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CATEGORIZE THE ARTICLE TOPICS

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Introduction

Problem:

- With a large number of articles and daily news and the increase in the length of articles on websites, Site administrators face difficulty in categorizing the subject of articles, the goal of categorizing articles is to help the administrators of the site to arrange articles in the related sections, and to suggest articles to users by their interests and previous readings.

Soluation

- Use Natural Language Processing (NLP) models to categorize the article topics

Objectives

- Create a models to categorize the article topics
- Build Recommendations system

Methodology :

Data Sources:

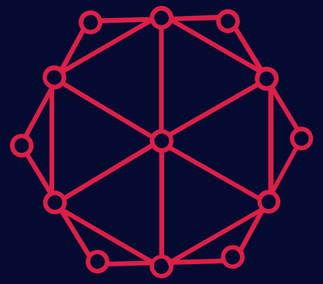
- The dataset contains a variety of articles in different Fields, and we collect the data from BBC News it contains 2126 articles.

Tools:

pandas jupyter scikit learn machine learning in Python NLTK

Preprocess:

- Remove all stop words
- Remove emojis
- Remove all punctuations
- Remove URLs



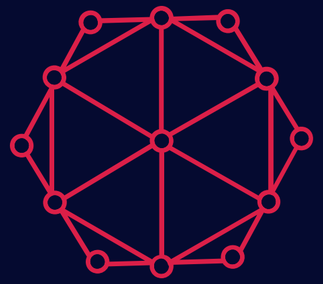
Models:

K-Mean

- **Topic 1**
  - music, game, album, band, chart, gadget, song, single, player, will, said, video, Sony, number, console, sale, digital, Nintendo, gaming, device
- **Topic 2**
  - labor, election, party, Blair, tory, said, brown, government, Howard, minister, lord, chancellor, prime, will, plan, conservative, people, leader, campaign, Kennedy
- **Topic 3**
  - phone, mobile, user, people, software, said, service, technology, computer, broadband, site, will, network, system, program, Microsoft, search, firm, virus, email
- **Topic 4**
  - award, best, film, oscar, nomination, actor, prize, ceremony, category, actress, aviator, winner, named, year, nominated, star, director, foxx, comedy, nominee
  -
- **Topic 5**
  - economy, growth, rate, economic, price, dollar, said, bank, year, market, rise, figure, deficit, spending, export, economist, quarter, month, consumer, china

(K-Mean) Results:

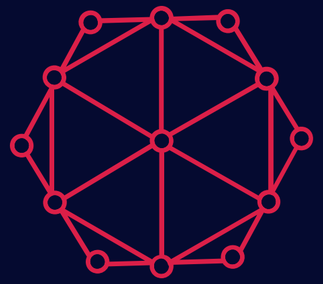
- **Cluster 1: Music industry**
- **Cluster 2: Governments and Politics**
- **Cluster 3: Technology**
- **Cluster 4: Film industry**
- **Cluster 5: Economy**



Models:

K-Mean

	text	cleaned	Topic_KMeans
1401	brazil plays down varig rescue the brazilian g...	[brazil, play, varig, rescue, brazilian, gover...	Companies & Businesses
115	byrds producer melcher dies at 62 record produ...	[byrd, producer, melcher, dy, record, producer...	Companies & Businesses
1834	school sport is back says pm tony blair has...	[school, sport, back, say, tony, blair, promis...	Companies & Businesses
664	no uk premiere for rings musical the producers...	[premiere, ring, musical, producer, behind, lo...	Film industry
2010	fast moving phone bugs appear security firms a...	[fast, moving, phone, bug, appear, security, f...	Technology
2120	ferguson rues failure to cut gap boss sir alex...	[ferguson, rue, failure, bos, alex, ferguson, ...	Sports
2198	asian banks halt dollar s slide the dollar reg...	[asian, bank, halt, dollar, slide, dollar, reg...	Economy
1993	parmalat bank barred from suing bank of americ...	[parmalat, bank, barred, suing, bank, america,...	Companies & Businesses
1421	roddick splits from coach gilbert andy roddick...	[roddick, split, coach, gilbert, andy, roddick...	Sports
1027	uk coal plunges into deeper loss shares in uk ...	[coal, plunge, deeper, loss, share, coal, fall...	Companies & Businesses



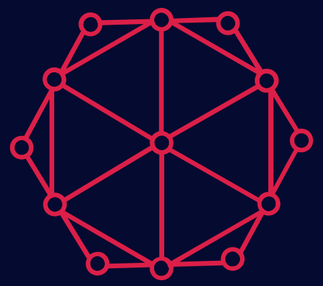
Models:

Latent Semantic Analysis (LSA)

- **Topic 1**
  - **said, will, year, people, labor, game, election, government, film, party, Blair, brown, tory, time, world**
- **Topic 2**
  - **software, microsoft, program, virus, search, user, email, site, security, computer, spyware, window, england, spam, film**
- **Topic 3**
  - **film, award, best, england, labour, oscar, blair, game, actor, election, star, party, wale, brown, tory**
- **Topic 4**
  - **economy, growth, rate, bank, economic, price, dollar, year, rise, china, quarter, film, sale, economist, export**
- **Topic 5**
  - **kenteris, olympic, athens, iaaf, thanou, greek, phone, mobile, test, race, drug, athlete, athletics, indoor, champion**

(LSA) Results:

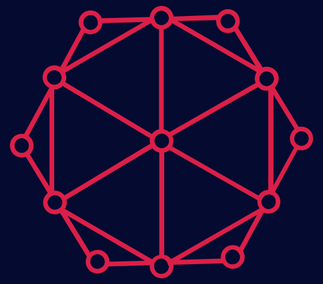
- **Topic 1: Politics**
- **Topic 2: Technology**
- **Topic 3: Film industry**
- **Topic 4: Economy**
- **Topic 5: Sports**



Latent Semantic Analysis (LSA)

Models:

text	Politics	Politics	Film industry	Film industry	Economy	Legal	Technology	Technology	Sports	Music industry
buyers snap up jet airways shares investors have snapped up shares in jet airways india s biggest airline following the launch of its much anticipated initial public offer (ipo). the ipo for 17.3 million shares was fully sold within 10 minutes of opening on friday. analysts expect jet to raise at least 16.4bn rupees ($375m; £198m) from the offering. interest in jet s ipo has been fuelled by hopes for robust growth in india s air travel market. the share offer representing about 20% of jet s equity was oversubscribed news agency reuters reported. jet which was founded by london-based travel agent naresh goyal plans to use the cash to buy new planes and cut its debt. the company has grown rapidly since it launched operations in 1993 overtaking state-owned flag carrier indian airlines. however it faces stiff competition from rivals and low-cost carriers. jet s ipo is the first in a series of expected share offers from indian companies this year as they move to raise funds to help them do business in a rapidly-growing economy.	0.142	-0.023	-0.115	-0.006	0.112	0.045	-0.057	0.022	-0.059	0.039
wenger shock at newcastle dip arsenal manager arsene wenger has admitted he is at a loss to explain why newcastle are languishing in the bottom half of the table. the gunners travel to st james park on wednesday with newcastle 14th in the premiership after a troubled season. and wenger said: at the beginning of the season you would expect them to be fighting for the top four. i don t know how they got to be where they are. it looks to me from the outside that they have many injuries. arsenal go into the game on the back of a 2-0 victory over fulham on sunday. and wenger added: the best way to prepare for a game is to win the previous one. we will go to newcastle in good shape. fatigue won t play too big a part in the next few weeks as we have players coming back so i can rotate a bit more. we do not play a season with 11 players and i believe that all of our squad deserve a chance in the team. striker thierry henry along with robert pires scored against fulham. and henry afterwards described the display as beautiful to watch . he said: what matters is winning and the three points of course. that is the only thing that really matters. but it is more enjoyable when you play like we did against fulham. we are playing as a team and that is important because there were some games when we maybe were not there as a team and suffered for that. those were games we lost.	0.155	-0.109	0.125	-0.181	-0.037	-0.032	-0.003	-0.026	-0.073	0.159



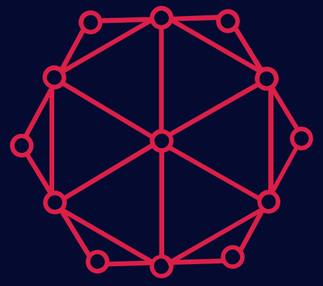
Models:

Non-Negative Matrix Factorization (NMF)

- **Topic 1**
  - mobile, phone, music, technology, digital, people, gadget, service, device, will, video, broadband, game, camera, handset
- **Topic 2**
  - labour, election, blair, party, tory, brown, said, howard, minister, government, chancellor, prime, will, plan, conservative
- **Topic 3**
  - game, england, player, will, wale, match, said, team, ireland, play, side, injury, rugby, club, champion
- **Topic 4**
  - film, award, best, oscar, actor, star, actress, festival, nomination, director, aviator, prize, year, comedy, movie
- **Topic 5**
  - growth, economy, rate, price, economic, year, bank, said, market, rise, dollar, figure, quarter, sale, china

(NMF) Results:

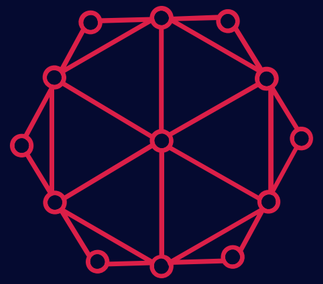
- **Topic 1: Technology**
- **Topic 2: Politics**
- **Topic 3: Sports**
- **Topic 4: Film industry**
- **Topic 5: Economy**



Non-Negative Matrix Factorization (NMF)

Models:

text	Technology	Politics	Sports	Film industry	Economy	Legal	Technology
us hacker breaks into t-mobile a man is facing charges of hacking into computers at the us arm of mobile phone firm t-mobile. the californian man nicholas lee jacobsen was arrested in october. mr jacobsen tried at least twice to hack t-mobile s network and took names and social security numbers of 400 customers said a company spokesman. the arrest came a year after t-mobile uncovered the unauthorised access. the us secret service has been investigating the case. t-mobile has stringent procedures in place where we monitor for suspicious activity so that limited his activities and we were able to take corrective action immediately peter dobrow a t-mobile spokesperson said. it is thought that mr jacobsen s hacking campaign took place over at least seven months during which time he read e-mails and personal computer files according to court records. although mr jacobsen 21 managed to get hold of some data it is thought he failed to get customer credit card numbers which are stored on a separate computer system said mr dobrow. t-mobile confirmed that the us secret service was also looking into whether the hacker accessed photos that t-mobile subscribers had taken with their camera phones. the associated press agency reported that mr jacobsen also read personal files on the secret service agent who was apparently investigating the case. a los angeles grand jury indicted mr jacobsen with intentionally accessing a computer system without authorisation and with the unauthorised impairment of a protected computer between march and october 2004. he is currently on bail. t-mobile is a subsidiary company of deutsche telekom and has about 16.3 million subscribers in the us.	0.034	0.00	0.0	0.000	0.000	0.024	0.064
house prices suffer festive fall uk house prices fell 0.7% in december according to figures from the office of the deputy prime minister. nationally house prices rose at an annual rate of 10.7% in december less than the 13.7% rise the previous month. the average uk house price fell from £180 126 in november to £178 906 reflecting recent land registry figures confirming a slowdown in late 2004. all major uk regions apart from northern ireland experienced a fall in annual growth during december. december is traditionally a quiet month for the housing market because of christmas celebrations. however recent figures from the land registry - showing a big drop in sales between the last quarter of 2004 and the previous year - suggested the slowdown could be more than a seasonal blip. the volume of sales between october and december dropped by nearly a quarter from the same period in 2003 the land registry said. although both the office of the deputy prime minister (odpm) and the land registry figures point to a slowdown in the market the most recent surveys from nationwide and halifax have indicated the market may be undergoing a revival. after registering falls at the back-end of 2004 halifax said house prices rose by 0.8% in january and nationwide reported a rise of 0.4% in the first month of the year.	0.000	0.00	0.0	0.000	0.174	0.000	0.000
more power to the people says hp the digital revolution is focused on letting people tell and share their own stories according to carly fiorina chief of technology giant hewlett packard. the job of firms such as hp now she said in a speech at the consumer electronics show (ces) was to ensure digital and physical worlds fully converged. she said the goal for 2005 was to make people the centre of technology. ces showcases 50 000 new gadgets that will be hitting the shelves in 2005. the tech-fest the largest of its kind in the world runs from 6 to 9 january. the digital revolution is about the democratisation of technology and the experiences it makes possible she told delegates. revolution has always been about giving power to the people. she added: the real story of the digital revolution is not just new products but the millions of experiences made possible and stories that millions can tell. part of giving people more control has been about the freeing up of content such as images video and music. crucial to this has been the effort to make devices that speak to each other better so that content can be more easily transferred from one device such as a digital camera to others such as portable media players. a lot of work still needs to be done however to sort out compatibility issues and standards within the technology industry so that gadgets just work seamlessly she said. ms fiorina s talk also touted the way technology is being designed to focus on lifestyle fashion and personalisation something she sees as key to what people want. special guest singer gwen stefani joined her on-stage to promote her own range of hp digital cameras which ms stefani has helped design and which are heavily influenced by japanese youth culture. the digital cameras which are due to go on sale in the us by the summer are based on the hp 607 model. the emphasis on personalisation and lifestyle is a big theme at this year s ces with tiny wearable mp3 players at every turn and rainbow hues giving colour to everything. ms fiorina also announced that hp was working with nokia to launch a visual radio service for mobiles which would launch in europe early this year. the service will let people listen to radio on their mobiles and download relevant content like a track s ringtone simultaneously. the service is designed to make mobile radio more interactive. among the other new products she showcased was the digital media hub a big upgrade to hp s digital entertainment centre. coming out in the autumn in the us the box is a networked high-definition tv cable set-top box digital video recorder and dvd recorder. it has a removable hard drive cartridge memory card slots and light scribe labelling software which lets people design and print customised dvd labels and covers. it is designed to contain all a household s digital media such as pre-recorded tv shows pictures videos and music so it can all be managed in one place. the hub reflects the increasing move to re-box the pc so that it can work as part of other key centres of entertainment. research suggests that about 258 million images are saved and shared every day equating to 94 billion a year. eighty per cent of those remain on cameras. media hubs are designed to encourage people to organise them on one box. ms fiorina was one of several keynote speakers who also included microsoft chief bill gates to set out what major technology companies think people will be doing with technologies and gadgets in the next 12 months. in a separate announcement during the keynote speech ms fiorina said that hp would be partnering mtv to replace this year s mtv asia music award. mtv s asia aid will be held in bangkok on 3 february and is aimed at helping to raise money for the asian tsunami disaster.	0.161	0.01	0.0	0.005	0.000	0.000	0.007



Models:

Latent Dirichlet Allocation (LDA)

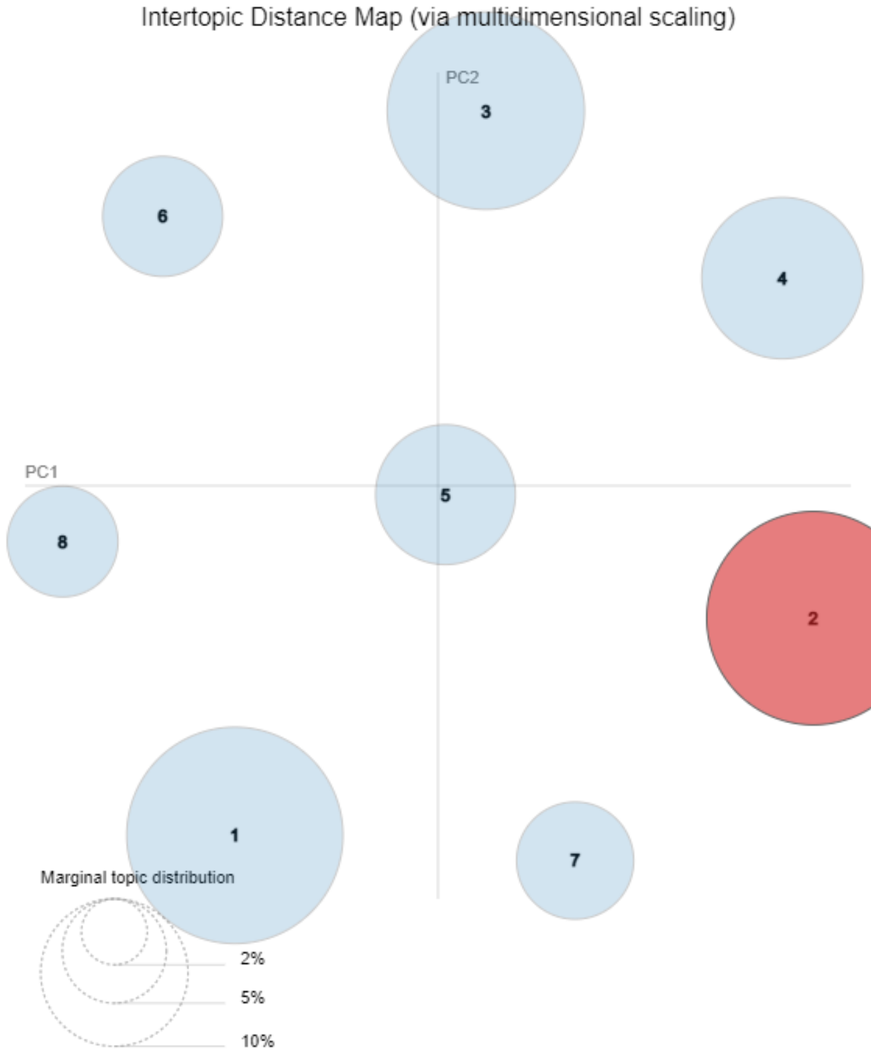
- **Topic 1**
  - film, said, best, award, actor, director, year, star, party, oscar, british, actress, london, role, ukip
- **Topic 2**
  - said, open, match, year, game, final, play, test, world, roddick, australian, injury, second, champion, number
- **Topic 3**
  - music, said, song, band, year, album, people, number, search, site, single, chart, record, radio, artist
- **Topic 4**
  - said, people, game, technology, government, year, make, time, lord, digital, work, want, right, video, home
- **Topic 5**
  - game, said, england, player, club, wale, ireland, team, time, rugby, play, chelsea, minute, united, good

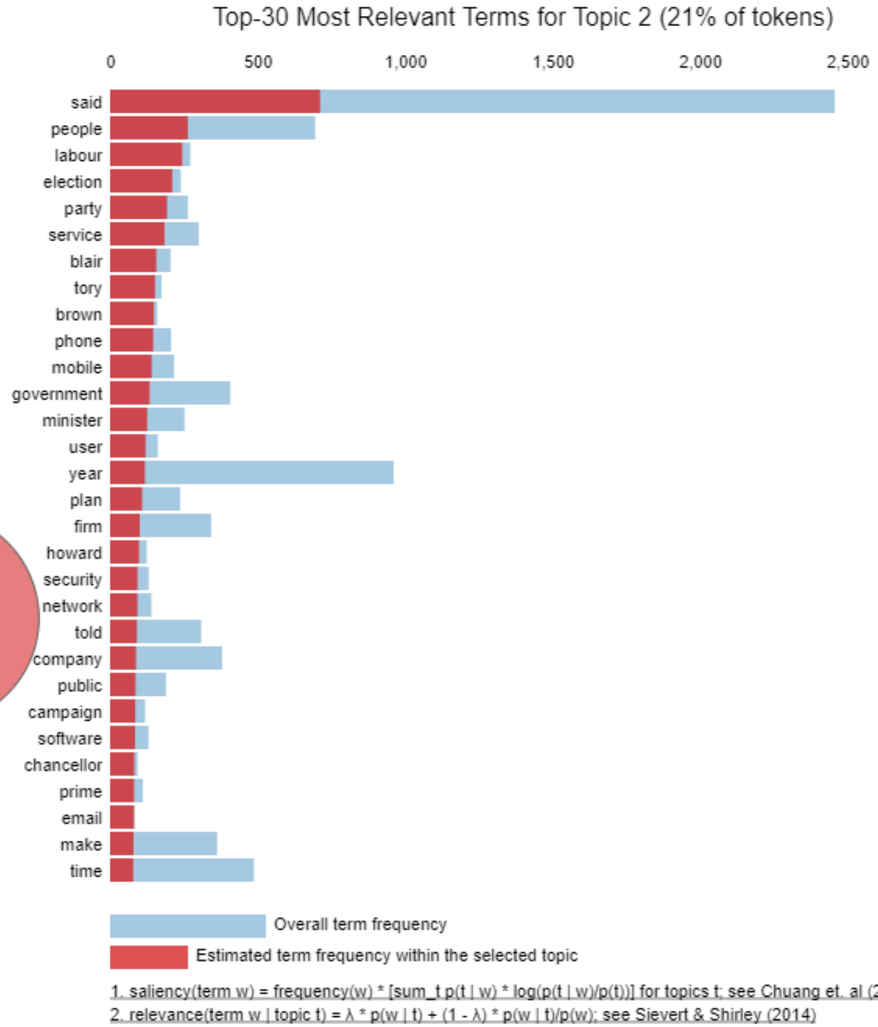
(LDA) Results:

- **Topic 1: Film industry**
- **Topic 2: Sports**
- **Topic 3: Music**
- **Topic 4: Technology**
- **Topic 5: Sports**

Latent Dirichlet Allocation (LDA)

Models:



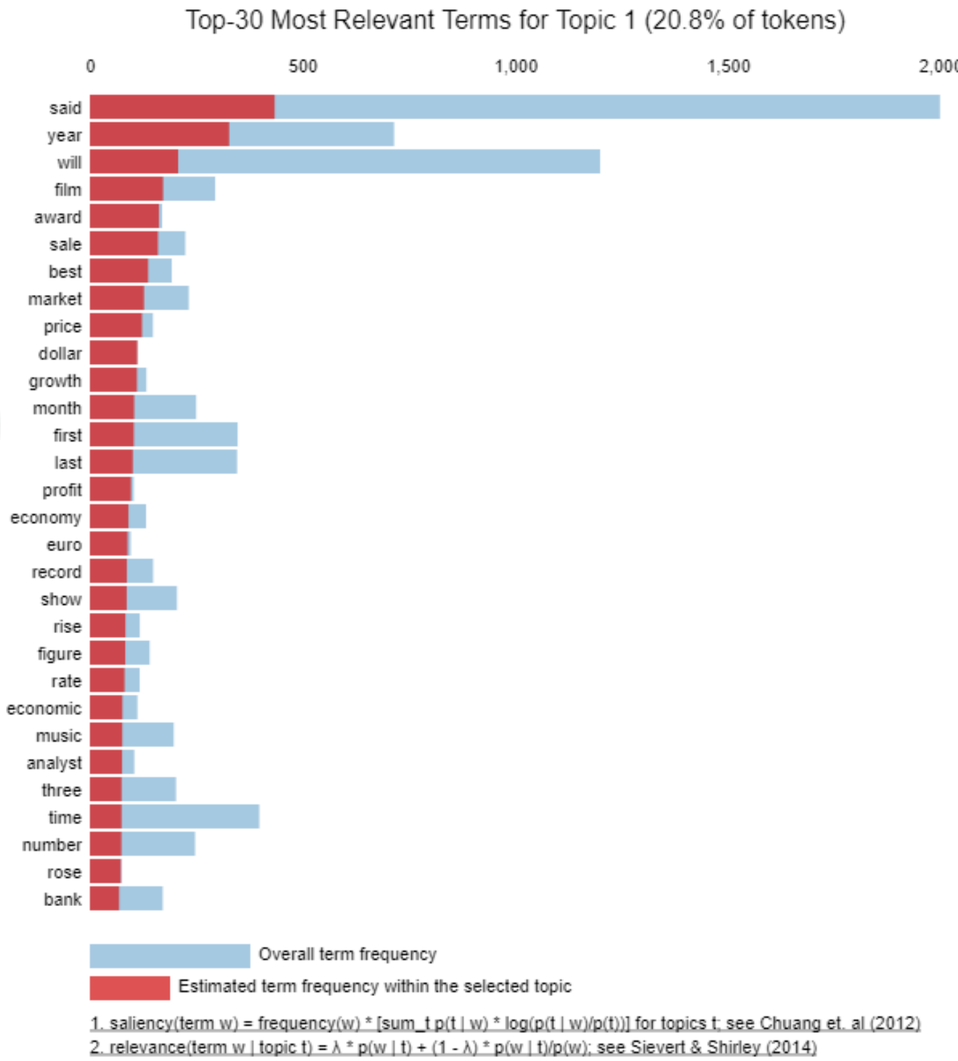


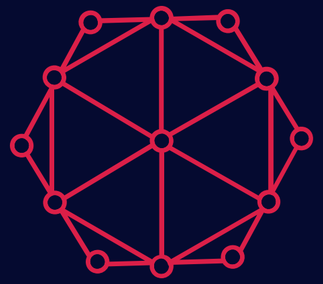
Gensim LDA

Models:

Gensim LDA Result

- **Topic 1: Sports**
- **Topic 2: Sports**
- **Topic 3: Film industry**
- **Topic 4: Technology**
- **Topic 5: Businesses**





Models:

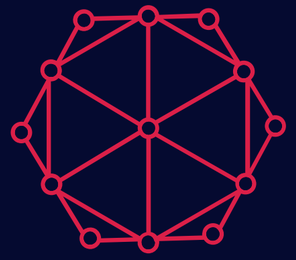
CorEx

- **Topic 1**
  - star, game, coach, champion, yearold, match, award, injury, play, season
- **Topic 2**
  - user, technology, computer, digital, online, software, device, website, video, internet
- **Topic 3**
  - tory, labour, conservative, election, party, blair, liberal, tony, leader, democrat
- **Topic 4**
  - firm, market, company, analyst, share, growth, consumer, business, price, product
- **Topic 5**
  - england, rugby, wale, ball, ireland, thing, think, chance, know, robinson

(LDA) Results:

- **Topic 1: Sports**
- **Topic 2: Technology**
- **Topic 3: Politics**
- **Topic 4: Businesses**
- **Topic 5: Sports**

Recommendations



Models:

```
============================== Queried article details ==============================
headline :  labour targets  hardcore truants  a fresh crackdown on persistent truants in england has been launched by education secretary ruth kelly.  serial truants make up
one in 13 pupils. previous initiatives brought 40 000 pupils back to school since 1997  according to official statistics. parenting contracts  penalty notices and  fast trac
k  prosecution systems have been used to tackle what has been a stubborn problem. it is thought that nearly half a million children skip school each day. tories say labour s
previous success regarding the issue came because it tackled the easy part of the problem by reducing authorised absence  where parents are permitted to take children out of
school. such absences are often due to family holidays.  however  serial truants avoid the classroom despite government schemes costing £885m. those missing classes are more
likely to become involved in crime as well as failing academically. measures such as parenting contracts and penalty notices were adopted by most local education authorities
last term and come into force in the remainder this term. in one local education authority alone 800 parents were warned they would receive a penalty notice unless their chi
ld s attendance improved. the tough stance paid off with just 24 issued  while attendance improved in 776 cases. truancy has been reduced by 5% at the 128 worst hit schools
through the government s behaviour improvement programme. this is the equivalent of 200 pupils back in classes since september.  the new measures come on top of national tru
ancy sweeps - the sixth of which will take place on monday. police and education welfare officers patrol problem hotspots picking up truants and returning them to school. he
ld twice each year  in addition to routine local patrols  previous country-wide sweeps have apprehended 31 000 pupils dodging school. in almost 14 000 of those cases  the yo
ungsters were accompanied by their parents. a department for education and skills source said:  every day in school counts.  it is clear form these figures that schools and
local education authorities are now seizing the tools we have given them to improve school attendance and crack down hard on the very small numbers of pupils which account f
or almost half of the nation s truancy.

 ======================== Recommended articles :  ========================

C:\Users\oalha\anaconda3\lib\site-packages\ipykernel\ipkernel.py:287: DeprecationWarning: `should_run_async` will not call `transform_cell` automatically in the future. Plea
se pass the result to `transformed_cell` argument and any exception that happen during thetransform in `preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

	headline	Euclidean similarity with the queried article
1	blair joins school sailing trip the prime minister has donned a life jacket and joined school ch...	1.177945
2	kelly trails new discipline power teachers could get more powers to remove unruly pupils from cl...	1.223273
3	school sport is back says pm tony blair has promised that sport is back as a priority for s...	1.243559
4	schools to take part in mock poll record numbers of schools across the uk are to take part in a ...	1.269675
5	schools to take part in mock poll record numbers of schools across the uk are to take part in a ...	1.269675
6	tories pledge free sports lessons children would be offered two hours free sports training a we...	1.281005
7	pupils to get anti-piracy lessons lessons on music piracy and copyright issues are to be taught ...	1.283174
8	research fears over kelly s views scientists have expressed concerns that new education secretar...	1.288923
9	faith schools citizenship warning schools must improve the quality of citizenship lessons - or s...	1.293649
10	student inequality exposed teenagers from well-off backgrounds are six times more likely to go...	1.298162

Most 100 Common Words

Conclusion:

In this project, We applied several types of NLP models in unsupervised dataset to identify news topics in BBC News dataset, Also we have noticed the diversity of topics from one to another, finally we developed a recommendations system to suggest similar topics to BBC News users.

Thank you!