

# GDELT-IR: Global Trending News Retrieval Using GDELT

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## 1 Motivation

### 1.1 Trending Topics

Traditional IR systems were capable of retrieving documents which are relevant to some given query. Today, interests have grown exponentially in data science and big data, with the rapidly growing data-hungry data systems, the traditional IR systems seems no longer powerful enough to fulfil the specific data needs of these data systems. This needs often requires the data preprocessing system to filter out the mass amount of noise and provide most relevant data not limited to one but many topics. For this reason, it is worth to explore, on top of the powerful IR systems, with the ranking pipeline and see if they could fit for this specific need.

While document embedding vectors had been widely used for semantic search, density based methods like clustering and density estimation could potentially be used for trend detection, which in turn may out to be a powerful noise filter in order to provide clean data.

The global wide news comes in a vast amount of different languages, it may be very hard or time consuming to go via the traditional routes in order to rank them altogether. By using a embedding and density based approach, it may be possible to rank the news articles of any language. A successful solution to this multilingual ranking problem could open potential doors to understand the world through common news trends in various countries.

## 2 Background

### 2.1 News & IR

Mühlroth et al. (2020) [5] used NLP, topic modelling and visualization to spot emerging trends and technologies. They were relying on the traditional N-gram based methods and queries, with a temporal resolution of annually. Nicholls et al. (2018) [6] used IR and network clustering techniques to analyze the content

of news stories as well as the communication chains of them. Their data size was a corpus of around 62000 articles.

## 2.2 Neural IR & Advanced Semantic Search

The traditional semantic search often involve a vector database and similarity search, with some assumption about vector similarity implies semantic similarity. An more advanced approach to this could be incorporate LLM and statistics to extract advanced insights like trends and relations.

MAPEGY is a Berlin-based Data Intelligence company, founded in 2012. They are applying LLM to extract insights from textual data ranging from technologies, news to research papers.

## 2.3 GDELT

GDELT stands for "Global Database of Event, Language and Tone", it is a massive database that contains preprocessed "NLP features" of news articles across the globe in at lest 65 languages (at the time of 2015), updated at a high temporal resolution in a 15 minutes intervals. The news articles data are preprocessed into various forms of "NLP features" like ngrams, document embeddings etc, see the Global Knowledge Graph for an example of the live knowledge graph dataset.

## 2.4 Topic Modelling

Topic modelling has been well studied and a common method is Latent Dirichlet Allocation (LDA<sup>1</sup>) [1] . However, LDA requires the data in form of ngrams. One can ask the question whether density based topic modelling is a well studied method, but since topic modelling is outside the scope of this specific project, we perform a limited topic extraction task from the articles' titles. The purpose of this approach is only to improve the visual evaluation of the clusters after parameter tuning, see section 7.3 below.

## 3 Goal

The goal of this project is two-folded. The first part is to try to define the research problem of trending news ranking itself, as well as decide on a evaluation process and dataset to evaluate the solution. The second part is to implement the solution in terms of a data ranking pipeline. None the less, the pipeline itself should be a form of an IR system, that is to say for a given query, a list of ranked news articles should be returned. The weight will be put in the "ranking" part.

Due to time constraint, a clear definition of the research problem may not be well formulated, instead a list of clearly formulated assumptions should be

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<sup>1</sup><https://scikit-learn.org/stable/api/sklearn.decomposition.html>

used to guide this exploratory study towards providing a solution that solves the problem to a certain degree.

## 4 Problem Formulation

The main problem can be formulated in terms of an open IR system, with a very open query:

What are the TOP-N most trending topics/articles for a date  $d$ ?

## 5 Data & Setup

The GSG (Global Similarity Graph) Document Embeddings dataset from the GDELT database is used. GSG is a live dataset of embedding of each global news articles, and it is freely available for download and use. The embeddings are generated online (as a data stream), utilizing Google USE (Universal Sentence Encoder) as 512-dimensional embedding vectors, one for each news article collected by GDELT, with an 15-min update frequency, ie the new data will become available after each said period.

For easy of development and evaluation of this project, a fixed set of datasets (files) are produced by sampling in the follow way:

1. Download and cache all GDELT GSG raw data.
2. Fix a date, say 2020-11-16 (e.g. when COVID started).
3. Select all data from 2020-11-16  $\pm 1$  day, ie. from 2020-11-15 to 2020-11-17.
4. Parse and sample the raw data uniformly, with a 20% sampling rate and export them to separate datasets.

The resulting datasets and the correspondence to the manually annotated events are summarized in Table 1:

Tagged Event	From Data	To Date
COVID-19	2020-11-16	2020-11-19
Russo-Ukrainian War	2022-02-23	2022-02-26
Iran-Israel Conflict	2024-04-13	2024-04-16
Palestinian Protests	2024-04-30	2024-05-03

Table 1: Datasets corresponding to annotation.

Note that the datasets were not filtered according to the annotation tags, rather only the tagged dates were used to matching the dates for the events to be found by the pipeline. The USE embeddings are multilingual thus there should be no different treatments required for different lanaguages. The size of each of the datasets after sampling is around 6000 articles, whereas the data

before sampling is around 1.7 million records for 3 day worth of global news articles.

The datasets were loaded into a personal Google Drive to enable collaborative research to be done using Google Colab Notebooks.

## 6 Assumptions

A set of assumptions is created to "approximate" a definition of trending news, however, a clear definition of it is not provided in this article. As it is equally worth to denote that the our work here is exploratory with a qualitative evaluation.

- **General base:** The news articles with similar topics will be clustered together by the USE embedding vector, and the denser (more articles in it) the cluster the trending the topic (of those articles) is at a certain timestamp.
- **Topic:** For each group of articles (cluster) there exist a topic that describes it perfectly.
- **Dimensionality reduction:**
  - All articles within the same topic will be pushed together close enough to be clustered into a single cluster.
  - All articles with different topics will be separated far enough, to build multiple clusters
- **Clustering:** The clustering algorithm will perfectly cluster all articles within the same topic.

## 7 Methods

### 7.1 Pipeline Overview

The main pipeline can be summarized as 6 main components:

1. **Raw Data:** the raw data of each articles like: URL (unique), title and vector embeddings.
2. **Dimensionality Reduction:** Uniform Manifold Approximation and Projection (UMAP) is used to reduce the dimension of the vector embeddings down to 2D points.
3. **Clustering:** Bayesian Gaussian Mixture model (BGMM) is used to cluster the 2D points.
4. **Per-Cluster Ranking:** Firstly, each of the Clusters is ranked.

5. In-Cluster Ranking: Secondly, each of the articles is ranked within each of the Clusters, locally.
6. Retrieval: The retrieval of the final documents is based on the two rankings above.

More specifically, a Data Flow Diagram has been used to demonstrate this pipeline in Figure 1.<sup>2</sup>

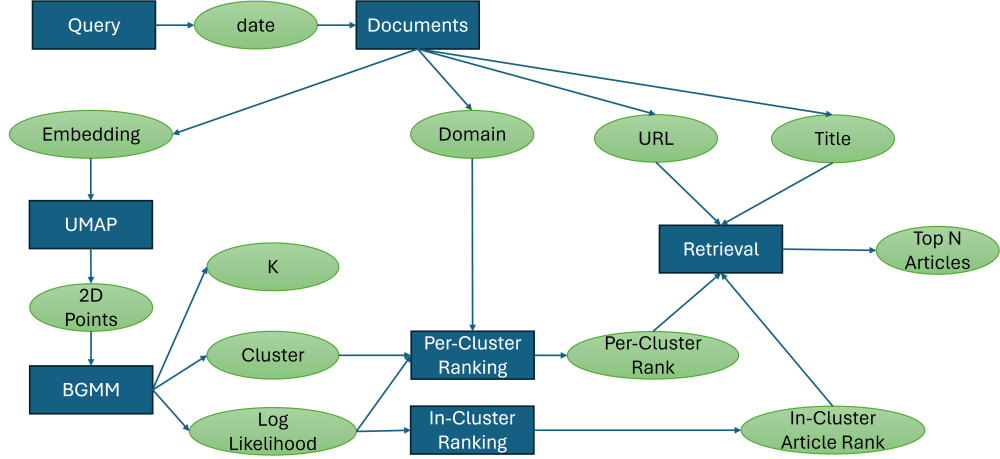


Figure 1: Final test accuracy for all configs.

## 7.2 Formal Definitions

Given a date  $d$ , each datasets can be formally described as a collection of documents  $D_i = (M_i, I_i, T_i, U_i)$  for  $i \in \{1, 2, \dots, n\}$  where:

- $i$  is the  $i$ -th document within this dataset (say sorted by URL) and  $n$  is the total number of articles in this dataset.
- $M_i$  is the 512-dimensional embedding vector.
- $I_i$  is the URL in raw text, which is also the unique identifier across the datasets.
- $T_i$  is the title of the document in raw text.
- $U_i$  is the top-level-domain in raw text, extracted from the URL, for example the URL "https://www.bbc.com/news/world-asia-china-51466362" have top-level-domain "www.bbc.com".

<sup>2</sup>K is the number of clusters according to BGMM, and it should be inputted into the Retrieval component in an updated figure.

The goal of the pipeline is to rank the documents within this dataset, that is to produce a set  $\{i \in \{1, 2, \dots, n\} | (D_i, r_i)\}$  where  $r_i$  is the per document ranking.

More specifically, the pipeline can be described as an algorithm operating on sets, as in Algorithm 1, with the list of symbols:

- The notation  $\{F_i\}$  is the set  $\{i | F(i)\}$  generated by some function "described by its symbol", for example  $\{D_i\}$  is the set of all articles in the corresponding dataset.
- $c_i \in \{1, 2, \dots, K\}$  is the cluster label for  $D_i$  and  $p_i$  is the log-likelihood for it to belong to that cluster.<sup>3</sup>
- $c$  is each of the unique cluster labels in  $\{c_i\}$ .
- $d_c$  is the average log-likelihood of cluster  $c$ .
- $u_c$  is the total unique domain in cluster  $c$ .
- $\Pi(c_i)$  is the total number of articles (points) in the cluster for which  $i$  belongs to.

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**Algorithm 1** Trending News Ranking Pipeline

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d ← date
{Di} ← SamplingGDELT( d )    ▷ Sampling for the datasets with the date.
{(Mi, Ii, Ti, Ui)} ← Di
{hi} ← UMAP( {Mi} )        ▷ (Section 7.3)
{(Ii, ci, pi)} ← BGMM( {hi} )    ▷ (Section 7.4)
{(c, Rc)} ← PerClusterRanking( {ci, pi, Ui} )    ▷ Rc = √dc · uc (Section 7.5)
{(Lc,i)} ← InClusterRanking( {pi} )    ▷ Lc,i = pi (Section 7.5)
{(ri)} = ci · Π(ci) + Lc,i    ▷ The final ranking is sorted by cluster rank then
by in-cluster rank of doc i.

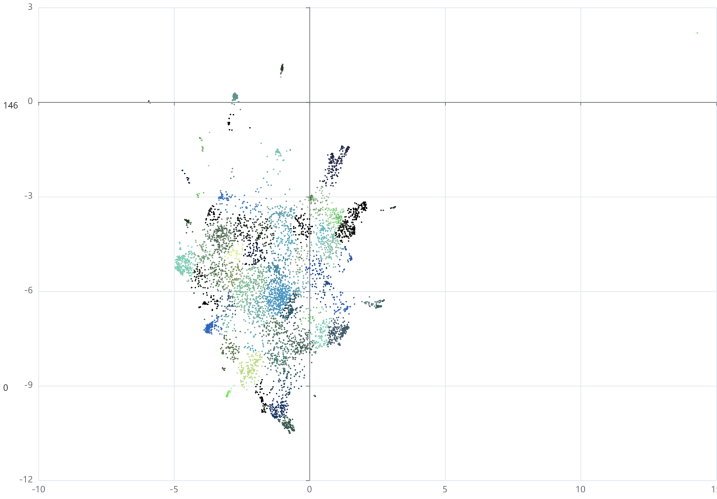
```

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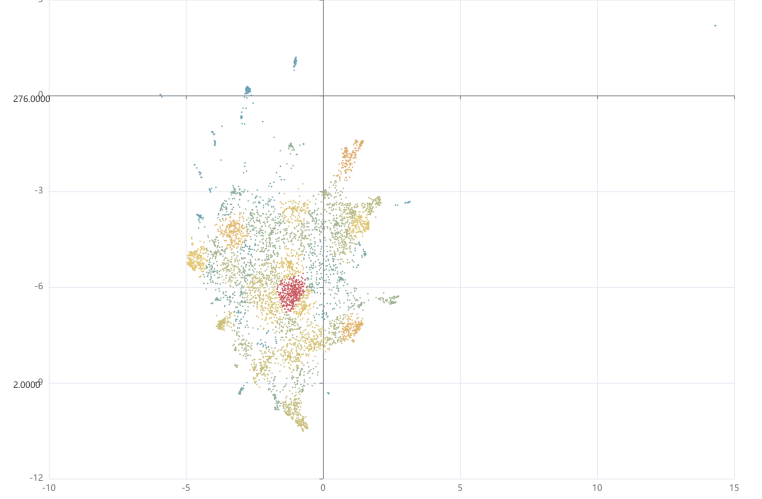
Figure 2 is a visualization of the intermediate variables, in an example run using the final pipeline.

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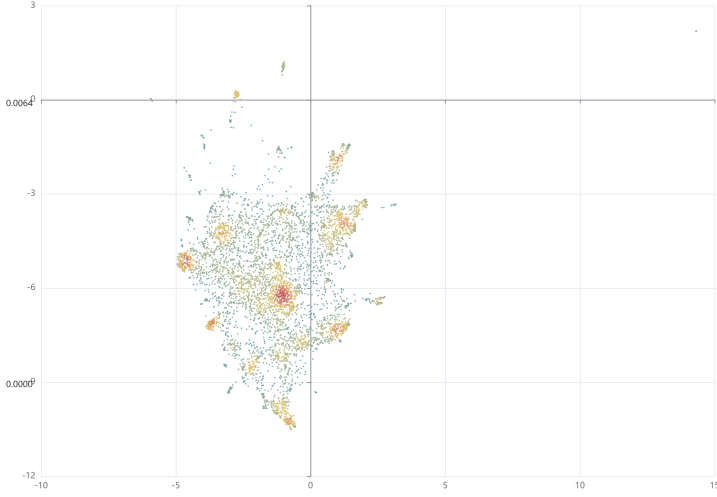
<sup>3</sup>Note that it could happen that we are also using  $p_i$  to referring to the "exponential log-likelihood", i.e., just the likelihood, which is closer to "some sort of density" than the log version of it. But there should not be too much difference in either way of our density estimation.



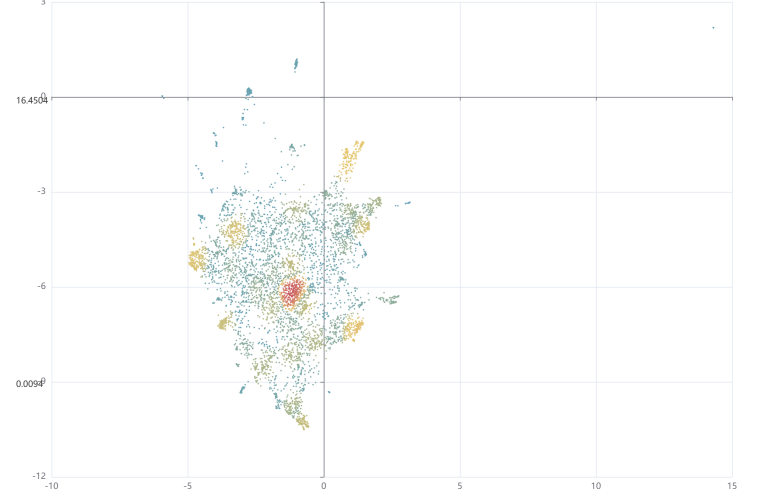
(a) Cluster labels  $c_i$  (with Scientific Color Map [3])



(b) Total unique domains per cluster  $u_c$ .



(c) Log-likelihood per article  $p_i$ .



(d) Final scores  $r_i$ .

Figure 2: visualization of the variables in an example run.

### 7.3 Dimensionality Reduction

We used Unifold Manifold Approximation and Projection (UMAP) [4] to reduce the high dimensional GDELT GSG dataset into a 2-dimensional space. UMAP is a machine learning method that converts data into a high-dimensional graph and project it into a low-dimensional space, thereby maintaining global structures at low computational costs<sup>4</sup>. Based on our assumptions, the goal was to find a

<sup>4</sup><https://pair-code.github.io/understanding-umap/>

set of optimal parameters that forces related articles to cluster around the same topic in this low-dimensional space.

The UMAP fine-tuning was based on a set of chosen parameters. We focused on nearest neighbors (**n\_neighbors**) and spread (**spread**) according to the UMAP documentation<sup>5</sup> and on-line manuals<sup>6</sup>. The first parameter controls the distance of neighboring data points in forming local vs. global structures, whereas the second parameter controls the tightness of the data points in forming clusters. Therefore, the criteria was to find a trade-off that could force related articles to cluster together. Additionally, the parameter minimum distance (**min\_dist**) was chosen with a value of 0.0 for maximizing the clustering of the data points.

We conducted four iterative tests on a 20% partition of the English dataset, in the parameter range of 5, 50, 100, 150 for **n\_neighbors**, and 1, 4, 8 for **spread**. For clustering classification, we implement the Bayesian Gaussian Mixture Model (BGMM)<sup>7</sup> in each iteration, see section 7.4 below. The classified clusters were visualized on screen and evaluated manually by analyzing the articles in the densest clusters. To improve the visual evaluation, we use LDA to extract 10 topic words with the highest probabilities for each clusters. For a detailed description, see Appendix A. The analysis was based on three well-defined and dense clusters: *Earthquake in Turkey*, *Ukrainian War*, and *Chinese Spy Balloon*. The result of the iterative tests is illustrated in Figure 3.

As Figure 3 shows, a low **n\_neighbors** value of 5 fails to find relevant structures in the scattered data. Conversely, a higher value of 50 with **spread** set to 1 forces coherent clusters to emerge. Increasing **spread** values of 4 and 8 causes some related articles, like those in the *Earthquake* cluster, to be split in two clusters, as well as causing some in-domain sub-clusters to emerge. This behavior is also encountered with **n\_neighbors** set to 100 and **spread** set to 1, resulting in the emergence of in-domains and unrelated articles in the *Ukrainian* and *Chinese* clusters. As **spread** increases to 4, the clusters start to approximately stabilize around the topic event without any further splitting. However, the last set of parameters with **n\_neighbors** set to 150 gives inconsistent results. Certain unrelated articles start to be clustered around broader topics, such as "war" or "natural disaster", and therefore, we discarded this parameter value. The last parameter set illustrated in Figure 3 is taken from a different partition and is included here for illustrative purpose. We identify a trade-off between **n\_neighbors** values of 50-100 and a maximum **spread** value of 4. This trade-off could be applied to our multi-lingual datasets of English, Italian, and Turkish.

## 7.4 Clustering

For clustering we used a SciKit-Learn [7] implementation of Variational Dirichlet Process Mixtures [2], under class `BayesianGaussianMixture`.

<sup>5</sup><https://umap-learn.readthedocs.io/en/latest/parameters.html>

<sup>6</sup><https://umap-learn.readthedocs.io/en/latest/>

<sup>7</sup><https://scikit-learn.org/stable/api/sklearn.decomposition.htm>



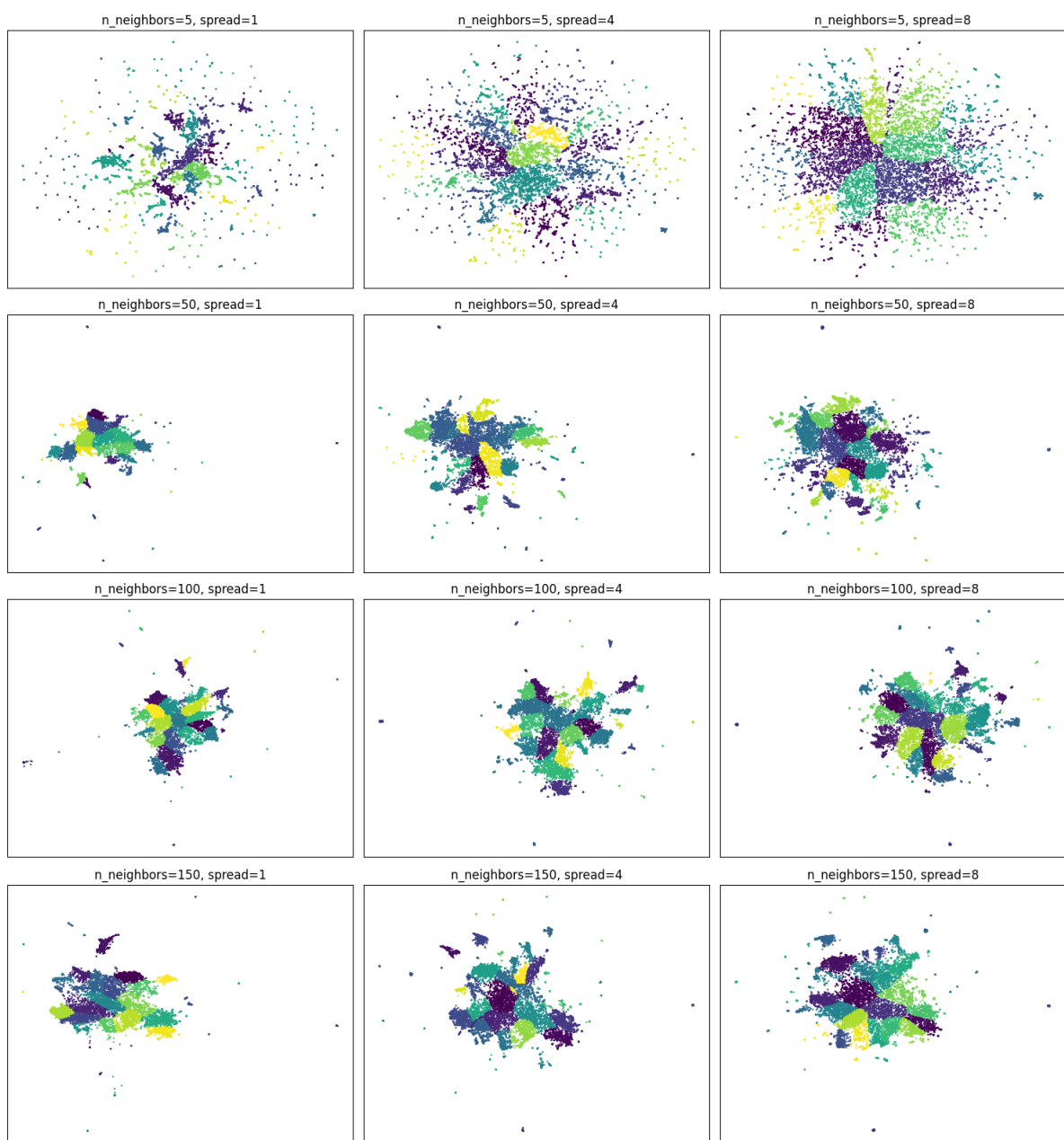


Figure 3: UMAP parameter tuning in the range 5, 50, 100, 150 for `n_neighbors` and 1, 4, 8 for `spread`. Each color denote a separate cluster.

The advantage of the "Bayesian flavour" is that the number of clusters is not required to be known a priori, rather it is enough to provide a wished upper-bound of it, and the algorithm will optimise the number of clusters, by setting weights to each of the clusters, i.e. clusters with 0 weights are considered "disabled".

The following hyperparameters were used:

1. `n_components = 150`
2. `weight_concentration_prior = 100000`
3. `mean_precision_prior = 0.001`
4. `degrees_of_freedom_prior = 50`
5. `random_state = 123456780`
6. `max_iter = 1000`
7. `init_params = "k-means++"`

The first 4 hyperparameters were chosen to enable a "sharp and detailed" clustering, for example, to allow the "breaking down of a giant point cloud ball into pieces". The reasoning behind this is a intuitive assumption that if some collection of points is trending, then each of the clustering within this "ball" should also be able to detected by the pipeline, and ranked as trending.

The hyperparameter 5. sets a fixed seed for reproducibility, 6. sets a high iteration number for convergence and 7. use an improved version of K-means for initialization of the points, which should also improve convergence.

## 7.5 Per-Cluster & In-Cluster Ranking1

We used a combination of measuring density and count unique domains to rank the clusters. The hypothesis was that trending news will be written about by several unique domains (all are writing about big news and big news is trending news). But to only see to unique domains was not the best solution, so we decided to combine unique domains with density, and it turned out to work well. In this step, the clusters are defined. We started by filter the data, took out the unique domains and mapped every data point to the correct unique domain for each cluster, see Figure 2b.

We computed the density of each cluster by taking the mean of the log-likelihood (see Figure 2c) of each data point in it. The combination of unique domains and density was calculated for each cluster as the square root of the density multiplied by unique domains:

$$R_c = \sqrt{d_c} \cdot u_c$$

To visualize the ranking, we created an array for  $r_i$  based on the dictionary of the ranking for each point in each cluster and the cluster ranking themselves, for each data points in the dataset, see Figure 2d.

In the final step, we sort the ranking dictionary so that the highest ranked cluster is found at the top of our list. We chose to pick out the top 10 clusters

for the document ranking and retrieval part (for example outputs, see Appendix B).

## 7.6 Retrieval

The articles are retrieved by sorting the final score  $r_i$  in descending order, this allows the retrieval of "overall top N" articles or "top N articles per top K clusters".  $r_i$  is computed, as described in Algorithm 1, i.e. by first sorting the clusters according to  $R_i$ s then sort the articles within the top N clusters, according to  $p_i$ .

## 8 Results

In this section, we will present the results of our algorithm, with different time, topic and language combinations. For each topic, we use the dataset with corresponding time range as described previously, across three languages: Italian, English, Turkish. Our set of topics for the test consisted of "COVID-19", "Russo-Ukraine War", "Iran-Israel Conflict", and "Palestinian Protests". In 2, we present the number of clusters that are related to our chosen set of topics per language.

	Italian	English	Turkish
COVID-19	2	4	1
Russo-Ukrainian War	3	2	5
Iran-Israel Conflict	1	1	1
Palestinian Protests	0	0	0

Table 2: Number of Clusters for Topic-Language Pairs

### 8.1 Qualitative Evaluation

To evaluate our algorithm, we created a set of handpicked news articles published during the spike period of a given topic, according to Google Trends. During the manual data collection process, We have considered important factors such as reliability of the source and national or local coverage of news. In this section, We compare the output with articles in the evaluation set, and discuss the relations within the cluster.

#### 8.1.1 COVID-19

Within the given period of time, the topic "COVID-19" appeared the most in the English data set, with 4 clusters in total, out of the top 10. Among those clusters, cluster number 2 was very consistent with the selected articles. All of them were reporting on COVID-19 statistics. They focused on the case numbers of COVID-19, including the number of new cases, death count, and people getting treated at the time of publication. Cluster number 5 included several

subcategories, ranging from containment issues with COVID-19, lack of hospital beds, to vaccinations against COVID-19. The last article being an exception, it was about snowfall in a temple. Cluster number 9 was about vaccinations in general. However, COVID-19 vaccinations formed a large subgroup, with only one article in the cluster being about HPV vaccination. One major issue about this cluster was the spam articles. Out of 9 COVID-19 related articles in the cluster, 3 of them were the exact same article, published in different websites.

In the Italian dataset, COVID-19 appeared as the main topic of 2 clusters. Cluster number 2 was very consistent with the selected articles. All of them were reporting on COVID-19. The articles in cluster 2 focused on the case numbers of COVID-19, including the number of new cases, death count, and people getting treated at the time of publication. Cluster number 3 contained articles mainly about the COVID-19 related restrictions and protests. However, 3 of the articles were not related to COVID-19 at all. Articles number 4, 6, and 9 formed another subgroup of articles, mainly dealing with death-related news.

The Turkish dataset contained the least amount of COVID-19 related clusters, by having only one cluster out of 10. Cluster number 1, consisted of 7 articles, 5 of which was about COVID-19. The other 2 articles were about the launch Jennifer Lopez’ cosmetic brand.

Across all languages, none of the articles matched the articles in the evaluation set.

### 8.1.2 Russo-Ukrainian War

For this topic, we identified the start of invasion as the spike period. And during the spike period, Turkish language had the biggest number of clusters across all languages. Turkish language dataset provided 5 clusters in total, out of 10 clusters. We could not observe any clear subgroups as seen in the previous examples for cluster 1. The articles ranged from the animated TV show ‘The Simpsons’s prediction of the war to Ukraine’s call for help. Article number 6 provided alternative routes for logistic companies in Turkey that are affected by the war. Article number 8 provided a pro-Russian perspective on the events preceding war. Cluster number 2 consisted of several subgroups, ranging from protests against the invasion in Moscow, declaration of military operations to Ukraine, routes used by Ukrainian refugees, to Putin’s plea to Ukrainian soldier to take over the country. Cluster 3 mainly dealt with the possible death toll of the war, with article number 4 as exception. Article 4 was about a missile attack in Syria. Cluster number 8 focused on the sanctions against Russia, and support for Ukraine. Articles 1 and 7 formed a subgroup of IMF support for Ukraine. Articles 2, 4, 8, 9, 10 focused on the sanctions, while the rest of the articles were about the Turkish stock market. The final cluster in this topic is cluster number 9. This cluster mainly focused on the war’s effects on the global stock markets, in addition to price changes in gas and benzene (articles 9 and 10).

In the Italian dataset, we observed 3 clusters related to the Russo-Ukrainian War, with more uniform subgroups compared to the Turkish one. 2 of the 3

clusters ranked first and second. The first cluster dealt with the reactions of the world to the Russian invasion, including but not limited to possible sanctions, possible aftermath scenarios, forming alliances and so on. Cluster number 2 was mainly about the Russian progression on Ukrainian soil, including capturing Chernobyl and Russian influence on separatist regions of Ukraine. Cluster number 8 was about the protests of Russian invasion of Ukraine, both in Russia, and around the world.

The English dataset contained 3 clusters that are related to the topic. The first cluster was ranked the second in our algorithm. It contained articles about NATO’s reaction to the war, as well as explanations on Putin’s reasoning behind the war. There were no clear subgroups, unlike the previous examples. The second cluster ranked the third in our algorithm. It also dealt with the reactions to the invasion. One major subgroup in this cluster was formed by articles 2, 4, 5, 7, and 10. In this subgroup, every article except for 5 and 7 was essentially the same article published in different websites. Article number 9 was about the Ukrainian protests outside the Russian embassy. The other articles did not form subgroups. The final cluster ranked 9th in our algorithm. Every article except for articles 2, 5 and 8 were about the sanctions against Russia. The articles 1, 2, 6, and 9 were the exact same articles, published on different websites. While articles 4 and 7 focused on Japan’s sanctions against Russia.

Across all languages, none of the articles matched the articles in the evaluation set.

### **8.1.3 Iran-Israel Conflict**

The Iran-Israel conflict appeared once per language.

For Italian dataset, the only cluster we observed focused on the reporting the attack itself, with no other subgroups.

The English dataset ranked the Iran-Israel conflict as the second cluster. This cluster mainly focused on the US’ reaction to the attack, as well as the reporting the attack’s occurrence. There were no clear subgroups in this cluster.

The Turkish dataset’s cluster on this topic was ranked highest among the three languages, being placed as the first. This cluster also lacked prominent subgroups. Only one article mentioned Iran’s drone failure in Iraq, while the other articles reported other countries’ disapproval of the attack.

Across all languages, none of the articles matched the articles in the evaluation set.

### **8.1.4 Palestinian Protests**

This topic did not rank high enough in our algorithm to appear in top 10 across all languages.

### **8.1.5 Evaluation**

The results vary greatly from language to language. Behind this difference lies the geopolitical position of the countries where the target language is spoken.

The current lingua franca is English. Thus, we can find news of great variety when it comes to events with great global consequences, such as COVID-19. The existence of ‘Anglosphere’ (countries that have English as the first language) could explain this phenomenon.

When the locality to ground zero is of more importance than global consequences, we can see that other languages pay more attention to the said events. For example, the Turkish language dataset had 5 clusters that are about Russo-Ukrainian War out of top 10 clusters in the whole dataset. This could be attributed to Turkey’s position in Black Sea, neighboring the countries involved in the war, along with now-destroyed trade routes with both of these countries. On the other hand, Italian language consistently stayed in between this dichotomy of global consequences and being local to the events. This could simply be explained by the geopolitical position of Italy, as suggested earlier. Italy is not closer to both Russia/Ukraine, and Israel/Palestine/Iran than Turkey is. And the countries where Italian is the first language are already neighbors with Italy, lacking the geographical spread that English has.

## 9 Discussion

Overall such open information retrieval problem is very hard to define, model, and evaluate in nature. Even if a clear definition could be found there will still be many complex factors which, when not well controlled, could contribute to uncertain results. The accuracy of the result is an effect of many advanced algorithms put together and recurring result of many complicated algorithms, where a tiny parameter change in one of the steps could result in huge change in the end result. Even the worse, the errors of the components will accumulate in an unexpected way.

This kind chaotic system is hard to tune, even given a good set of evaluation data. For instance, smaller changes in the UMAP parameters lead to unexpected changes in the low-dimensional space. We observed that the `n_neighbors` parameter set to a value of 150 with a `spread` value of 1 causes the “sport” cluster to further split into two, as well as force well-defined clusters to both include unrelated documents and to become more broader around a specific topic.

A limitation in our method is the parameter tuning on monolingual data. We used the English dataset as a baseline, which is approximately 20 times larger than the Italian (12174 articles) and Turkish dataset (10337 articles). Given this unbalanced distribution of articles, the proposed trade-off could affect the quality of the clusters, leading to worse accuracy for ranking and retrieval of relevant document. A possible solution for our cluster-based IR system is a language-based parameter tuning, albeit a time-consuming approach.

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## Appendix A Topic Modelling

We implemented the LDA model in the iterative tests of the tuning parameter. According to the documentation<sup>8</sup>, LDA is a probabilistic model based on the assumptions that given a document collection  $D$ , there are  $N$  topic words that are related to  $K$  topics in the collection. After the clusters were classified by the BGMM algorithm, we extracted 10 topics from the articles' titles within each cluster, with each topic comprising 10 topic words. The analysis was based solely on the normalized probability distribution of the first topic. The first topic showed the highest values among the 10 topic words, which could be representative of the clusters' content. Table 2 shows the normalized probabilities for each chosen event. Table 3 illustrates an example of the extracted topic words from the events with highest normalized probability.

Table 3: Topic probabilities according to each parameters in the iterative tests.

	<i>Earthquake Turkey</i>	<i>Ukrainian War</i>	<i>Chinese Spy Balloon</i>
<b>50-1</b>	0.09808	0.04657	0.08074
<b>50-4</b>	0.10401, 0.04390	0.06070	0.08859
<b>50-8</b>	0.09211, 0.03712	0.06664	0.05968
<b>100-1</b>	0.09164	0.04813	0.07996
<b>100-4</b>	0.09724	0.05576	0.05175
<b>100-8</b>	0.10801	0.07996	0.07793
<b>150-1</b>	0.09331	0.03847	0.07345
<b>150-4</b>	0.09554	0.04787	0.08582
<b>150-8</b>	0.08610	0.05542	0.08725

Table 4: Extracted topic words with the highest probability in Table 1.

	<i>Topics (n= 10)</i>
<b>Earthquake Turkey</b>	turkey earthquake syria toll death quake kills powerful earthquakes search
<b>Ukrainian War</b>	ukraine russian minister defence russia request warplanes confident news tanks
<b>Chinese Spy Balloon</b>	balloon chinese us spy china suspected biden downs says surveillance

As Table 2 shows, high probability values with coherent topic words (i.e. that relate to the same topic), may indicate a dense, well-formed cluster. On the other hand, low probability values with mixed topic words may suggest either i) in-domain sub-clusters with articles that are related to each other, or ii) ill-formed clusters with unrelated articles. For instance, the event *Earthquake in Turkey* is split into low probability, in-domain sub-clusters with a `n_neighbors` value of 50 and increasing `spread` of 4 and 8 (0.04390-0.03712). Additionally,

<sup>8</sup><https://scikit-learn.org/stable/modules/decomposition.html#latentdirichletallocation>



we observe mixed topics in the *Ukrainian* clusters (*news health world breaking migration newsnow search westerly ukraine russia*) with a  $p = 0.06070$ , suggesting a possible reference boundary. However, due to the unpredictable variation of the clustering algorithm and the scarcity of textual data, the results might not be reliable. Therefore, we decided to use LDA as an helping tool for the visual evaluation of the clusters.

## Appendix B Results from a Evaluation Run

### B.1 COVID-19

Top 10 articles for nr 1:

- 1-th Title: DeWine imposes overnight curfew for three weeks amid COVID crisis
- 1-th URL: <https://www.cincinnati.com/story/news/2020/11/17/devine-expected-unveil-new-steps-ohio-covid-19-coronavirus-battle/6322527002/>
- 2-th Title: '3-week pause' implementing new statewide COVID-19 restrictions in effect today
- 2-th URL: <https://www.fox17online.com/news/coronavirus/whitmer-announces-3-week-pause-to-include-ending-in-person-dining-closing-movie-theatres-more>
- 3-th Title: Hampton considers town-wide mask mandate after all
- 3-th URL: <https://www.seacoastonline.com/story/news/local/hampton-union/2020/11/17/hampton-considers-mask-mandate/6331095002/>
- 4-th Title: Governors ratchet up restrictions ahead of Thanksgiving
- 4-th URL: <https://www.wcvb.com/article/governors-restrictions-thanksgiving/34692497>
- 5-th Title: The Nashville Ledger
- 5-th URL: <http://www.tnledger.com/editorial/Article.aspx?id=135793>
- 6-th Title: Governors ratchet up restrictions ahead of Thanksgiving
- 6-th URL: [https://cumberlandlink.com/news/state-and-regional/governors-ratchet-up-restrictions-ahead-of-thanksgiving/article\\_0c8d0e4b-673b-5eba-a67f-8fba46c776e6.html](https://cumberlandlink.com/news/state-and-regional/governors-ratchet-up-restrictions-ahead-of-thanksgiving/article_0c8d0e4b-673b-5eba-a67f-8fba46c776e6.html)
- 7-th Title: Legislators Baker and Lang urge more mask-wearing in region
- 7-th URL: <https://www.wctrib.com/newsmd/6763438-Legislators-Baker-and-Lang-urge-more-mask-wearing-in-region>
- 8-th Title: Despite concerns, Greenfield to sign with Ballston Spa EMS
- 8-th URL: <https://www.timesunion.com/news/article/Despite-concerns-Greenfield-to-sign-with-15734195.php>
- 9-th Title: As COVID-19 cases surge, Tarrant County judge urges churches to stop meeting in-person
- 9-th URL: <https://www.fox4news.com/news/as-covid-19-cases-surge-tarrant-county-judge-urges-churches-to-stop-meeting-in-person>
- 10-th Title: Some driver licensing offices reopen after COVID exposure
- 10-th URL: <https://apnews.com/article/bowling-green-owensboro-coronavirus-pandemic-kentucky-lexington-390431166238418abdbd2c2083d09222>

Top 10 articles for nr 2:

- 1-th Title: Still no resolution for two facing organized crime charges in Prince Albert
- 1-th URL: <https://www.newsoptimist.ca/news/follow-the-sirens/still-no-resolution-for-two-facing-organized-crime-charges-in-prince-albert-1.24241532>
- 2-th Title: Lil Wayne Hit With Federal Weapons Charge, Faces Possible Years Behind Bars
- 2-th URL: <https://beatcolorado.iheart.com/content/2020-11-17-lil-wayne-hit-with-federal-weapons-charge-faces-possible-years-behind-bars/>
- 3-th Title: Not guilty plea entered in rural Fillmore County drug raid
- 3-th URL: <https://www.kint.com/content/news/Not-guilty-plea-entered-in-rural-Fillmore-County-drug-raid-573094131.html>
- 4-th Title: Rapper Lil Wayne charged with federal gun offense in Florida
- 4-th URL: <https://www.pressdemocrat.com/article/entertainment/rapper-lil-wayne-charged-with-federal-gun-offense-in-florida/>
- 5-th Title: Courts Fairfield County indictments
- 5-th URL: <https://www.lancastereaglegazette.com/story/news/2020/11/16/courts-fairfield-county-indictments/6277686002/>
- 6-th Title: Two charged in Marmora
- 6-th URL: <https://www.quinteenews.com/2020/11/16/248731/>
- 7-th Title: Lil Wayne charged with firearm possession
- 7-th URL: <https://krdo.com/entertainment/2020/11/18/lil-wayne-charged-with-firearm-possession/>
- 8-th Title: Jamaican accused of having half million dollars in drugs
- 8-th URL: <https://barbadostoday.bb/2020/11/16/jamaican-accused-of-having-half-million-dollars-in-drugs/>
- 9-th Title: Police: man arrested after attempting to flee traffic stop on bicycle
- 9-th URL: [https://www.havasunews.com/news/police-man-arrested-after-attempting-to-flee-traffic-stop-on-bicycle/article\\_d444379a-231e-11eb-8d73-4f4178acd71b.html](https://www.havasunews.com/news/police-man-arrested-after-attempting-to-flee-traffic-stop-on-bicycle/article_d444379a-231e-11eb-8d73-4f4178acd71b.html)
- 10-th Title: Gang member sentenced to 30 years on drug, gun charges
- 10-th URL: <https://krdo.com/news/national-world/2020/11/16/gang-member-sentenced-to-30-years-on-drug-gun-charges/>

Top 10 articles for nr 3:

- 1-th Title: Market exchange rates in China -- Nov. 17
- 1-th URL: <https://www.southeastasiapost.com/news/267004033/market-exchange-rates-in-china---nov-17>
- 2-th Title: Taiwan dollar, South Korean won lead Asian currency gains
- 2-th URL: <https://www.sharenet.co.za/views/views-article.php?views-article=530309>
- 3-th Title: Market exchange rates in China -- Nov. 17
- 3-th URL: <https://www.oklahomacitysun.com/news/267004033/market-exchange-rates-in-china---nov-17>
- 4-th Title: Rupee weakens
- 4-th URL: <https://www.thenews.com.pk/print/745218-rupee-weakens>
- 5-th Title: Market exchange rates in China -- Nov. 18
- 5-th URL: <https://www.bangladeshsun.com/news/267012757/market-exchange-rates-in-china---nov-18>
- 6-th Title: USD/CAD Forecast: US Dollar Tipped To Strengthen Towards 1.33
- 6-th URL: <https://www.exchangerates.org.uk/news/31165/2020-11-17-usd-cad-forecast-us-dollar-tipped-to-strengthen-towards-1-33.html>
- 7-th Title: Stocks in Japan dip but gains recorded across most other Asian fronts
- 7-th URL: <https://www.caribbeanherald.com/news/267015279/stocks-in-japan-dip-but-gains-recorded-across-most-other-asian-fronts>
- 8-th Title: EUR/USD edges up past 1.1850 area amid a moderate dollar weakness
- 8-th URL: <https://www.fxstreet.com/news/eur-usd-edges-up-past-11850-area-amid-a-moderate-dollar-weakness-202011162203>
- 9-th Title: Euro climbs on vaccine optimism, offshore yuan hits highest since June 2018
- 9-th URL: <https://uk.reuters.com/article/us-global-forex/euro-climbs-on-vaccine-optimism-offshore-yuan-hits-highest-since-june-2018-idUKKBN27X04I>
- 10-th Title: Weekly Economic Index: NSE All-Share Index records largest daily gain in more than five years
- 10-th URL: <http://venturesafrica.com/weekly-economic-index-48/>

Top 10 articles for nr 4:

- 1-th Title: Manitoba reserve on lockdown after all residents at care home infected with COVID-19
- 1-th URL: <https://www.680news.com/2020/11/16/manitoba-reserve-on-lockdown-after-all-residents-at-care-home-infected-with-covid-19/>

2-th Title: Arkansas reports record COVID-19 deaths, hospitalizations  
2-th URL: <https://www.sfgate.com/news/article/Arkansas-virus-panel-to-meet-as-hospitalizations-15729890.php>  
3-th Title: PM says military could help distribute COVID-19 vaccine, but Canada not there yet  
3-th URL: <https://www.thestar.com/politics/2020/11/17/ontario-hits-12th-straight-day-of-1000-plus-covid-cases-as-count-rises-across-canada.html>  
4-th Title: Health care providers call for stricter measures in Nebraska as COVID-19 cases spike  
4-th URL: [https://omaha.com/lifestyles/health-med-fit/health-care-providers-call-for-stricter-measures-in-nebraska-as-covid-19-cases-spike/article\\_dda95c30-e9eb-5a9c-929c-298253](https://omaha.com/lifestyles/health-med-fit/health-care-providers-call-for-stricter-measures-in-nebraska-as-covid-19-cases-spike/article_dda95c30-e9eb-5a9c-929c-298253)  
5-th Title: Essex tier two: Bosses say move was the right thing to do | Harwich and Manningtree Standard  
5-th URL: [https://www.harwichandmanningtreestandard.co.uk/news/north\\_essex\\_news/18877697.essex-tier-two-bosses-say-move-right-thing/](https://www.harwichandmanningtreestandard.co.uk/news/north_essex_news/18877697.essex-tier-two-bosses-say-move-right-thing/)  
6-th Title: Downing Street to give live briefing on coronavirus latest today  
6-th URL: <https://www.nottinghampost.com/news/uk-world-news/downing-street-give-live-briefing-4711391>  
7-th Title: More Ontario regions classified as red zones  
7-th URL: <https://www.nugget.ca/news/local-news/more-ontario-regions-classified-as-red-zones>  
8-th Title: Could B.C. see 4,000 COVID-19 cases a day by Christmas?  
8-th URL: <https://www.tricitynews.com/news/could-b-c-see-4-000-covid-19-cases-a-day-by-christmas-1.24240910>  
9-th Title: 'We're heading to a place that is very bad': Ontario announces 29 COVID-19 deaths as Mayor John Tory warns of increased restrictions  
9-th URL: <https://www.stcatharinesstandard.ca/ts/news/gta/2020/11/15/were-heading-to-a-place-that-is-very-bad-ontario-announces-29-covid-19-deaths-as-mayor-john-tory-warns-of-in>  
10-th Title: Missoula nursing home will accept positive COVID-19 patients to alleviate hospitals  
10-th URL: <https://localnews8.com/news/2020/11/17/missoula-nursing-home-will-accept-positive-covid-19-patients-to-alleviate-hospitals/>

Top 10 articles for nr 5:

1-th Title: DeAndre Hopkins - Kyler Murray Hail Mary: the best ever.  
1-th URL: <https://slate.com/culture/2020/11/deandre-hopkins-kyler-murray-hail-mary.html>  
2-th Title: Bears unsure of Foles' status after late-game injury  
2-th URL: <https://www.milwaukeejournal.com/news/267006418/bears-unsure-of-foles-status-after-late-game-injury>  
3-th Title: Russell Wilson's Seahawks stumble again, blowing NFC West race wide open  
3-th URL: <https://www.nfl.com/news/battista-cardinals-catch-up-with-seahawks-rams-in-wild-nfc-west>  
4-th Title: NFL's DeAndre Hopkins Offers Jersey Prize for Best Meme of His Stunning Catch|Here Are the Funniest  
4-th URL: <https://www.newsweek.com/nfl-deandre-hopkins-offers-jersey-prize-best-meme-stunning-winning-catch-1548290>  
5-th Title: Hail Murray: Arizona Cardinals stun Buffalo Bills in final seconds  
5-th URL: <https://www.tsn.ca/hail-murray-cardinals-stun-bills-32-30-in-final-seconds-1.1552328>  
6-th Title: Chicago Bears quarterback Nick Foles carted off field with injury  
6-th URL: <https://www.wcoapsacola.com/news/chicago-bears-quarterback-nick-foles-carted-off-field-with-injury/>  
7-th Title: K2: "I got you, KD."  
7-th URL: <https://www.revengeofthebirds.com/2020/11/18/21573057/k2-i-got-you-kd>  
8-th Title: Bengals waive DE McKinley after failed physical  
8-th URL: <https://www.texasguardian.com/news/267009985/bengals-waive-de-mckinley-after-failed-physical>  
9-th Title: After early lead, 49ers unravel against New Orleans, as playoff prospects become exceedingly dim  
9-th URL: <https://www.1077thebone.com/2020/11/15/after-early-lead-49ers-unravel-against-new-orleans-as-playoff-prospects-become-exceedingly-dim/>  
10-th Title: Nick Foles Carted Off the Field After Being Slammed to the Ground - Earliest Reports Mildly Positive  
10-th URL: <https://www.bleacheration.com/bears/2020/11/17/nick-foles-carted-off-the-field-after-being-slammed-to-the-ground/>

Top 10 articles for nr 6:

1-th Title: Here's what 'Ludo' actor Rohit Saraf found alternative for beer  
1-th URL: <https://www.orissapost.com/heres-what-ludo-actor-rohit-saraf-found-alternative-for-beer/>  
2-th Title: 'Big Brother' couple Nicole Franzel and Victor Arroyo postpone their wedding  
2-th URL: <https://www.realitytvworld.com/news/big-brother-couple-nicole-franzel-and-victor-arroyo-postpone-their-wedding-28577.php>  
3-th Title: Siddharth Chandekar & Mitali Mayekar To Have A Destination Wedding In 2021; Deets Inside  
3-th URL: <https://www.filmibeat.com/marathi-movies/news/siddharth-chandekar-mitali-mayekar-to-have-a-destination-wedding-in-2021-deets-inside-306422.html>  
4-th Title: KBC 12 gets season's second crorepati in IPS officer Mohita Sharma  
4-th URL: <https://zeenews.india.com/television/kbc-12-gets-seasons-second-crorepati-in-ips-officer-mohita-sharma-2325061.html>  
5-th Title: Britney Spears' early birthday Hawaiian vacay  
5-th URL: <https://www.vlav.com/news/britney-spears-early-birthday-hawaiian-vacay/>  
6-th Title: Kareena Kapoor, Saif Ali Khan, Malaika Arora take a stroll in Dharamshala, Taimur yells 'no photo'. Watch viral video - bollywood  
6-th URL: <https://www.hindustantimes.com/bollywood/kareena-kapoor-saif-ali-khan-malaika-arora-take-a-stroll-in-dharamshala-taimur-yells-no-photo-watch-viral-video/story-NKiMWow>  
7-th Title: Aaradhya Bachchan turns 9: Grandfather Amitabh shares adorable collage on her birthday  
7-th URL: <https://indianexpress.com/article/entertainment/bollywood/aaradhya-bachchan-turns-9-grandfather-amitabh-shares-adorable-collage-on-her-birthday-see-photo-7053028/>  
8-th Title: Britney Spears' early birthday Hawaiian vacay  
8-th URL: <https://www.kiss-1031.com/news/britney-spears-early-birthday-hawaiian-vacay/>  
9-th Title: Cody Simpson Unfollows Ex Miley Cyrus After Insisting They're Still Friends  
9-th URL: <https://mix931.heart.com/content/2020-11-16-cody-simpson-unfollows-ex-miley-cyrus-after-insisting-theyre-still-friends/>  
10-th Title: George Lopez Photos, News, and Videos  
10-th URL: <http://www.justjared.com/tags/george-lopez/>

Top 10 articles for nr 7:

1-th Title: Aldi and Lidl middle aisles: What's available from Thursday, November 19?  
1-th URL: <https://www.lancashiretelegraph.co.uk/news/18879460.aldi-lidl-middle-aisles-available-thursday-november-19/>  
2-th Title: Win A \$5,000 Holiday Shopping Spree  
2-th URL: <https://b985.fm/win-a-5000-holiday-shopping-spree/>  
3-th Title: The Gift Hunter | NZ Gift Ideas, Unique Presents & Online Gift Shop  
3-th URL: <https://www.thegifthunter.co.nz/>  
4-th Title: Your \*ultimate\* holiday wish list this year  
4-th URL: <https://girlslife.com/vishlist2021>  
5-th Title: Huron County wish book is out  
5-th URL: <https://shorelinetoday.ca/2020/11/16/20555/>  
6-th Title: How to Create a Nontraditional Christmas Tree  
6-th URL: <https://www.marthastewart.com/8020506/how-create-nontraditional-christmas-tree>  
7-th Title: Handmade wreaths and custom gift bags now available from Historic Annapolis  
7-th URL: <https://www.eyeeonnapolis.net/2020/11/handmade-wreaths-and-custom-gift-bags-now-available-from-historic-annapolis-2/>  
8-th Title: 7 Back-to-School Essentials for Kids  
8-th URL: <https://divine.ca/en/7-back-to-school-essentials-for-kids/>  
9-th Title: 2020 Chubbuck Holiday Decorating Contest announced  
9-th URL: <https://localnews8.com/life/holidays/2020/11/16/2020-chubbuck-holiday-decorating-contest-announced/>  
10-th Title: Machesney Park Christmas Decoration Contest Starts Soon  
10-th URL: <https://q985online.com/machesney-park-christmas-decoration-contest-starts-soon/>

Top 10 articles for nr 8:

1-th Title: Dan + Shay, Lady A, Tim McGraw Among 'CMA Country Christmas' Performers  
1-th URL: <https://kol1fm.heart.com/content/2020-11-16-dan-shay-lady-a-tim-mcgraw-among-cma-country-christmas-performers/>  
2-th Title: Jade de Lister { Interview  
2-th URL: <https://rtrfm.com.au/story/jade-de-lister-interview/>  
3-th Title: Dan + Shay, FGL + More Sign on for 'CMA Country Christmas' 2020

3-th URL: <https://koel.com/cma-country-christmas-performers-2020/>  
4-th Title: Dan + Shay, Lady A, Tim McGraw Among 'CMA Country Christmas' Performers  
4-th URL: <https://98txt.heart.com/content/2020-11-16-dan-shay-lady-a-tim-mcgraw-among-cma-country-christmas-performers/>  
5-th Title: Poppy Releases I Won't Be Home For Christmas; Announces Upcoming Christmas EP | Kerrang!  
5-th URL: <https://www.kerrang.com/the-news/poppy-releases-i-wont-be-home-for-christmas-announces-upcoming-christmas-ep/>  
6-th Title: Dolly Parton has advice for a 'divided' America  
6-th URL: <https://www.kpla.com/news/dolly-parton-has-advice-for-a-divided-america/>  
7-th Title: Dragon Ball Z: Kakarot Receiving New DLC This Week | RPGamer  
7-th URL: <https://rpgamer.com/2020/11/dragon-ball-z-kakarot-receiving-new-dlc-this-week/>  
8-th Title: Tomas Slavik: Riding an eerie Prague in 'the Wave'  
8-th URL: <https://www.redbull.com/au-en/tomas-slavik-wave-prague-interview>  
9-th Title: LIVE IN LONDON at The Hippodrome Announces New Performance Schedule  
9-th URL: <https://www.broadwayworld.com/westend/article/LIVE-IN-LONDON-at-The-Hippodrome-Announces-New-Performance-Schedule-20201116>  
10-th Title: Delaware State Fair announces line up for 2021 summer concert series  
10-th URL: <https://www.vmdt.com/2020/11/delaware-state-fair-announces-line-up-for-2021-summer-concert-series/>

Top 10 articles for nr 9:

1-th Title: How Long Will It Take for Coronavirus Vaccines to Help the U.S. Move Past the Pandemic?  
1-th URL: <https://www.fool.com/investing/2020/11/15/how-long-will-it-take-for-coronavirus-vaccines-to/>  
2-th Title: A Birmingham pharmacy will distribute a COVID-19 vaccine  
2-th URL: <https://www.wvtm13.com/article/a-birmingham-pharmacy-will-distribute-a-covid-19-vaccine/34708289>  
3-th Title: More coronavirus vaccine deals are needed: Labor  
3-th URL: <https://www.heraldson.com.au/lifestyle/health/more-coronavirus-vaccine-deals-are-needed-labor/news-story/f7a67569d1df1a92e650fe94bbe378de?nk=dcf058bb28bed542f9c3f556bb>  
4-th Title: FDA Commissioner 'encouraged' by vaccines but wants to see more data  
4-th URL: <https://www.KAATV.com/article/stories/S5927650.shtml?cat=10728>  
5-th Title: Opinion: A COVID-19 vaccine would only be the beginning of the end of the pandemic  
5-th URL: <https://www.theglobeandmail.com/opinion/article-a-covid-19-vaccine-would-only-be-the-beginning-of-the-end-of-the/>  
6-th Title: Who should be first to get access to a Covid-19 vaccine in Singapore?  
6-th URL: <https://www.straitstimes.com/singapore/health/who-should-be-first-to-get-access-to-vaccine>  
7-th Title: Scotland's coronavirus vaccination plans 'well advanced'  
7-th URL: <https://www.eveningexpress.co.uk/news/scotland/scotlands-coronavirus-vaccination-plans-well-advanced/>  
8-th Title: We Can Get Back To Normal, Chief Science Adviser Responds To Vaccine News  
8-th URL: <https://www.publicradioeast.org/post/we-can-get-back-normal-chief-science-adviser-responds-vaccine-news>  
9-th Title: Ontario set to receive 2.4 million doses of COVID-19 vaccine in early 2021  
9-th URL: <https://toronto.ctvnews.ca/ontario-set-to-receive-2-4-million-doses-of-covid-19-vaccine-in-early-2021-1.5194268>  
10-th Title: Canadian military prepares to help with COVID-19 vaccine distribution  
10-th URL: <https://www.ctvnews.ca/health/coronavirus/canadian-military-prepares-to-help-with-covid-19-vaccine-distribution-1.5191182>

Top 10 articles for nr 10:

1-th Title: These are the top private schools with the most powerful alumni  
1-th URL: <https://thetab.com/uk/2020/11/18/the-private-school-power-league-the-schools-producing-the-most-influential-toffs-182977>  
2-th Title: Tulane University's Center for Brain Health starts programs program to help vets dealing with mental illness  
2-th URL: <https://louisianaradionetwork.com/2020/11/16/tulane-universitys-center-for-brain-health-starts-programs-program-to-help-vets-dealing-with-mental-illness/>  
3-th Title: Best RV mattresses of 2020 - Business Insider  
3-th URL: <https://www.businessinsider.com/best-rv-mattresses>  
4-th Title: Summit Receives Investment from U. of Colorado Anschutz Medical Campus CDI Fund  
4-th URL: <https://www.prnewswire.com/443/news-releases/summit-receives-investment-from-u-of-colorado-anschutz-medical-campus-cdi-fund-301176168.html>  
5-th Title: Erskine Academy in China to go fully remote until Nov. 30  
5-th URL: <https://www.centralmaine.com/2020/11/17/erskine-academy-in-south-china-to-go-fully-remote-until-november-30/>  
6-th Title: 20 Reasons Why I Love Uganda | Ugandans at Heart  
6-th URL: <https://www.ugandanathart.org/culture/reasons-why-i-love-uganda/>  
7-th Title: VA Secretary visits Panama City Beach VA clinic  
7-th URL: <https://www.blogs.va.gov/VAntage/80653/va-secretary-visits-panama-city-beach-va-clinic/>  
8-th Title: COVID Amplifies Importance of UofL Health - Health System Now Entering Second Year  
8-th URL: <https://www.thetelegraph.com/business/press-releases/article/COVID-Amplifies-Importance-of-UofL-Health-15731404.php>  
9-th Title: My last bit of in person teaching was cancelled and now I've had enough  
9-th URL: <https://thetab.com/uk/leeds/2020/11/13/my-last-bit-of-in-person-teaching-was-cancelled-and-now-ive-had-enough-52931>  
10-th Title: JALC returns to online-only classes  
10-th URL: <https://www.kfvs12.com/2020/11/17/jalc-returns-online-only-classes/>

## B.2 Russo-Ukrainian War

Top 10 articles for nr 1:

1-th Title: NY Knicks Star Mitchell Robinson Pleads For Help Searching For His Father  
1-th URL: <https://kwhn.heart.com/content/2022-02-23-ny-knicks-star-mitchell-robinson-pleads-for-help-searching-for-his-father/>  
2-th Title: NY Knicks Star Mitchell Robinson Pleads For Help Searching For His Father  
2-th URL: <https://937theriver.heart.com/content/2022-02-23-ny-knicks-star-mitchell-robinson-pleads-for-help-searching-for-his-father/>  
3-th Title: Paducah teen reporting missing for the second time in two days  
3-th URL: [https://www.wpsdlocal6.com/news/paducah-teen-reporting-missing-for-the-second-time-in-two-days/article\\_4b5cc9d0-9459-11ec-a9a5-db6ab8d27544.html](https://www.wpsdlocal6.com/news/paducah-teen-reporting-missing-for-the-second-time-in-two-days/article_4b5cc9d0-9459-11ec-a9a5-db6ab8d27544.html)  
4-th Title: NY Knicks Star Mitchell Robinson Pleads For Help Searching For His Father  
4-th URL: <https://patriotla.heart.com/content/2022-02-23-ny-knicks-star-mitchell-robinson-pleads-for-help-searching-for-his-father/>  
5-th Title: Police seek public's help to find missing Hampton man; silver alert issued  
5-th URL: <https://www.msn.com/en-us/news/us/police-seek-public-s-help-to-find-missing-hampton-man-silver-alert-issued/ar-AAUj1eI>  
6-th Title: Silver Alert declared for man missing from Fort Wayne  
6-th URL: <https://www.wthr.com/article/news/local/indiana/fort-wayne-silver-alert-randall-walker/531-270d2a40-b412-4be9-b115-5cf08bb7f4f8>  
7-th Title: Nanaimo RCMP search for man not heard from since Christmas  
7-th URL: <https://www.timescolonist.com/local-news/nanaimo-rcmp-search-for-man-not-heard-from-since-christmas-5095555>  
8-th Title: Police searching for missing Henry, 23, find a body | Somerset County Gazette  
8-th URL: <https://www.somersetcountygazette.co.uk/news/19944945.police-searching-missing-henry-23-find-body/>  
9-th Title: Police searching for missing woman in Pierce County  
9-th URL: <https://www.msn.com/en-us/news/crime/police-searching-for-missing-woman-in-pierce-county/ar-AAUdBYX>  
10-th Title: Police appeal to find man wanted in connection with assault  
10-th URL: <https://www.northsomerstimes.co.uk/news/matthew-sheppard-weston-police-appeal-8701846>

Top 10 articles for nr 2:

1-th Title: NATO Invokes Article 4  
1-th URL: <https://www.independentsentinel.com/nato-invokes-article-4/>  
2-th Title: US: Over 130,000 Russian troops now staged outside Ukraine

2-th URL: <https://abcnews.go.com/US/wireStory/ukraines-leader-asks-evidence-invasion-warnings-82863566>  
 3-th Title: What war games tell us about a possible Russian invasion of Ukraine  
 3-th URL: <https://www.telegraph.co.uk/news/2022/02/23/war-games-tell-us-possible-russian-invasion-ukraine/>  
 4-th Title: Franco Ordonez  
 4-th URL: <https://www.wno.org/people/franco-ordonez>  
 5-th Title: Nato leaders meet to reassure allies near Russia and Ukraine  
 5-th URL: <https://www.enfieldindependent.co.uk/news/19952462.nato-leaders-meet-reassure-allies-near-russia-ukraine/>  
 6-th Title: Oklahoma lawmakers react to Russia's invasion of Ukraine  
 6-th URL: <https://www.kjrh.com/news/local-news/oklahoma-lawmaker-reacts-to-russias-invasion-of-ukraine>  
 7-th Title: Putin says 'no other way' to defend Russia other than by invading Ukraine  
 7-th URL: <https://www.indiatoday.in/world/russia-ukraine-war/story/russia-president-putin-ukraine-invasion-no-other-way-war-nato-1917537-2022-02-24>  
 8-th Title: NATO leaders agree to bolster eastern forces after invasion  
 8-th URL: <https://panow.com/2022/02/25/nato-leaders-agree-to-bolster-eastern-forces-after-invasion/>  
 9-th Title: Nato allies set to meet following 'cynical and brutal invasion' of Ukraine  
 9-th URL: <https://www.bournemouthecho.co.uk/news/national/19951078.nato-allies-set-meet-following-cynical-brutal-invasion-ukraine/>  
 10-th Title: Ukraine: Russia invades, Biden sanctions, Ukrainians want freedom  
 10-th URL: <https://www.usatoday.com/story/opinion/voices/2022/02/23/ukraine-russia-biden-freedom/6895236001/>

Top 10 articles for nr 3:

1-th Title: Bloodshed and tears as east Ukraine faces Russian attack  
 1-th URL: <https://www.kuwaittimes.com/bloodshed-and-tears-as-east-ukraine-faces-russian-attack/>  
 2-th Title: Jared Leto and Penelope Cruz among those expressing solidarity with Ukraine  
 2-th URL: <https://www.thenorthernecho.co.uk/news/19951451.jared-letto-penelope-cruz-among-expressing-solidarity-ukraine/>  
 3-th Title: The years I spent in Ukraine taught me a very Jewish concept: hope  
 3-th URL: <https://www.jpost.com/opinion/article-698440>  
 4-th Title: Jared Leto and Penelope Cruz among those expressing solidarity with Ukraine  
 4-th URL: <https://www.thecourier.co.uk/politics/3047385/jared-letto-and-penelope-cruz-among-those-expressing-solidarity-with-ukraine/>  
 5-th Title: Arnold Schwarzenegger: I hope sanity will prevail in Ukraine conflict  
 5-th URL: <https://www.andoveradvertiser.co.uk/news/19951455.arnold-schwarzenegger-hope-sanity-will-prevail-ukraine-conflict/>  
 6-th Title: Ukrainian-Canadian strives to find solace through solidarity  
 6-th URL: <https://dailyhive.com/vancouver/ukrain-anti-war-rally-solidarity-organizer>  
 7-th Title: Javed Akhtar, Tillotama Shome, other celebrities react to Russia's military operation in Ukraine  
 7-th URL: <https://www.arabherald.com/news/272332001/javed-akhtar-tillotama-shome-other-celebrities-react-to-russia-military-operation-in-ukraine>  
 8-th Title: Sketchy details from Russia complicate invasion coverage  
 8-th URL: [https://missoulain.com/news/national/sketchy-details-from-russia-complicate-invasion-coverage/article\\_de67bf2e-f977-5ca8-b794-26e4c903e8e2.html](https://missoulain.com/news/national/sketchy-details-from-russia-complicate-invasion-coverage/article_de67bf2e-f977-5ca8-b794-26e4c903e8e2.html)  
 9-th Title: Ukrainians protest outside Russian Embassy  
 9-th URL: <https://www.milfordmercury.co.uk/news/19953731.ukrainians-protest-outside-russian-embassy/>  
 10-th Title: Jared Leto and Penelope Cruz among those expressing solidarity with Ukraine  
 10-th URL: <https://www.surreycomet.co.uk/news/19951451.jared-letto-penelope-cruz-among-expressing-solidarity-ukraine/>

Top 10 articles for nr 4:

1-th Title: Israel Covid rules relaxed, unvaccinated tourists to be welcomed  
 1-th URL: <https://www.clevelandstar.com/news/272327476/israel-covid-rules-relaxed-unvaccinated-tourists-to-be-welcomed>  
 2-th Title: Covid in Scotland: 15 further deaths recorded on February 23  
 2-th URL: <https://www.thenational.scot/news/19946237.covid-scotland-15-deaths-recorded-february-23/>  
 3-th Title: Iraq's Health Ministry Urges Citizens to Get Vaccinated  
 3-th URL: <https://www.basnews.com/en/babat/741854>  
 4-th Title: Alberta parents urged to vaccinate kids against COVID-19 to boost province's low uptake  
 4-th URL: <https://www.cbc.ca/news/canada/edmonton/alberta-parents-urged-to-vaccinate-kids-against-covid-19-to-boost-province-s-low-uptake-1.6361573>  
 5-th Title: Mumbai: COVID-19 cases drop by 52.25%, test positivity rate also drops below 1%  
 5-th URL: <https://www.freepressjournal.in/mumbai/mumbai-covid-19-cases-drop-by-5225-test-positivity-rate-also-drops-below-1>  
 6-th Title: Xinhua Asia-Pacific news summary at 1000 GMT, Feb. 24  
 6-th URL: <https://www.japanherald.com/news/272331294/xinhua-asia-pacific--summary-at-1000-gmt-feb-24>  
 7-th Title: UAE relaxes restrictions for Pakistanis travelling to Dubai  
 7-th URL: <https://www.geo.tv/latest/400783-uae-relaxes-restrictions-for-pakistanis-travelling-to-dubai>  
 8-th Title: Lebanon eases COVID-19 measures for travelers { PanamaGusta Gazette  
 8-th URL: <http://panamagusta-gazette.com/2022/02/23/lebanon-eases-covid-19-measures-for-travelers/>  
 9-th Title: Covid-19: Pakistan drops PCR test rule for vaccinated travel...  
 9-th URL: <https://memafn.com/1103749355/Covid-19-Pakistan-drops-PCR-test-rule-for-vaccinated-travellers-from-UAE&source=138>  
 10-th Title: Japan to accept J&J COVID vaccine for border entry next month  
 10-th URL: <https://kelo.com/2022/02/24/japan-to-accept-jj-covid-vaccine-for-border-entry-next-month/>

Top 10 articles for nr 5:

1-th Title: newt | Corona Coming Attractions  
 1-th URL: <http://www.coronacomingattractions.com/movie/newt>  
 2-th Title: Fathom | Corona Coming Attractions  
 2-th URL: <http://www.coronacomingattractions.com/movie/fathom>  
 3-th Title: Waterproof | Corona Coming Attractions  
 3-th URL: <http://www.coronacomingattractions.com/movie/waterproof>  
 4-th Title: Alien Zoo | Corona Coming Attractions  
 4-th URL: <http://www.coronacomingattractions.com/movie/alien-zoo>  
 5-th Title: Tower Heist | Corona Coming Attractions  
 5-th URL: <http://www.coronacomingattractions.com/movie/tower-heist>  
 6-th Title: Moonshot: What We Know About the Film Starring Lana Condor  
 6-th URL: <https://www.popsugar.com/entertainment/hbo-max-moonshot-48727267>  
 7-th Title: Watchmen | Corona Coming Attractions  
 7-th URL: <http://www.coronacomingattractions.com/movie/watchmen>  
 8-th Title: Riddick 4 | Corona Coming Attractions  
 8-th URL: <http://www.coronacomingattractions.com/movie/riddick-4>  
 9-th Title: Fans Get a Taste of the 'Lore of Morbius' in New Featurette  
 9-th URL: <https://vegothiscovered.com/movies/fans-get-a-taste-of-the-lore-of-morbius-in-new-featurette/>  
 10-th Title: Crimson Peak | Corona Coming Attractions  
 10-th URL: <http://www.coronacomingattractions.com/movie/crimson-peak>

Top 10 articles for nr 6:

1-th Title: AI-enabled quality assurance software developed by Jamaican engineers  
 1-th URL: [https://www.jamaicaobserver.com/business-observer/ai-enabled-quality-assurance-software-developed-by-jamaican-engineers\\_244600?profile=1283](https://www.jamaicaobserver.com/business-observer/ai-enabled-quality-assurance-software-developed-by-jamaican-engineers_244600?profile=1283)  
 2-th Title: Kinnect appoints Bharatesh Salian to head customer experience vertical | Digital  
 2-th URL: <https://www.campaignindia.in/article/kinnect-appoints-bharatesh-salian-to-head-customer-experience-vertical/476025>  
 3-th Title: 2021 Digital Transformation Report  
 3-th URL: [https://www.informationweek.com/whitepaper/executive-insights-and-innovation/it-strategy/2021-digital-transformation-report/428703?gset=yes&cid=smartbox\\_techweb\\_analyt](https://www.informationweek.com/whitepaper/executive-insights-and-innovation/it-strategy/2021-digital-transformation-report/428703?gset=yes&cid=smartbox_techweb_analyt)

4-th Title: Shoptelligence Achieves Quadruple Growth With Home Furnishing Retailers - Utilizing Their A.I.-Powered Merchandising and Marketing Solutions  
4-th URL: <https://www.prweb.com/releases/2022/2/prweb18517887.htm>  
5-th Title: AI-Powered MarTech Startup Intelligent Relations Announces Acquisition of Net Positive Agency  
5-th URL: <https://www.phoenixherald.com/news/272333216/ai-powered-martech-startup-intelligent-relations-announces-acquisition-of-net-positive-agency>  
6-th Title: Reflective Tapes and Their Visibility Control Applications  
6-th URL: <https://www.thomasnet.com/knowledge/reflective-tapes-and-their-visibility-control-applications>  
7-th Title: Quench Announces Acquisition of Blue Caffe of North Carolina  
7-th URL: [https://www.prweb.com/releases/quench\\_announces\\_acquisition\\_of\\_blue\\_caffe\\_of\\_north\\_carolina/prweb18511725.htm](https://www.prweb.com/releases/quench_announces_acquisition_of_blue_caffe_of_north_carolina/prweb18511725.htm)  
8-th Title: Booyah Advertising Acquires Denver-Based FiveFifty,  
8-th URL: <https://www.globenewswire.com/news-release/2022/02/23/2390526/0/en/Booyah-Advertising-Acquires-Denver-Based-FiveFifty-Launches-Programmatic-Media-Division.html>  
9-th Title: Meesho looking to enable close to 100 million small entities digitise their businesses  
9-th URL: <https://www.thehindubusinessline.com/info-tech/meesho-looking-to-enable-close-to-100-million-small-entities-digitise-their-businesses/article65083858.ece>  
10-th Title: SPEDE Technologies Push-Button Labeling  
10-th URL: <https://www.datacollectiononline.com/doc/spede-technologies-push-button-labeling-0001>

Top 10 articles for nr 7:

1-th Title: Remember When Keith Urban Scored His First No. 1 Hit?  
1-th URL: <https://981thehawk.com/remember-when-keith-urban-scored-his-first-no-1-hit/>  
2-th Title: Little Big Town Album Reaches 5-Year Milestone  
2-th URL: <https://kiak.heart.com/content/2022-02-24-little-big-town-album-reaches-5-year-milestone/>  
3-th Title: Little Big Town Album Reaches 5-Year Milestone  
3-th URL: <https://1013wnco.heart.com/content/2022-02-24-little-big-town-album-reaches-5-year-milestone/>  
4-th Title: Little Big Town Album Reaches 5-Year Milestone  
4-th URL: <https://bill95.heart.com/content/2022-02-24-little-big-town-album-reaches-5-year-milestone/>  
5-th Title: Little Big Town Album Reaches 5-Year Milestone  
5-th URL: <https://wdsd.heart.com/content/2022-02-24-little-big-town-album-reaches-5-year-milestone/>  
6-th Title: Dave Grohl Once Considered Faking A Foo Fighters Split To Promote An Album  
6-th URL: <https://kbgo.heart.com/content/2022-02-25-dave-grohl-once-considered-faking-a-foo-fighters-split-to-promote-an-album/>  
7-th Title: Grunge icon Mark Lanegan dead at 57  
7-th URL: <https://www.q13fox.com/news/grunge-icon-mark-lanegan-dead-at-57>  
8-th Title: Avril Lavigne Brings Back Pop-Punk With New Album 'Love Sux'  
8-th URL: <https://alt987fm.heart.com/content/2022-02-25-avril-lavigne-brings-back-pop-punk-with-new-album-love-sux/>  
9-th Title: Screaming Trees Frontman Mark Lanegan Has Died At 57  
9-th URL: <https://945rocks.heart.com/content/2022-02-22-screaming-trees-frontman-mark-lanegan-has-died-at-57/>  
10-th Title: Avril Lavigne releases pop-punk record Love Sux  
10-th URL: [http://homenewshere.com/national/entertainment/article\\_708edbcf-ebe9-5aac-b1db-99f3e496cf29.html](http://homenewshere.com/national/entertainment/article_708edbcf-ebe9-5aac-b1db-99f3e496cf29.html)

Top 10 articles for nr 8:

1-th Title: AP Mine Ban Convention: Side Events  
1-th URL: <https://www.apminebanconvention.org/interseasonal-meetings/may-2012/side-events/>  
2-th Title: Southwold: New restrictions agreed on holiday/second homes | East Anglian Daily Times  
2-th URL: <https://www.eadt.co.uk/news/business/southwold-holiday-homes-restrictions-agreed-8717000>  
3-th Title: Fears that Llandudno housing application could 'permanently damage much-loved landscape'  
3-th URL: <https://www.northwalespioneer.co.uk/news/19952600.fears-llandudno-housing-application-permanently-damage-much-loved-landscape/>  
4-th Title: Government takes post-qualification admissions off the table  
4-th URL: <https://www.messengernewspapers.co.uk/news/national/19949350.government-takes-post-qualification-admissions-off-table/>  
5-th Title: Council refuses permission to Castlepollard wind turbine plan  
5-th URL: <https://www.westmeathexaminer.ie/2022/02/24/council-refuses-permission-to-castlepollard-wind-turbine-plan/>  
6-th Title: Kathmandu roads get filled with garbage as locals disrupt way to land-fill site  
6-th URL: <https://www.southeastasiapost.com/news/272325064/kathmandu-roads-get-filled-with-garbage-as-locals-disrupt-way-to-land-fill-site>  
7-th Title: The installation of anti-terror bollards on Hampton Court Bridge. Xanthe Ryder, Surbiton High School  
7-th URL: <https://www.thisislocalondon.co.uk/news/19945485.installation-anti-terror-bollards-hampton-court-bridge-xanthe-ryder-surbiton-high-school/>  
8-th Title: Deal means Shrub Hill major regeneration work can start  
8-th URL: <https://www.vorcesternews.co.uk/news/19952737.deal-means-shrub-hill-major-regeneration-work-can-start/>  
9-th Title: Photos from the New River Tunnel under Hewitt Road  
9-th URL: <https://harringtononline.com/forum/topics/photos-from-the-new-river-tunnel-under-hewitt-road?commentId=844301%3AComment%3A1477700>  
10-th Title: Shell confirms shuttered Convent facility will become an alternative fuels complex  
10-th URL: [https://www.theadvocate.com/baton\\_rouge/news/business/article\\_ad522d06-95ad-11ec-9457-bb64f61e4803.html](https://www.theadvocate.com/baton_rouge/news/business/article_ad522d06-95ad-11ec-9457-bb64f61e4803.html)

Top 10 articles for nr 9:

1-th Title: World leaders fine-tune sanctions meant to punish Russia  
1-th URL: [https://www.stltoday.com/news/national/govt-and-politics/world-leaders-fine-tune-sanctions-meant-to-punish-russia/article\\_a252bb33-dca9-55dd-9eci-eb71bc997399.html](https://www.stltoday.com/news/national/govt-and-politics/world-leaders-fine-tune-sanctions-meant-to-punish-russia/article_a252bb33-dca9-55dd-9eci-eb71bc997399.html)  
2-th Title: World leaders fine-tune sanctions meant to punish Russia  
2-th URL: <https://apnews.com/b57700241d650315db1eb0a8516ce2d6>  
3-th Title: Kishida says Russian attack on Ukraine undermines international order  
3-th URL: <https://japantoday.com/category/politics/Kishida-says-Russian-attack-on-Ukraine-undermines-international-order>  
4-th Title: Japan, hesitant to impose sanctions on Russia in 2014, embraces them now. One reason: China  
4-th URL: <https://bdnews24.com/world/2022/02/24/japan-hesitant-to-impose-sanctions-on-russia-in-2014-embraces-them-now.-one-reason-china>  
5-th Title: AP News in Brief at 11:04 p.m. EST  
5-th URL: [https://www.reformer.com/ap/national/ap-news-in-brief-at-11-04-p-m-est/article\\_e254b104-21a6-5d27-be8d-ea72bd30b761.html](https://www.reformer.com/ap/national/ap-news-in-brief-at-11-04-p-m-est/article_e254b104-21a6-5d27-be8d-ea72bd30b761.html)  
6-th Title: World leaders fine-tune punitive measures against Russia  
6-th URL: <https://isp.netscape.com/news/world/story/0001/20220225/b57700241d650315db1eb0a8516ce2d6>  
7-th Title: Japan imposes sanctions on Russia over actions in Ukraine  
7-th URL: <http://www.msn.com/en-us/news/world/japan-imposes-sanctions-on-russia-over-actions-in-ukraine/ar-AAUboK2>  
8-th Title: Russia-Ukraine invasion: Thousands of Ukrainians flee as Russian missiles hit Kyiv  
8-th URL: <https://www.brisbanetimes.com.au/world/europe/thousands-of-ukrainians-flee-as-russian-missiles-hit-kyiv-20220226-p59zvi.html>  
9-th Title: World leaders fine-tune punitive measures against Russia  
9-th URL: <https://wusfnews.wusf.usf.edu/2022-02-25/world-leaders-fine-tune-punitive-measures-against-russia>  
10-th Title: EU adopts sanctions in response to Russian oblasts of Ukrain...  
10-th URL: <https://menafn.com/1103754688/EU-adopts-sanctions-in-response-to-Russian-oblasts-of-Ukraine>

Top 10 articles for nr 10:

1-th Title: Texas order on gender-confirming care, Alabama bill on trans hormone treatments draw outrage  
1-th URL: [https://omaha.com/news/national/article\\_iddc889-0662-5ee1-844c-db3050a22664.html](https://omaha.com/news/national/article_iddc889-0662-5ee1-844c-db3050a22664.html)  
2-th Title: Texas governor order treats gender-confirming care as abuse  
2-th URL: <https://www.texarkanagazette.com/news/2022/feb/23/texas-governor-order-treats-gender-confirming/>  
3-th Title: Texas Families With Trans Kids Are Wondering If They Should Leave the State  
3-th URL: <https://truthout.org/articles/texas-families-with-trans-kids-are-wondering-if-they-should-leave-the-state/>  
4-th Title: Texas AG declares pediatric gender-affirming procedures to be child abuse, legal opinion says  
4-th URL: [https://www.rockdalenenewtoncitizen.com/news/texas-ag-declares-pediatric-gender-affirming-procedures-to-be-child-abuse-legal-opinion-says/article\\_938af963-88a9-51bc-b6e0](https://www.rockdalenenewtoncitizen.com/news/texas-ag-declares-pediatric-gender-affirming-procedures-to-be-child-abuse-legal-opinion-says/article_938af963-88a9-51bc-b6e0)  
5-th Title: Alabama lawmakers advance transgender students bathroom ban

5-th URL: <https://www.wabe.org/alabama-lawmakers-advance-transgender-students-bathroom-ban/>  
6-th Title: In trans people, GOP candidates find latest 'wedge issue'  
6-th URL: <https://www.fairfieldcitizenonline.com/news/article/In-trans-people-GOP-candidates-find-latest-16947924.php>  
7-th Title: Critical Race Theory Limits Bill Passes Wyoming Senate  
7-th URL: <https://kgab.com/critical-race-theory-limits-bill-passes-wyoming-senate/>  
8-th Title: POLITICAL ROUNDUP: Legislature again pushing to protect conversion therapy  
8-th URL: [https://www.tahlequahdailypress.com/news/political-roundup-legislature-again-pushing-to-protect-conversion-therapy/article\\_79234959-cf86-5ccc-aad6-b9a9dc4620f5.html](https://www.tahlequahdailypress.com/news/political-roundup-legislature-again-pushing-to-protect-conversion-therapy/article_79234959-cf86-5ccc-aad6-b9a9dc4620f5.html)  
9-th Title: Alabama lawmakers advance transgender students bathroom ban  
9-th URL: <https://www.kios.org/2022-02-23/alabama-lawmakers-advance-transgender-students-bathroom-ban>  
10-th Title: Judge halts South Dakota Gov. Noem's abortion pill rule  
10-th URL: <https://www.whcc.com/health/federal-judge-halts-noems-abortion-pill-restriction-rule/6371321/?cat=10036>

## B.3 Iran-Israel Conflict

Top 10 articles for nr 1:

1-th Title: 2 Bodies Found In A Rural Oklahoma County As Authorities Searched For Missing Kansas Women { 710am KURV  
1-th URL: <https://www.kurv.com/2-bodies-found-in-a-rural-oklahoma-county-as-authorities-searched-for-missing-kansas-women/>  
2-th Title: Radio Station WHMI 93.5 FM | Livingston County Michigan News, Weather, Traffic, Sports, School Updates, and the Best Classic Hit  
2-th URL: <https://www.whmi.com/news/national/two-dead-bodies-recovered-amid-investigation-missing-kansas-moms-police>  
3-th Title: ABC National News - Beach 95.1 - WPCP Panama City Beach Greatest Hits of the 60s, 70s & 80s  
3-th URL: <https://beach951.com/abc-national-news/c2aa82d74f7d6796feaf5f5be41154126>  
4-th Title: Two Dead Bodies Recovered Amid Investigation Into Missing Kansas Moms  
4-th URL: <https://powertalk1460.heart.com/content/2024-04-15-two-dead-bodies-recovered-amid-investigation-into-missing-kansas-mom/>  
5-th Title: Authorities to give update after 4 charged with murder in missing Kansas women case  
5-th URL: <https://abc6onyourside.com/news/nation-world/authorities-to-give-update-after-4-charged-with-murder-in-missing-kansas-women-case-victoria-butler-and-jilian-kelley-texas/>  
6-th Title: Missing Kansas women confirmed dead, kids safe, 4 charged with kidnapping and murder - Medicine Hat NewsMedicine Hat News  
6-th URL: <https://medicinehatnews.com/news/world-news/2024/04/15/missing-kansas-women-confirmed-dead-kids-safe-4-charged-with-kidnapping-and-murder/>  
7-th Title: 4 arrested in disappearance of 2 Texas County women  
7-th URL: <https://www.krmg.com/news/local/4-arrested-disappearance-2-texas-county-women/BZ7XPA4VJZBQLJFJTUSLA6AREU/>  
8-th Title: 4 people are facing murder charges in Oklahoma as authorities search for 2 missing women  
8-th URL: <https://us.cnn.com/2024/04/14/us/missing-women-jilian-kelley-veronica-butler/>  
9-th Title: Missing Kansas women confirmed dead, kids safe, 4 charged with kidnapping and murder  
9-th URL: <https://panov.com/2024/04/15/missing-kansas-women-confirmed-dead-kids-safe-4-charged-with-kidnapping-and-murder/>  
10-th Title: Correctional lieutenant arrested in Avoyelles Parish  
10-th URL: <https://www.kalb.com/2024/04/12/correctional-lieutenant-arrested-avoyelles-parish/>

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1-th Title: Sen. Joni Ernst to Newsmax: 'Shame on You, President Biden'  
1-th URL: <https://www.newsradio1029.com/news/sen-joni-ernst-to-newsmax-shame-on-you-president-biden/>  
2-th Title: US vows 'ironclad' support for Israel against Iran attack  
2-th URL: <https://gulfnnews.com/world/americas/us-vows-ironclad-support-for-israel-against-iran-attack-1.1713046901703>  
3-th Title: The President Who Wasn't There  
3-th URL: <https://townhall.com/columnists/derekhunter/2024/04/15/the-president-who-wasnt-there-n2637765>  
4-th Title: Biden tells Netanyahu US would not take part in Israeli counter strike against Iran - World  
4-th URL: <https://www.brecorder.com/news/40298539/biden-tells-netanyahu-us-would-not-take-part-in-israeli-counter-strike-against-iran>  
5-th Title: Biden returns to Washington as Iran launches attack on Israel  
5-th URL: <https://www.devdiscourse.com/article/law-order/2887124-biden-returns-to-washington-as-iran-launches-attack-on-israel>  
6-th Title: Israel-Gaza live updates: WH says it's up to Israel how to respond to Iran's attack  
6-th URL: <https://abcnews.go.com/International/live-updates/israel-gaza-hamas-war/israel-says-iran-fired-dozens-of-drones-109207091?id=108860743>  
7-th Title: White House says US support for Israel is 'ironclad,' will 'support their defense' amid Iran attack  
7-th URL: <https://www.aol.com/white-house-says-us-support-205531281.html>  
8-th Title: Biden Officials Fear Israel's Response To Iran Could Drag US Into Wider War  
8-th URL: <https://klvi.heart.com/content/2024-04-14-biden-officials-fear-israels-response-to-iran-could-drag-us-into-wider-war/>  
9-th Title: US does not want to see Middle East crisis 'escalate'  
9-th URL: [https://www.spacewar.com/reports/US\\_does\\_not\\_want\\_to\\_see\\_Middle\\_East\\_crisis\\_escalate\\_999.html](https://www.spacewar.com/reports/US_does_not_want_to_see_Middle_East_crisis_escalate_999.html)  
10-th Title: Iran launches hundreds of suicide drones to attack Israel  
10-th URL: <https://floppingaces.net/most-wanted/iran-launches-hundreds-of-suicide-drones-to-attack-israel/comment-page-1/>

Top 10 articles for nr 3:

1-th Title: Why April 15th Matters in Rock History  
1-th URL: <https://997thefox.heart.com/content/2021-04-14-why-april-15th-matters-in-rock-history/>  
2-th Title: The Black Crowes joined by The Rolling Stones' Ronnie Wood at LA show { AM 880 KIXI  
2-th URL: <https://kixi.com/the-black-crowes-joined-by-the-rolling-stones-ronnie-wood-at-la-show/>  
3-th Title: Shows | Ultimate Classic Rock  
3-th URL: <https://vizmz.com/shows-ultimate-classic-rock/>  
4-th Title: Pretenders - Rock 94  
4-th URL: <https://www.rock94.com/artist/the-pretenders/>  
5-th Title: Cheap Trick  
5-th URL: <https://www.kbbz.com/artist/cheap-trick/>  
6-th Title: Pantera's Cringey Sex Song That Dimebag Darrell Sang Lead On  
6-th URL: <https://k1aq.com/ixp/366/p/pantera-pst-88-song-lyrics-dimebag-darrell-vocals/>  
7-th Title: Riley Green super serves fans with 'Way Out Here' EP  
7-th URL: <https://www.1015shankfm.com/riley-green-super-serves-fans-with-way-out-here-ep/>  
8-th Title: George Strait  
8-th URL: <https://www.countryline.radio/music/artist/george-strait/>  
9-th Title: Deep Purple  
9-th URL: <https://www.kbbz.com/artist/deep-purple/>  
10-th Title: Watch Rick Astley Rock Glastonbury Stage With Blossoms  
10-th URL: <https://www.nova.ie/watch-rick-astley-rock-glastonbury-stage-with-blossoms-230956/>

Top 10 articles for nr 4:

1-th Title: Conveyor solutions supporting fruit and vegetable handling and processing applications  
1-th URL: <https://www.freshplaza.com/africa/article/9611423/conveyor-solutions-supporting-fruit-and-vegetable-handling-and-processing-applications/>  
2-th Title: Cadence Systems Employ New Single-Pass TFF Technology To Simplify Processes And Lower Costs  
2-th URL: <https://www.pharmaceuticalonline.com/doc/cadence-systems-employ-new-single-pass-tff-technology-to-simplify-processes-and-lower-costs-0001>  
3-th Title: GROWING CASE FLEET DELIVERS FOR HYWEL GRIFFITHS ON SITE AND ON THE ROAD  
3-th URL: <https://www.joyfreepress.com/2024/04/15/418526-growing-case-fleet-delivers-for-hywel-griffiths-on-site-and-on-the-road/>

4-th Title: FSi Limited - Fire Stopping and Cavity Barrier Products & Systems  
4-th URL: <https://fsiltd.com/>  
5-th Title: 26 Business Ideas for Writers  
5-th URL: <https://smallbiztrends.com/business-ideas-for-writers/>  
6-th Title: tritec Gesellschaft für Labortechnik und Umweltsimulation m.b.H  
6-th URL: <https://www.chemeurope.com/en/companies/6325/tritec-gesellschaft-fuer-labortechnik-und-umweltsimulation-m-b-h.html>  
7-th Title: C3 Prozess- und Analysentechnik GmbH - Haar, Germany  
7-th URL: <https://www.chemeurope.com/en/companies/725/c3-prozess-und-analysentechnik-gmbh.html>  
8-th Title: SUEZ Water Technologies & Solutions  
8-th URL: [https://www.newfoodmagazine.com/company\\_profile/113427/suez-water-technologies-solutions/](https://www.newfoodmagazine.com/company_profile/113427/suez-water-technologies-solutions/)  
9-th Title: Büchi AG - Uster, Switzerland  
9-th URL: <https://www.chemeurope.com/en/companies/3706/buechi-ag.html>  
10-th Title: Starna Scientific Limited - Ilford, United Kingdom  
10-th URL: <https://www.chemeurope.com/en/companies/14068/starna-scientific-limited.html>

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1-th Title: Hilda Raftery née Broderick - Bunratty  
1-th URL: <https://www.clare.fm/obituaries/hilda-raftery-nee-broderick-bunratty/>  
2-th Title: Judy Williams | Obituary | Lebanon Reporter  
2-th URL: <https://obituaries.reporter.net/obituary/judy-williams-1089571777>  
3-th Title: In Memory ROBERT WILLIAM HELMS - DailyRidge.com  
3-th URL: <https://dailyridge.com/2019/10/09/in-memory-robert-william-helms/>  
4-th Title: Obituary: Lisa Marie Moody, Brazil, IN (4/15/24)  
4-th URL: <http://www.thebraziltimes.com/story/3036664.html>  
5-th Title: Kenneth Cervine | News, Sports, Jobs - Messenger News  
5-th URL: <https://www.messengernews.net/obituaries/2024/04/kenneth-cervine-2/>  
6-th Title: Millennials Are Sharing How Awful Their Boomer Parents Are Getting  
6-th URL: <https://www.buzzfeed.com/briangalindo/millennials-stories-about-boomer-parents-becoming-awful>  
7-th Title: Lois Douberley - 101.7 WGOG  
7-th URL: <https://wgog.com/lois-douberley/>  
8-th Title: Mary Jo Wepking - SWNews4U  
8-th URL: <https://www.swnews4u.com/obituaries/mary-jo-wepking-ft/>  
9-th Title: Nancy Swessinger | News, Sports, Jobs - Times Republican  
9-th URL: <https://www.timesrepublican.com/obituaries/2024/04/nancy-swessinger/>  
10-th Title: Foxtrot Classics by Bill Amend for April 13, 2024  
10-th URL: <https://www.gocomics.com/443/foxtrotclassics/2024/04/13>

Top 10 articles for nr 6:

1-th Title: Joseph Fiennes and Mark Gatiss call for more arts funding at Olivier Awards  
1-th URL: <https://www.northwalespioneer.co.uk/news/national/24252434.joseph-fiennes-mark-gatiss-call-arts-funding-olivier-awards/>  
2-th Title: Deadline  
2-th URL: <https://deadline.com/print-article/1235884861/>  
3-th Title: King Charles' Funeral Plans Unveiled After Monarch Is Given 2 Years to Live With Pancreatic Cancer  
3-th URL: <https://www.libertyballers.com/2024/4/14/24130125/king-charles-funeral-plans-unveiled-after-monarch-is-given-2-years-to>  
4-th Title: 'SEAL Team': Will Max Thieriot Appear in Final Season? | Entertainment  
4-th URL: [https://www.foxbangor.com/news/national/entertainment/seal-team-will-max-thieriot-appear-in-final-season/article\\_2c539030-51fa-56a6-ab87-fd434402ef2d.html](https://www.foxbangor.com/news/national/entertainment/seal-team-will-max-thieriot-appear-in-final-season/article_2c539030-51fa-56a6-ab87-fd434402ef2d.html)  
5-th Title: Joseph Fiennes and Mark Gatiss call for more arts funding at Olivier Awards  
5-th URL: <https://www.leighjournal.co.uk/news/national/24252434.joseph-fiennes-mark-gatiss-call-arts-funding-olivier-awards/>  
6-th Title: Gigi Hadid teases Ryan Reynolds over fashion: "You'll never look like Blake in it"  
6-th URL: <https://aninews.in/news/entertainment/hollywood/gigi-hadid-teases-ryan-reynolds-over-fashion-youll-never-look-like-blake-in-it20240413221523/>  
7-th Title: 'True Detective: Night Country' Interview: Jodie Foster, Issa López & Kali Reis  
7-th URL: <https://deadline.com/2024/04/true-detective-night-countrys-jodie-foster-issa-lopez-interview-1235883788/>  
8-th Title: Dear England writer to begin creating TV show straight after Olivier win  
8-th URL: <https://www.ethelesstar.co.uk/news/national/24252539.dear-england-writer-begin-creating-tv-show-straight-olivier-win/>  
9-th Title: Sarah Snook and Mark Gatiss take early wins at Olivier Awards  
9-th URL: <https://www.independent.ie/style/celebrity/celebrity-news/sarah-smook-and-mark-gatiss-take-early-wins-at-olivier-awards/a1121935259.html>  
10-th Title: Keanu Reeves debuts new look as he steps out with Alexandra Grant  
10-th URL: <https://www.thenews.com.pk/latest/1178306-keanu-reeves-debuts-new-look-as-he-steps-out-with-alexandra-grant>

Top 10 articles for nr 7:

1-th Title: FAFSA form: When will FAFSA be processed 2024?  
1-th URL: <https://www.bostonglobe.com/2024/04/08/magazine/new-fafsa-form-college-limbo/>  
2-th Title: Newsmakers to Feature "The Institute", Sunday, April 14, 2024  
2-th URL: <https://www.yahoo.com/news/newsmakers-feature-institute-sunday-april-204500735.html>  
3-th Title: Greece to spend 780 million euros to protect marine biodiversity, PM says  
3-th URL: <https://hot96.com/2024/04/15/greece-to-spend-780-million-euros-to-protect-marine-biodiversity-pm-says/>  
4-th Title: Wealthy neighbours of Lotto heiress, 34, say they are 'glad' she has sold her three-bed bungalow overlooking Edinburgh Castle after her 'ridiculous' plans to transfer  
4-th URL: <https://www.dailymail.co.uk/news/article-13293443/Wealthy-neighbours-Lotto-heiress-newbuild-mansion-edinburgh-castle.html>  
5-th Title: Povy: Defra plan for river Wye in Herefordshire revealed  
5-th URL: <https://www.countytimes.co.uk/news/24251037.revealed-defra-plan-river-veye-herefordshire/>  
6-th Title: Sixteen Offaly primary schools approved for Hot School Meals Programme  
6-th URL: <https://www.offalyindependent.ie/2024/04/15/sixteen-offaly-primary-schools-approved-for-hot-school-meals-programme/>  
7-th Title: Vehicle free bridge over the A30 at Chiverton is now open  
7-th URL: <https://www.falmouthpacket.co.uk/news/24253247.vehicle-free-bridge-a30-chiverton-now-open/>  
8-th Title: Limerick: Ireland's first fully electric regional city bus service  
8-th URL: <https://www.irishcentral.com/news/limerick-electric-bus>  
9-th Title: Education for all  
9-th URL: <https://www.thenews.com.pk/print/1178011-education-for-all>  
10-th Title: Take Dresden landfill fight provincewide: Chatham-Kent mayor  
10-th URL: <https://www.chathamdailynews.ca:443/news/local-news/take-dresden-landfill-fight-provincewide-chatham-kent-mayor>

Top 10 articles for nr 8:

1-th Title: Celebrating academic excellence at Caroline Chisholm Catholic College  
1-th URL: <https://brimbanknorthwest.starweekly.com.au/in-business/celebrating-academic-cxcellence-at-caroline-chisholm-catholic-college/>  
2-th Title: Five years after fire, Notre-Dame rises from ashes  
2-th URL: [https://www.fhberald.com/news/national/five-years-after-fire-notre-dame-rises-from-ashes/article\\_398f60c4-a980-51e4-b114-303b7bf818f9.html](https://www.fhberald.com/news/national/five-years-after-fire-notre-dame-rises-from-ashes/article_398f60c4-a980-51e4-b114-303b7bf818f9.html)  
3-th Title: Keenan Taking On Additional Responsibilities at Catholics Schools  
3-th URL: <https://squatchrocks.com/ixp/67/p/keenan-taking-on-additional-responsibilities-at-catholics-schools/>  
4-th Title: Northern Nevada backyards and gardens: Do systemic insecticides work on pine pests?  
4-th URL: <https://www.carsonnow.org/story/04/14/2024/northern-nevada-backyards-and-gardens-do-systemic-insecticides-work-pine-pests>  
5-th Title: Digging up new species of Australia and New Guinea's giant fossil kangaroos

5-th URL: <https://phys.org/news/2024-04-species-australia-guinea-giant-fossil.html>  
6-th Title: Mackinac Island is Unmoored and Drifting  
6-th URL: <https://wgrd.com/mackinac-island-is-unmoored-and-drifting/>  
7-th Title: Universities news | Breaking News & Top Stories  
7-th URL: <https://www.newsnow.co.uk/h/UK/Education/Universities>  
8-th Title: Dear Annie: Small office mooch isn't paying his share of the coffee fund  
8-th URL: <https://www.oregonlive.com/advice/2024/04/dear-annie-small-office-mooch-isnt-paying-his-share-of-the-coffee-fund.html>  
9-th Title: CC Parks and Rec Department hosting job fair  
9-th URL: <https://www.kztv10.com/news/local-news/cc-parks-and-rec-department-hosting-job-fair>  
10-th Title: Welcome  
| Silliman College  
10-th URL: <https://silliman.yalecollege.yale.edu/>

Top 10 articles for nr 9:

1-th Title: Jesus calls Heaven 'The Great Banquet' - Odessa American  
1-th URL: <https://www.oaoa.com/local-news/jesus-calls-heaven-the-great-banquet/>  
2-th Title: 6 Of The Biggest Land Owners In Texas  
2-th URL: <https://mix941kmxj.com/ixp/160/p/6-of-the-biggest-land-owners-in-texas/>  
3-th Title: The Codependency Conspiracy | Texas Monthly  
3-th URL: <https://www.texasmonthly.com/news-politics/the-codependency-conspiracy/>  
4-th Title: Ron Elving | KGOU  
4-th URL: <https://www.kgo.org/people/ron-elving>  
5-th Title: How Avoca Bridge connected older adults with a curious teen | Drayton Valley Western Review  
5-th URL: <https://www.draytonvalleywesternreview.com:443/feature/sonic-soul-how-avoca-bridge-connected-older-adults-with-a-curious-teen>  
6-th Title: How Avoca Bridge connected older adults with a curious teen | St. Thomas Times-Journal  
6-th URL: <https://www.stthomastimesjournal.com:443/feature/sonic-soul-how-avoca-bridge-connected-older-adults-with-a-curious-teen>  
7-th Title: Minister Lokpobiri Addresses Nigeria's Crude Oil Shortfall, Expects Production Recovery  
7-th URL: <https://naija247news.com/2024/04/13/minister-lokpobiri-addresses-nigerias-crude-oil-shortfall-expects-production-recovery/>  
8-th Title: Julia Mueller  
8-th URL: <https://thehill.com/author/julia-mueller/>  
9-th Title: Kat Lonsdorf  
9-th URL: <https://news.wjct.org/people/kat-lonsdorf>  
10-th Title: Michaelleen Doucleff  
10-th URL: <https://www.southcarolinapublicradio.org/people/michaelleen-doucleff>

Top 10 articles for nr 10:

1-th Title: Shota Imanaga continues strong start to major-league career as Cubs top Mariners 4-1  
1-th URL: <https://www.dailyherald.com/20240413/chicago-cubs/shota-imanaga-continues-strong-start-to-major-league-career-as-cubs-top-mariners-4-1/>  
2-th Title: Padres score 3 in 7th to top Dodgers, win weekend series  
2-th URL: <https://www.640wxsm.com/news/padres-score-3-in-7th-to-top-dodgers-win-weekend-series/>  
3-th Title: Major League Leaderboards - 2024 - Pitching | FanGraphs Baseball  
3-th URL: <https://www.fangraphs.com/leaders/major-league?pos=all&stats=pit&lg=all&qual=0&type=8&season=2024&month=0&season1=2024&ind=0&team=0&roster=0&age=0&filter=&players=p2024->  
4-th Title: Thairo Estrada powers Giants past Rays  
4-th URL: <https://www.bignewsnetwork.com/news/274268277/thairo-estrada-powers-giants-past-rays>  
5-th Title: After lengthy rain delay, Dodgers cool off Padres' bats  
5-th URL: <https://www.wjoxam.com/news/after-lengthy-rain-delay-dodgers-cool-off-padres-bats/>  
6-th Title: Cardinals get off to fast start, hang on to beat Diamondbacks  
6-th URL: <https://www.ktop1490.com/news/cardinals-get-off-to-fast-start-hang-on-to-beat-diamondbacks/>  
7-th Title: MLB roundup: Down to final strike, Braves stun Marlins  
7-th URL: <https://www.thecore1260.com/news/mlb-roundup-down-to-final-strike-braves-stun-marlins/>  
8-th Title: Enhanced Box Score: Cubs 3, Mariners 2 - April 14, 2024  
8-th URL: <https://www.bleachernation.com/cubs/2024/04/14/enhanced-box-score-cubs-3-mariners-2-april-14-2024/>  
9-th Title: Josh Bell homers, Max Meyer fans career-high seven batters as Marlins beat Braves  
9-th URL: <https://www.tsn.ca/josh-bell-homers-max-meyer-fans-career-high-seven-batters-as-marlins-beat-braves-1.2104011>  
10-th Title: Rays Take Series From Giants | 95.7 The Beat  
10-th URL: <https://957thebeat.ihheart.com/content/2024-04-14-rays-take-series-from-giants/>