conveyed easily but searching the genuine news is little difficult as in today's time the internet is filled with all kinds of news, be it a genuine news, fake news or an irrelevant news related to user's search. The user has to search his/her specific type of news from different categories of news and then produce a search. This is a long and tiring process which involves a lot of user's time. In this long process the user has to make many clicks, follow many links and open many web pages, all at the same time.

There are many works done related to creating a user-friendly news search app. I have discussed some of the relevant work done before and the technologies which is used in creating the news search app. A survey of such papers is done below:

NOVA approach was proposed, and showcased that can be extended similarly to [1], by checking composite license characteristics for compatibility with the planned usage of a node. Second, they addressed the issue of missing links from flows to contained nodes. In fact, the name of listed nodes can be ambiguous. Using SPARQL, they showed a two-fold querying process that addresses this issue and solves ambiguity for many nodes [2]. The possibilities for future use and research on the created knowledge base are broad. Automated quality checks or indexes can be developed based on different input parameters from the NOVA model [3]. This indicates to the users if a component can be utilized or not. Discovery could be improved too. This can be achieved by semantically annotating nodes and flows with categories, or transforming their keywords into links to well-defined terms [4]. This way, links to a more general knowledge base, such as wikidata [5], could be built up.

Cognitive computing solutions patterned [6] after several key aspects of human thought are emerging in many industries [7]. Their ability to ingest varieties of data and to understand [8], evaluate, and learn from the data has the potential to unlock novel insights. These solutions may enhance areas such as Life Sciences [9], which are in dire need of accelerated innovation [10]. Early pilot projects suggest that cognitive computing infuses novelty and adds speed to the research process. Further study is needed to validate its utility in different therapeutic areas and research domains [11]. Cognitive computing may also add value in the identification and coding of adverse event reports from the text of case reports and published articles [12]. Current pilot projects are beginning to yield insight into whether Watson has the potential to improve both the accuracy and speed of adverse-event detection [13] and coding. As with discovery, multiple test cases across event types, drug types, and diseases will be needed to evaluate and improve Watson's abilities in drug safety [14]. In both cases, IBM will learn from each engagement and improve Watson's ability to both, extracting known relationships and hypothesizing novel

relationships [15] through predictive text analytics.

A series of recommendations for application designers, based on data from a 1505-person study where participants played a game while a user interface element tried to get their attention was presented [16]. Based on their survey answers, reaction times, and recall, UI elements were identified with glowing shadows [17] as the most likeable and effective way to get user attention. Icons with badges were shown as a good alternative for less-critical information. It was also found that users prefer dynamic visual elements [18] that blend in with the surrounding content instead of pop-ups. Using these recommendations, designers can create user interfaces that are likely to be more useful, usable and appealing [19] to users. Data-driven studies to improve user interfaces were considered as a promising avenue for research [20] and encourage future work in this area.

2.2 Proposed solution

In this project an UI is developed for news search. This app will reduce the time-consuming process that user spend on searching particular news. This app will process the news query and provide a relevant news along with its sentiment. Artificial intelligence is used for news categorizing, sentiment analysis and several other features. These all features are already provided by IBM Watson Discovery Services API. And user interface can also be created easily using node-red flow editor. Total positive, negative and neutral sentiment are also displayed along with the search results.

3. THEORITICAL ANALYSIS
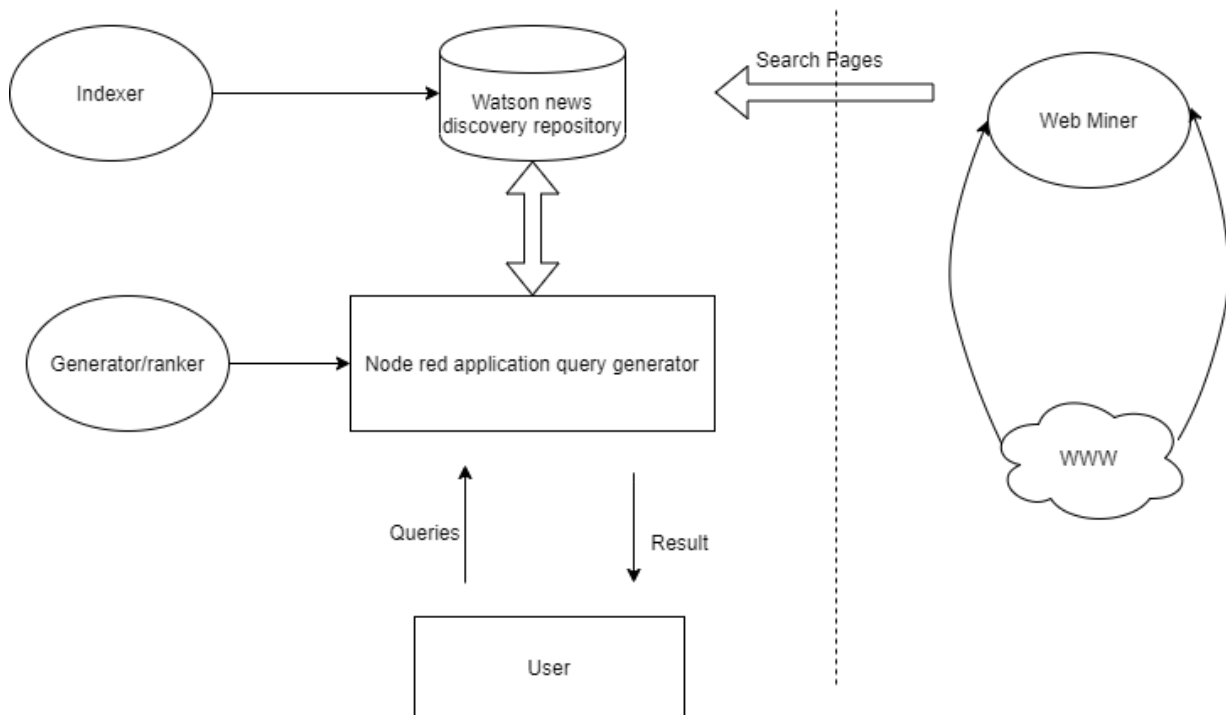
3.1 Block diagram

Fig1: Block diagram of news search mining

- ♣ User interacts with user interface by giving news as a query. This interface is created using node red application.
- ♣ Appropriate query is generated and query is passed towards Watson news discovery repository.
- ♣ Watson news discovery repository has a pre-build news mining feature. It extracts the appropriate news based on the user query and JSON file is given as a response to the Node-RED application.
- ♣ Then the query is processed as per the requirements and the appropriate result is displayed on the User Interface.

3.2 Hardware / Software designing

Software required for creating an AI powered news search app are:

- ♣ **Watson Discovery:** A cognitive search and content analytics engine for applications to identify patterns, trends, and actionable insights.

- **Node.js:** An asynchronous event driven JavaScript runtime, designed to build scalable applications
- **React:** JavaScript library for building User Interfaces
- **Express:** A popular and minimalistic web framework for creating API and Web server
- **Slack:** Slack is a cloud-based set of team collaboration tools and services with chat bot integration

In order to develop an app UI for news mining there are certain requirements which need to be fulfilled. Major Requirements are: -

- Knowledge regarding IBM Cloud and use of IBM Watson Discovery Service to collect the news article.
- Development of Web application using Node-RED.
- Process user query and give appropriate response.
- Access the Watson Discovery Service through the Discovery API.
- Use a Slack interface to query the data
- Push news alerts out to web notification
- Deploy the app on IBM Cloud

4. EXPERIMENTAL INVESTIGATIONS

In development of this project many experimental investigations have been done throughout the complete project. I have to look towards numerous news search user interfaces to examine their features and their user interfaces. After going through different other UI, I started working on my app. There are different components present in my UI, which are as follows:

- Form is used for creating the search button and writing the user query
- The input taken through form is then send to the Watson discovery service for getting the appropriate searched news through proper aggregation of query.
- Response from Watson discovery service is a Json File. Therefore, processing of response is done to extract important components such as

URL, text, title, sentiment, etc.

- The extracted news data is presented to user using a template
- Clicking on any news title will redirect you towards the website where the news is originally published
- Graph is also added to UI which shows total sentiment of searched news i.e. either positive, negative or neutral.
- Sentiment of each news are also displayed so that a person can easily judge the news.
- Each news belongs to certain category. So, Top 10 categories of the searched news are also displayed on the UI.

Node-RED is used from scratch for developing the above explained user interface and for news search an API named Discovery provided by IBM Watson Service is used. This not only had a bank of news search entities but was also capable of performing sentiment analysis (by writing appropriate J-Queries) on the searched text which enabled the user to get a deep insight of his/her search result. Aggregation for search query used in my project is:

term(enriched_text.sentiment.document.label,count:10)

The above aggregation is used to collect news based on their sentiment and display based on their relevance score.

5. FLOWCHART
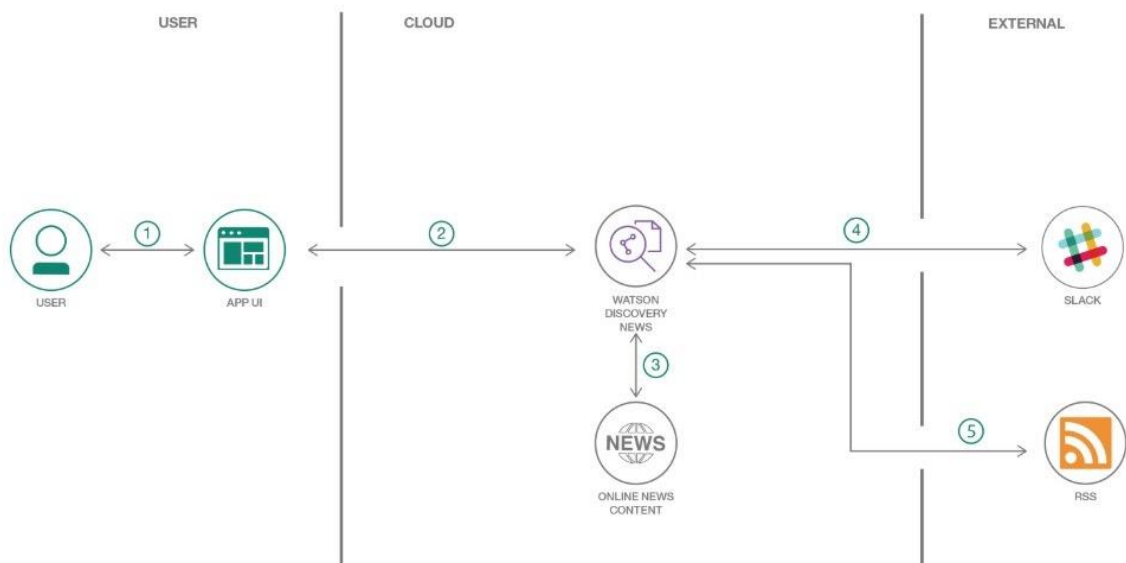
Fig2: Flow chart

The steps shown in the flow chart are as follows:

- The user interacts with the Watson Discovery News Server via the app UI.
- User input is processed and routed to the Watson Discovery News Server.
- The Watson Discovery News Server sends user requests to the Watson Discovery Service.
- The Watson Discovery Service queries the Watson News Collection.
- The Watson Discovery Service responds to Slack search requests.

6. RESULT
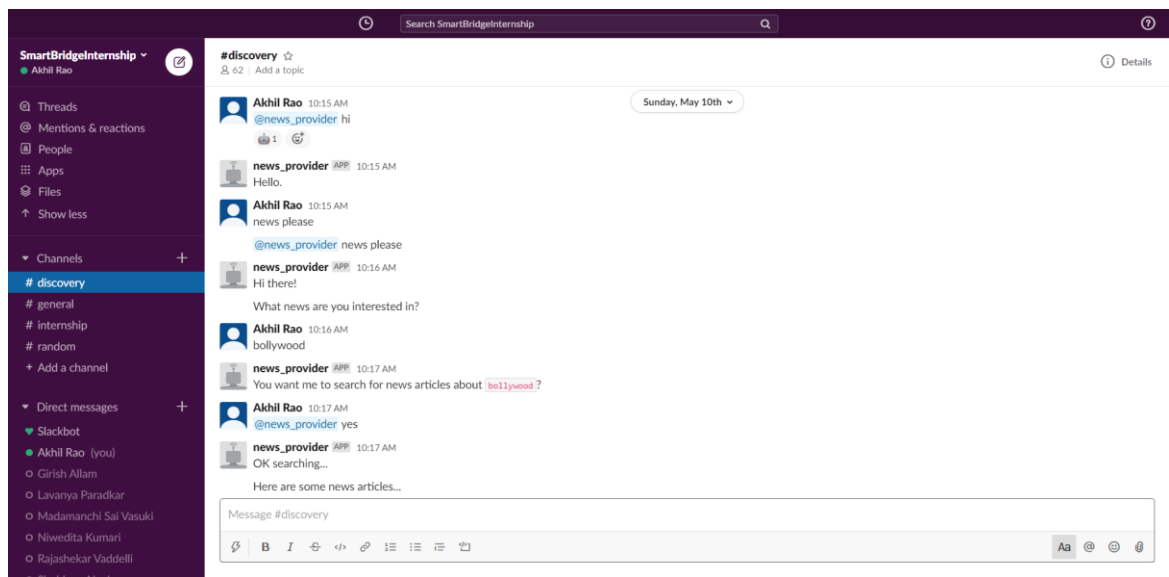
Fig3: News search using Slack
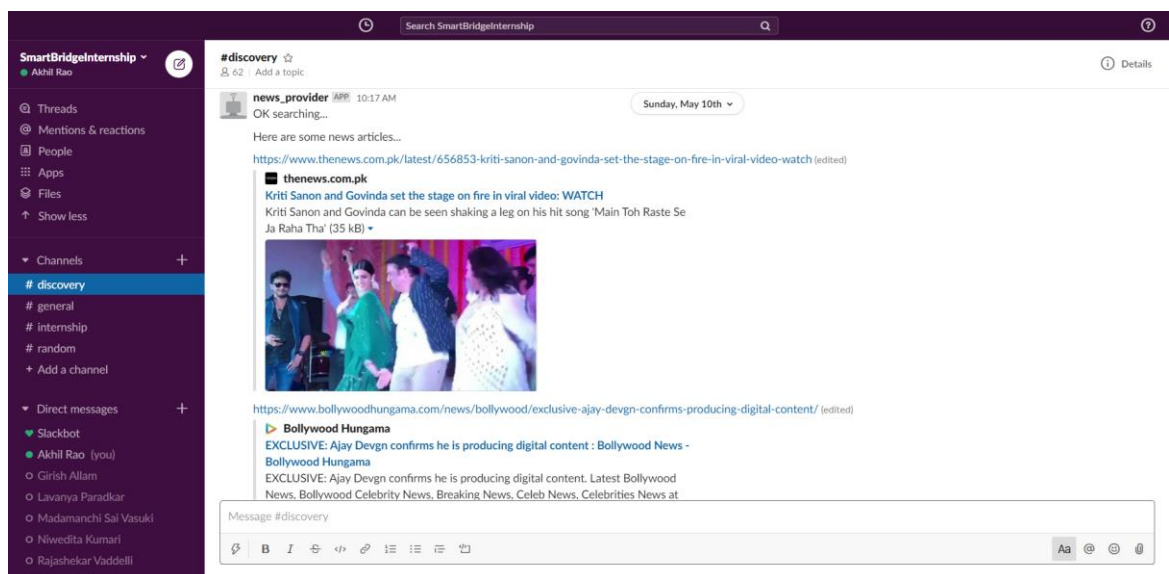
Fig4: News search result using slack
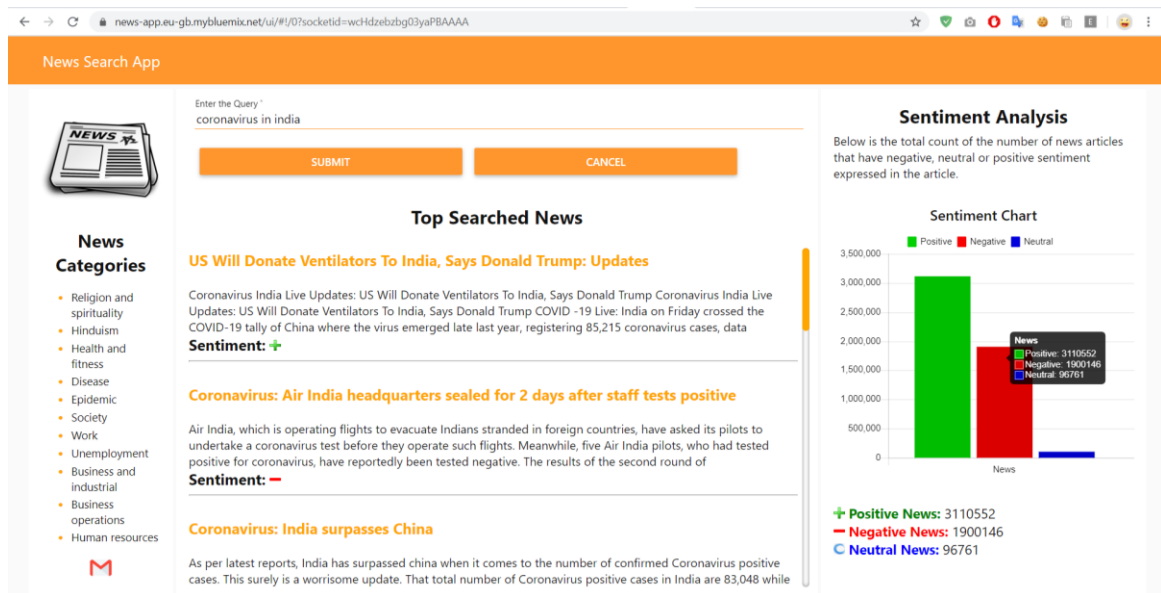
Fig5: News search App

Interaction with slack is shown in Fig3. Name of slack bot used is "news_provider". Search result of query provided to slack bot is shown in Fig4. News app created and deployed on IBM cloud successfully. Screenshot of news app is shown in Fig5.
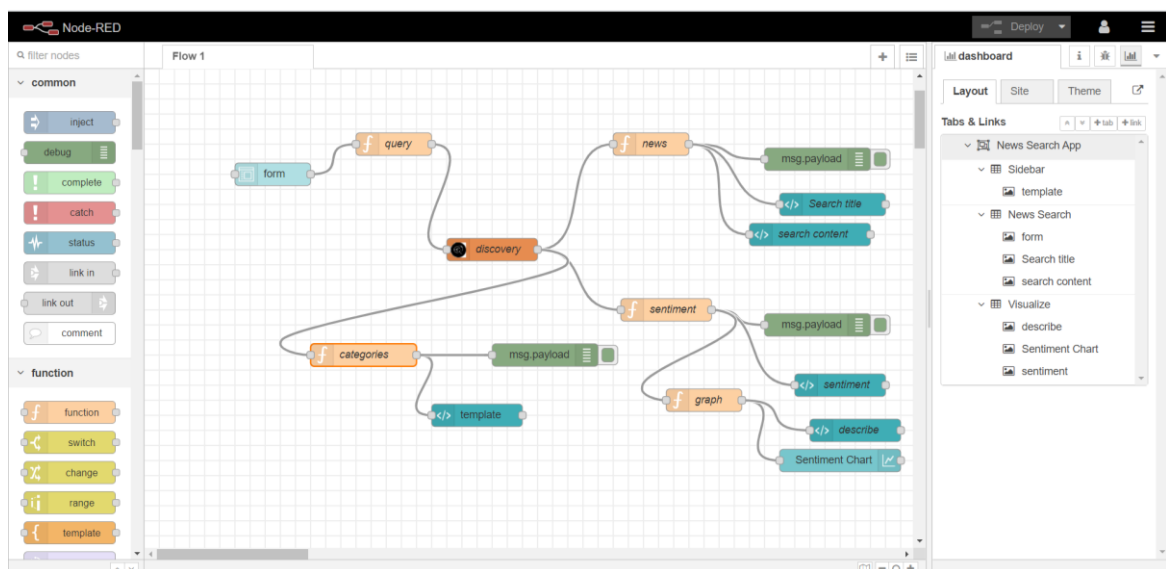
Fig6: Flow of my Node-RED flow Editor

Fig6 shown above contains the flow of node-red flow editor. It shows how the nodes are connected and under which group it come. User interface is created using node-red flow editor. And each function created has different role. Discovery node is used which contains IBM discovery service API credentials.

App Url:https://news-app.eu-gb.mybluemix.net/ui/

7. ADVANTAGES & DISADVANTAGES

Everything created in this world has its own advantages and disadvantages. So, lets see the advantages and disadvantages of the news search app created.

Advantages:
- Simple User Interface which is very easy and comfortable to use.
- Sentiment is also provided for each searched news which makes easy to understand
- New news content will be automatically added to the IBM Watson discovery repository. So, no need to worry about new news content.
- Less response time on searched results
- Total sentiment of the news query is shown graphically, so that user can decide about the sentiment of the topic
- User can go to original news website by just clicking on the title of each news
- User will get top news article based on the relevance. So, user will not face any problem in searching top news.
- News category is provided for each searched news which helps user to understand the category of the news titles.
- Slack integration is also done.

Disadvantages:
- The UI will display only top 10 news only
- UI is not much responsive
- Search query is limited to only 200 times per month
- Not much space for adding other features or advertisements.
- The interface can be made much user friendly

8. APPLICATIONS

Some of the applications of news search app are:

- Can be used for searching most relevant and latest news
- This application can also be used for sentiment analysis of news
- Integrate the app with slack to search news using slack bot
- User can use this app to know in which category a particular news belongs.

9. CONCLUSION

The App was successfully created and deployed on IBM cloud. This app is created using Node-RED and IBM Watson Discovery Services using Discovery API. I have a great experience in creating this UI and learnt a lot about IBM cloud and node red. The pre-enriched documents in the IBM Watson enabled me to make the basis of my news application so that it could return the latest news and updates. It was easy to create an UI using node-red flow editor and interaction with Discovery API was done using API credentials. Using such features proper user interface was developed which gives a proper search result based on the news query. Slack integration was also done. It was a great experience working with IBM cloud and node-red.

10. FUTURE SCOPE

The news search app is created successfully but it can be further improved. The application can be made more responsive such that it can work at any platform. News search can be made more efficient by showing the current trending news topic. Some more functionalities such as web-notifications, share of particular news will be more useful to the users. User interface can be improved by providing different themes to the user. This news app can be made available to everyone and there should be no limit on search. News search using voice can also be added. This will surely increase the commercial value of news search app.

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pp. 378-384

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11.2 Other sources

https://cloud.ibm.com

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https://api.slack.com/support

https://nodered.org

https://youtube.com

APPENDIX

A. Source code

Below is the JSON code of flow of node-red.

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```

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content:msg.search_results.results[i].text,\n
url:msg.search_results.results[i].url,\n
sentiment:msg.search_results.results[i].enriched_text.sentiment.document.label\n
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src=\"https://cdn.imgbin.com/13/17/9/imgbin-blue-circle-watercolor-brush-
7Hh4HcUPTCYGEBjriew8GuLHx.jpg\" width=\"15\" height=\"15\">\n   \n

\n   <hr class=\"line\">\n
\n   </div>\n</div>",
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        "name": "",
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        "console": false,
        "tostatus": false,
        "complete": "false",
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        "y": 440,
        "wires": []

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    },
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        "collectionId": "news-en",
        "configurationname": "",
        "configurationId": "",
        "language_code": "en",
        "collection_name": "",
        "count": "10",
        "passages": true,
        "nlp_query": true,
        "query": "",
        "filter": "",
        "aggregation": "term(enriched_text.sentiment.document.label,count:10)",
        "return": "",
        "description": "",
        "size": "LT",
        "discovery-method": "query",
        "service-endpoint":                                                "https://api.eu-
gb.discovery.watson.cloud.ibm.com/instances/7ca5d0f1-4b24-4e41-8d36-
2f0f50b0af1a",
        "x": 460,
        "y": 340,
        "wires": [
            [
                "65af433f.e5952c",
                "4a22f49d.034cdc",
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                    "7e70afcd.2cd6"
                ]
            ]
        },
        {
            "id": "65af433f.e5952c",
            "type": "function",
            "z": "ee44a6f.259e858",
            "name": "sentiment",
            "func":                                              "var
val=[msg.search_results.aggregations[0].results[0].matching_results];\nval.push(ms
g.search_results.aggregations[0].results[1].matching_results);\nval.push(msg.searc
h_results.aggregations[0].results[2].matching_results);\nmsg.payload=val;\nreturn
msg;",
            "outputs": 1,
            "noerr": 0,
            "x": 690,
            "y": 420,
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                    "be5f0036.44915",
                    "bbfcbd1d.3da27"
                ]
            ]
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            "type": "ui_chart",
            "z": "ee44a6f.259e858",
            "name": "",
            "group": "204fe1c2.3999be",
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"order": 2,

"width": "7",

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"label": "Sentiment Chart",

"chartType": "bar",

"legend": "true",

"xformat": "HH:mm:ss",

"interpolate": "linear",

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"ymin": "",

"ymax": "",

"removeOlder": 1,

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"removeOlderUnit": "3600",

"cutout": 0,

"useOneColor": false,

"useUTC": false,

"colors": [

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    "#f70000",

    "#0000dd",

    "#2ca02c",

    "#98df8a",

    "#d62728",

    "#ff9896",

    "#9467bd",

    "#c5b0d5"

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"useOldStyle": false,

"outputs": 1,

"x": 920,

            "y": 620,

            "wires": [

                []

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        {

            "id": "be5f0036.44915",

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            "z": "ee44a6f.259e858",

            "group": "204fe1c2.3999be",

            "name": "sentiment",

            "order": 3,

            "width": "7",

            "height": "2",

            "format": "<div>\n   <p style=\"font-size:18px;\">\n   <img src=\"https://cdn.pixabay.com/photo/2012/04/13/00/21/plus-31216_960_720.png\" width=\"15\" height=\"15\">\n   \n   Positive News:\n   {{msg.payload[0]}}\n
\n   <img src=\"data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAOEAAADhCAMAA AAJbSJIAAAAbFBMVEX/////AAD/KSn/uLj/wcH/MTH/ODj/fX3/y8v/QED/1NT/Rkb/j Iz/3d3/TU3/6Oj/9/f/XFz/VFT/rq7/vb3/8vL/2tr/ycn/nZ3/amr/ZWX/kJD/DQ3/Gxv/7 e3/b2//dXX/goL/qKj/lpYrq+qLAAAB1UlEQVR4nO3b246CMBSF4SogqMCAimfB0fd/ xyniaSbGiRc729b/ewBYK0jayK4xAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA AAcEIRVdWXlZ3MRzfJA4vwX7PgBU+uc3/bLlAXsQ1bFc8qVcEyjffNam2VZTmxcmt 8MrwzeCT6V/8VT65zf9cuUBexDTuZ2OTr9aqJN9Pqb8FNf7fteWTb//7VL9lpJxKwS 24Fpz4WtM/xccCkYDrSzCImCrmCWayciRk2endWGjnUNQ2q4fmZ8v4dncNky1Q4iK7 Y/U60fY6xWm0o4grDZz7QjCEhNqRxAWmKl2BGFLc9COIOxoltoRhG2MzzuaVuz5gk 9DH9DQfbGJtSMIo6H7aOg+GrqPhu6f0PCoHUFY+gH/CPv/3SL QjiDsYBBLtCMJCU2tHEJaZQjjuCsMIUpXYGUXlhPP/M3c591WvtFILKuh37WvS1c4jZ d3As78bt/Q8Fl3ttZMIaa6j0IWfFZv7We9Z5NWUt7W9jM9eHVZlPh4OXhyqfz9RNBiO 83K1fHQgoc5GyWvnIt7QLFyMsvrJsQsAAAAAAAAAAAAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

AAAAAC8hx89ukbRSJQNSgAAAABJRU5ErkJggg==\" width=\"15\" height=\"15\">\n
\n   Negative News:\n
{{msg.payload[1]}}\n
\n   <img
src=\"https://cdn.imgbin.com/13/17/9/imgbin-blue-circle-watercolor-brush-
7Hh4HcUPTCYGEBjriew8GuLHx.jpg\" width=\"15\" height=\"15\">\n   \n   Neutral News:\n
{{msg.payload[2]}}\n
\n   </p>\n</div>",
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      "fwdInMessages": true,
      "resendOnRefresh": true,
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      "y": 520,
      "wires": [
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    {
      "id": "bbfcbd1d.3da27",
      "type": "function",
      "z": "ee44a6f.259e858",
      "name": "graph",
      "func": "msg.payload=[{\n   \"series\": [\"News\"],\n   \"data\": [
msg.payload[0], msg.payload[1], msg.payload[2]],\n   \"labels\": [\"Positive\",
\"Negative\", \"Neutral\"]\n}]\nreturn msg;",
      "outputs": 1,
      "noerr": 0,
      "x": 740,
      "y": 540,
      "wires": [
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          "8559c5e.ea89c38",

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                    "512fb428.62261c"
                ]
            ]
        },
        {
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            "type": "ui_template",
            "z": "ee44a6f.259e858",
            "group": "204fe1c2.3999be",
            "name": "describe",
            "order": 1,
            "width": "0",
            "height": "0",
            "format": "<div style=\"overflow:hidden\">\n    <p style=\"text-align:center;font-size:25px;font-weight:bold\">Sentiment Analysis</p>\n    <p>\n        Below is the total count of the number of news articles that have negative, neutral or positive sentiment expressed in the article.\n    </p>\n</div>",
            "storeOutMessages": true,
            "fwdInMessages": true,
            "resendOnRefresh": true,
            "templateScope": "local",
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                []
            ]
        },
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            "type": "ui_template",
            "z": "ee44a6f.259e858",
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"name": "",

"order": 0,

"width": "3",

"height": "10",

"format": "<style>\nul {\n   list-style: none;\n}\n\nul li::before {\n   content: \"\\2022\";\n color: orange;\n font-weight: bold;\n display: inline-block; \n width: 1em;\n   margin-left: -1em;\n   font-size:1.2em;\n}\n</style>\n<div>\n   <img src=\"https://pngimage.net/wp-content/uploads/2018/06/newspaper-logo-png-5.png\"   width=\"100%\">\n   <h1   style=\"text-align:center\">News Categories</h1>\n   <ul style=\"font-size:15px\">\n   <li ng-repeat=\"x in msg.payload\">{{x}}
\n   \n</div>\n<div style=\"text-align:center\">\n   \n   <img src=\"https://encrypted-tbn0.gstatic.com/images?q=tbn%3AANd9GcRm4AQcYbPCPGgtsRSqAl1DsVk3JPW sgVFQOljNEtt0Kn6y7it7&usqp=CAU\" width=\"30\">\n   \n</div>\n",

"storeOutMessages": true,

"fwdInMessages": true,

"resendOnRefresh": true,

"templateScope": "local",

"x": 440,

"y": 560,

"wires": [

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"type": "ui_template",

"z": "ee44a6f.259e858",

"group": "6c340085.ae30a",

"name": "Search title",

"order": 2,

"width": 0,

"height": 0,

"format":   "\<p   style=\"text-align:center;font-size:25px;font-weight:bold\">Top Searched News</p>\n",

"storeOutMessages": true,

"fwdInMessages": true,

"resendOnRefresh": true,

"templateScope": "local",

"x": 910,

"y": 280,

"wires": [

    []

]

},

{

"id": "7e70afcd.2cd6",

"type": "function",

"z": "ee44a6f.259e858",

"name": "categories",

"func": "var i,key;\nvar arr=[];\nfor (i = 0; i < 10; i++) {\n   var a=(msg.search_results.results[i].enriched_title.categories[0].label).split(\"/\");\n for(var j=0;j<a.length;j++){\n   a[j]=a[j].charAt(0).toUpperCase()+a[j].slice(1); \n arr.push(a[j]);\n   }\n}\nvar unique = arr.filter((v, i, a) => a.indexOf(v) === i);\nmsg.payload=unique.slice(1,12);\nreturn msg;",

"outputs": 1,

"noerr": 0,

"x": 290,

"y": 480,

"wires": [

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    "9b1ab100.d9afb"

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        "name": "",
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        "console": false,
        "tostatus": false,
        "complete": "payload",
        "targetType": "msg",
        "x": 530,
        "y": 480,
        "wires": []
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