

The project report:

Multi-Document Summarization based on Metro Maps

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Introduction

With the continuing growth of online information, it has become increasingly important to provide improved mechanisms to find and present textual information effectively. Consider the situation where the user issues a search query, for instance on a news topic, and the retrieval system finds hundreds of closely-ranked documents in response. Many of these documents are likely to repeat much the same information, while differing in certain parts. Summaries of the individual documents would help, but are likely to be very similar to each other, unless the summarization system takes into account other summaries that have already been generated.

Generating an effective summary requires the summarizer to **select, evaluate, order and aggregate** items of information according to their relevance to a particular subject or purpose.

There are two types of situations in which multi-document summarization would be useful: (1) the user is faced with a collection of dis-similar documents and wishes to assess the information landscape contained in the collection, or (2) there is a collection of topically-related documents, extracted from a larger more diverse collection as the result of a query, or a topically-cohesive cluster.

The idea of a project was inspired by the paper on metro maps [\[Shahaf et al., 2012\]](#) that was shown in class. Our intention was to generate summaries based on structured search results on specific themes. We wanted to compare the summaries generated from results of Google, based on some existing and implemented algorithms, with summaries generated from the metro map on the same topic.

Our intuition was that metro maps' abilities to 'catch' dependencies between the articles and to achieve more full coverage of the theme will result in better, more comprehensive summaries.

Brief results

We have shown that metro-map based summarisation technique provides a more coherent, more comprehensive and easier to read text compared to a plain multi-document summarisation algorithm.

Literature review

Document Summarization Approaches

[\[Goldstein et al., 2000\]](#) review the whole subject of multi document summarization (MDS). First, they describe the different considerations of MDS compared to single document summarization.

1. The degree of redundancy in information contained within a group of topically-related articles is much higher than the degree of redundancy within a single document.
2. A group of articles may contain a temporal dimension, typical in a stream of news reports about an unfolding event. Here later information may override earlier more tentative or incomplete accounts.
3. The compression ratio of the input will typically be much smaller for collections of dozens or hundreds of topically related documents than for single document summaries. Summarization becomes significantly more difficult when compression demands increase.

Then, they elaborate on what they consider important for a decent MDS system. These are some of the principles:

- The ability to cluster similar documents and passages to find related information.
- The ability to cover the main points across documents
- The ability to minimize redundancy between passages in the summary.
- The ability to combine text passages in a useful manner for the reader (e.g. correct timeline, present most relevant information first)
- coherence: Summaries generated should be readable and relevant to the user.

It's easy to see that these are similar to the metro map's principles, so it's only intuitive that the use of metro maps will improve the process.

One of the papers that may help to make sense of the variety is a Survey of Deep-learning multi-document summarization techniques [\[Ma et al., 2021\]](#). It is a very recent and comprehensive overview of the most common methods in the area. One of the approaches that is of big interest to us is graph neural networks based models. These models build graphs representing input documents, where nodes can be documents themselves as well as sentences and words. At the same time input documents are pushed through a DNN (deep neural network) based model that generates embeddings on different levels. GNN is applied on these embeddings in order to catch salient contextual information. As metro maps provide us

with graph structure over the input documents, it feels natural to incorporate a graph based model in the algorithm.

In summarization models, objective functions play an important role by guiding the model to achieve specific purposes. The survey [\[Ma et al., 2021\]](#) discusses different objective functions and their purposes. We can decide the function based on the measurement we would like to improve. For example, if one wants to minimize redundancy, she can add a minimization objective of the similarity function to the general objective function.

According to [\[Zhang et al., 2019\]](#) the abstractive method is more flexible and thus can generate more diverse summaries. The main focus of the article is single-document multi-sentence summarization.

Their suggested model is composed of two main stages: On the first one, they generate the summary using a left-context-only decoder. On the second one, they refine the summary's words by masking them one by one using a refine-decoder. This makes the summary more natural and less "machine like". In order to improve naturalness, they use some kind of reinforcement objective on the refine-decoder.

The innovation is their use of Google AI's BERT, Bidirectional Encoder Representations from Transformers. BERT makes use of Transformer, an attention mechanism that learns contextual relations between words (or sub-words) in a text. As opposed to directional models, which read the text input sequentially (left-to-right or right-to-left), the Transformer encoder reads the entire sequence of words at once and therefore it is considered bidirectional, and has a full context when encoding (or decoding).

When considering the Extractive summarization techniques, most previous works in the area have studied the problems of sentence selection and sentence ordering separately, while [\[Christensen et al., 2013\]](#) present a joint model, in order to create a coherent summary.

Overall, they consider the summarization problem as a constraint optimization problem where salience and coherence are soft constraints, and redundancy and summary length are hard constraints. They build a directed graph over the sentences of the collection of documents, and each edge between two sentences represents a pairwise ordering constraint. The edges are weighted by combination of multiple parameters, and the weight helps decide how salient a sentence is, avoid redundancy and set the order of the sentences, which improves coherence. This optimization problem is NP-hard, that's why they use local search to approximate it. Notice that they do not optimize coverage, claiming that this did not give better results.

Our intuition is that combining a structured set of documents - a metro map - with their model may improve the coverage rate of their system, as the metro map itself already considers coverage into account. We can apply their system on each branch of the metro map, creating a short summary for it and then connect the short summaries by using appropriate conjunctions.

One of the ways to improve an extractive algorithm is to identify the key words by detecting the words that are preserved both in the original text and in summary, as was suggested in paper by [\[Hong et al.2014\]](#). We can use it in order to refine an extractive algorithm if we choose to use one.

They describe multiple experiments on identifying words from the input that are also included in the human summaries (summary keywords). In order to do that they use the DUC datasets, which contain dozens of multi-document clusters with about 10 documents each, and each cluster is paired with 4 human summaries for the topic. The goal is to generate 100-word long summaries.

First, they assign importance weights on words. Then, they use these weights to form a summary with some more improvements. The algorithm extracts sentences by weighting them based on word importance. Note that a sentence is considered non-redundant if it is not similar to any of the sentences that are already in the summary.

According to [\[Liu et al., 2019\]](#), the realization that cross-document links are important in isolating salient information, eliminating redundancy, and creating overall coherent summaries, has led to the widespread adoption of graph-based models for multi-document summarization. Graphs conveniently capture the relationships between textual units within a document collection and can be easily constructed under the assumption that text spans represent graph nodes and edges are semantic links between them.

Their suggested model uses an existing Transformer architecture, with a slight difference - the documents collection is encoded in a hierarchical manner, instead of concatenated flat sequence. In order to identify the cross-documents relationships they use an attention mechanism, so the model will learn richer structural dependencies among textual units. In addition, a simple ranking module was found helpful in order to determine the documents' usefulness for the target summary.

We can use the metro map in order to boost their attention model performance, as some of the cross-documents relationships might be implied from the metro map graph.

We can compare their model's performance without a metro map to the one with the metro map.

Another approach to capture relations between textual units is using a graph. [\[Li et al., 2020\]](#) describe a model with graph encoding layer, that is used for capturing cross-document relations, and the decoder uses the graph in order to create a better summary. An explicit graph representation is created from the input documents by the graph encoder layer. Later, that representation is fed to a graph decoder layer, to guide the summary decoding process. Both layers are composed of attention models. They claim that their model can be easily combined with any pre-trained language model (like BERT).

Evaluation

In order to be able to estimate the quality of the summarization algorithm we need to choose an evaluation metric. The most commonly used one is ROUGE [\[Lin, 2004\]](#) - Recall-Oriented Understudy for Gisting Evaluation. It is a collection of methods (ROUGE-N, ROUGE-L, ROUGE-W, ROUGE-S) that compare automatically generated summaries to a set of human generated ones. We will use it as well, as the paper shows that ROUGE-1, ROUGE-2, ROUGE-SU4 and ROUGE-SU9 work reasonably well for multi-document summarisation evaluation. Moreover, the evaluation algorithms are already implemented and ready for use.

Data

Due to limited scope of the project we have decided not to implement the metro map's generation algorithm. As a result we had to use an existing metro map we found on the web. We have found a metro map that was built in paper on metro maps [Shahaf et al., 2012] and which interactive version was found [here](#). You can see it in *fig 1*.

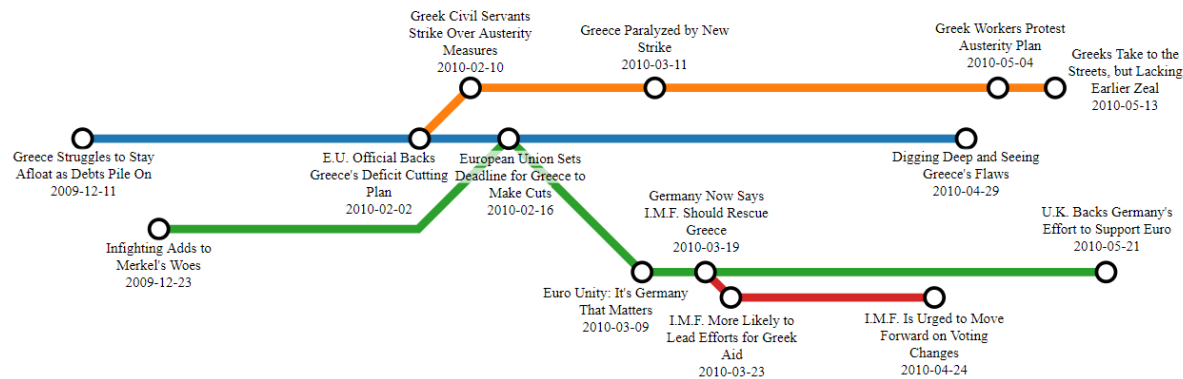


Fig 1 : the metro map that was used

We received the map as a pair of csv files - one contains a list of the articles and one detailing the edges, as shown below:

n	title	date	text	from	to	description
1b	Greece Struggles to Stay Afloat as Debts Pile On	2009-12-11	Ever since Greece's credit rating was downgrad...	0	1b 2b1o	debt, austerity, credit
1g	Infighting Adds to Merkel's Woes	2009-12-23	Chancellor Angela Merkel will be glad when thi...	1	1g 3b2g	germany, euro, merkel
2b1o	E.U. Official Backs Greece's Deficit Cutting Plan	2010-02-02	Greece's deficit-cutting plan is ambitious but...	2	2b1o 3b2g	debt, austerity, credit
2o	Greek Civil Servants Strike Over Austerity Mea...	2010-02-10	Striking civil servants brought public service...	3	2b1o 2o	strike, riot, bank
2r	I.M.F. More Likely to Lead Efforts for Greek Aid	2010-03-23	The International Monetary Fund seemed more li...	4	2o 3o	strike, riot, bank
3b2g	European Union Sets Deadline for Greece to Mak...	2010-02-16	Greece faced increased pressure Tuesday over i...	5	2r 3r	imf, fund, strauss
3g	Euro Unity: It's Germany That Matters	2010-03-09	Ten years after the euro, it's still all about...	6	3b2g 3g	germany, euro, merkel
3o	Greece Paralyzed by New Strike	2010-03-11	Greek public transport was halted, flights gro...	7	3b2g 4b	debt, austerity, credit
3r	I.M.F. Is Urged to Move Forward on Voting Changes	2010-04-24	Officials from the United States, South Korea,...	8	3g 4g1r	germany, euro, merkel
4b	Digging Deep and Seeing Greece's Flaws	2010-04-29	For Paul Koptides, who works in a car rental a...	9	3o 4o	strike, riot, bank
4g1r	Germany Now Says I.M.F. Should Rescue Greece	2010-03-19	After weeks of backing a European rescue for t...	10	4g1r 5g	germany, euro, merkel
4o	Greek Workers Protest Austerity Plan	2010-05-04	Hundreds of demonstrators took to the streets ...	11	4g1r 2r	imf, fund, strauss
5g	U.K. Backs Germany's Effort to Support Euro	2010-05-21	Setting the stage for another significant chan...	12	4o 5o	strike, riot, bank
5o	Greeks Take to the Streets, but Lacking Earlie...	2010-05-13	As officials across Europe continued managing ...			
First csv file - articles list				Second csv file - edges list		

Fig 2 : data representation

We also used the description provided for each branch of the Metro map in the branches legend, as described briefly in [\[Shahaf et al., 2012\]](#), which can be found in the description column of the edges' csv.

Different Approaches and Methods

Initial Idea: Feed extracted Metro Map features to an existing multi-document model

As stated above, a lot of the literature on the subject of Multi-Document summarizations, no matter if describing an extractive or an abstractive model, talks about trying to detect cross documents relationships in order to create a better summary. So we figured we can help an existing model with prior knowledge on the documents collection we have from the metro map.

We planned on training a model for extracting features from the metro map, such as timeline data, branching data (relation between a document and an edge branching from it) and so on. Then we could improve an existing model by feeding it with these features, or improve its encoder if it exists.

Most Multi-Document summarization approaches are extractive, which extract salient textual units from documents based on graph-based representations of sentences. Various ranking methods have been developed to rank textual units based on graphs to select most salient ones for inclusion in the final summary.

[\[Li et al., 2020\]](#) describes an abstractive encoder-decoder model that produces graph representations which are learnt via a graph-informed attention mechanism in the encoding process. Under the guidance of explicit relations in graphs, the model can learn better and richer cross-document relations, thus achieving significantly better performance. They also leverage the graph structure to guide the summary decoding process, which is beneficial for long summary generation.

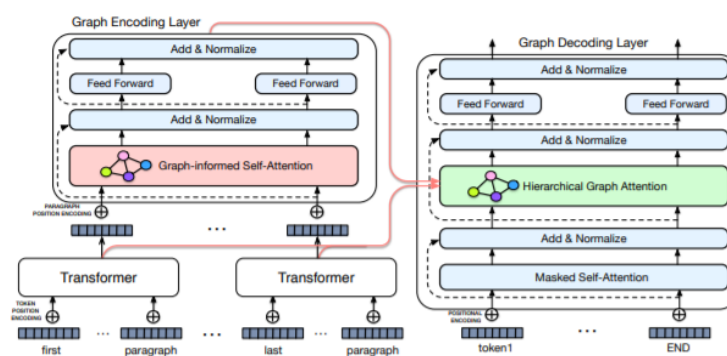


Fig 3 : Illustration of [Li et al., 2020] model, which follows the encoder-decoder architecture

The model is provided with the paragraphs of the documents collection (extracted by new line separation).

Our idea was to do some kind of transfer learning or a model adaptation on their model, by fixing their original weights from the trained model and adding a new feature extraction layer to the encoder. This could have been helpful for detecting similar documents, chronological order (timelines on same branches in the Metro Map), and documents that might be related so thus should be encoded closely together (based on Metro Map's branching).

Transfer learning is a machine learning technique where a model trained on one task is re-purposed on a second related task, thus the training procedure for the desired task is significantly shortened, and requires less data. It is a popular approach in deep learning given the enormous resources required to train deep learning models on the large and challenging datasets on which deep learning models are trained.

The idea turned out to be unworkable, as we could not produce new maps as mentioned before, and in addition we did not have tagged examples, so we dropped it.

Procedural Algorithm for Combining Paragraphs

The realization that we could not produce more examples of the Metro Map led us to our next idea. We realized that we cannot "learn" from the map anything in the form of deep learning because we have no tagged data, but can infer the connections between the documents by understanding the graph the map represents. The edges of the graph are directed, so the documents on the same trajectory are arranged in a certain order - a chronological order.

By that logic, if we would summarize each of the articles of the map into a paragraph by using an existing Single-Document Summarization model, we could combine the paragraphs of the same branch into a single branch summary by concatenating the paragraphs one after the other and it will make sense, because of the timeline knowledge.

Next, we have to infer the relations between branches in order to combine the summaries into a single summary of the whole map.

Here is our suggested algorithm for this process:

```
1. Paragraph of most ancient document
2. While the next document does not branch:
    2.1. Add the next document on current path
3. If there is a branch:
    3.1. Add the document of the branching point
    3.2. If forward (time is later):
        3.2.1. The relation is implication (cause and effect). Conjunctions: As A result, This led to, ...
        3.2.2. Add the document until the end of branch
    3.3. If backwards (happened before):
        3.3.1. The relation is "This was caused by..."
        3.3.2. Add the branch until the end of it
    3.4. Return back to the initial path storyline
```

We planned to avoid the task of inferring relationships between branches by fixing a cause and effect relation when branching occurs. When the branch starts on the separation document (case 3.2), the relation is implication - the initial branch *caused* the new branch. When the new branch has an earlier article (case 3.3) the relation is reversed. I.e. The initial branch was *caused by* the new branch. We planned on giving lists of conjunctions for each of these cases, and randomly choose one of the lists when needed.

Our intuition was that it was not good enough, and overfitted for the single Metro Map we had. We scanned the article of the Metro Maps several times in search of information on the subject of the connections between the paths, but to no avail. We thought about combining an existing

model that detects relations between two documents and from that infer the conjunction, but we could not find one. Another attempt was to take a part of an existing Multi-Document model, that detects cross-documents relations but only found an encoder that does that and it does not fit as it requires a lot of adjustments. So we abandoned the idea.

Final Approach: Use Existing Multi-Document Model on Branches Summarizations

This led us to the final idea:

1. Summarizing each of the articles using a Single-Document Model from [\[Liu & Lapata et al., 2019\]](#) into a paragraph.
2. Combining the paragraphs of the same branch into a single branch summary by concatenating them one after the other.
3. Use an existing Multi-Document summarization [model](#) on the branches' summaries to create a single summary.

This way we are utilizing the timeline from the map and drawing the connections between the branches using a separated pretrained Multi-Document summarization model.

[\[Liu & Lapata et al., 2019\]](#) demonstrate how BERT can be usefully applied in text summarization and propose a general framework for both extractive and abstractive models. Using an encoder based on BERT, which is able to express the semantics of a document and obtain representations for its sentences, they introduce extractive models, abstractive models and a combination of the two.

After several trials, We chose to use the combination approach for the Single Document summarization task (phase 1). This is a two-stage approach where the encoder is fine-tuned twice, first with an extractive objective and subsequently on the abstractive summarization task. It was previously suggested that using extractive objectives can boost the performance of abstractive summarization, and indeed they show it produces the best results (using ROUGE). Important note is that the pretrained BERT encoder and their decoder were a bit problematic with special characters (e.g. period, comma, quotes signs...) in a non deterministic way, i.e. sometimes they were decoded as unknown characters. By enlarging the summary length parameter of the model, we reduced the amount of times it happened, and for the times it still occurred, we replaced the unknown token with period, and the model handled it pretty well.

An example of a branch summary can be found on the [Appendix section](#).

As for the Multi-Document model we used a simple unsupervised extractive model. With the goal of choosing informative yet non-redundant sentences, each sentence of each set of articles is given a score, weighed by the following features:

- Words in common with headline (using stemming)

- Sentence length (assuming longer sentences are more representative; goal: ~20 words).
- TF-IDF word frequency (using stemming), using 11k Reuters news articles as background corpus.
- Relative sentence location in article

For the headline of each branch we used the branch description provided with the Metro Map.

After the process of creating the summary we did some refinement by capitalizing names of countries, languages, days and months and also the first word of each sentence (using nltk library).

An example of a result summary can be found on the [Appendix section](#).

Results

Numeric Results

Before starting the work on automatic summarization we have read all the articles from the map and written their summary. We have viewed this summary as the golden standard that we have been comparing to all automatic summaries. The text of the summary is provided in the [Appendix section](#).

In order to estimate the quality of the summary we used ROGUE estimation. We have used the python implementation replicating the results of the original perl implementation of the paper by [Lin, 2004].

We have calculated ROUGE-1, ROUGE-2 and ROUGE-L.

ROUGE-1, ROUGE-2 are variants of rouge-n - an n-gram recall between a candidate summary and a set of reference summaries. As we only had one reference summary we used only it.

$$\text{ROUGE-N} = \frac{\sum_{S \in \{\text{ReferenceSummaries}\}} \sum_{gram_n \in S} \text{Count}_{\text{match}}(gram_n)}{\sum_{S \in \{\text{ReferenceSummaries}\}} \sum_{gram_n \in S} \text{Count}(gram_n)}$$

ROUGE-L refers to the longest common subsequence between two summaries and is pretty straightforward.

The package that we have used calculates recall and precision, as in recall - $\frac{\text{number of overlapping words}}{\text{total n of words in reference summary}}$ and precision - $\frac{\text{number of overlapping words}}{\text{total n of words in suggested summary}}$.

Both measures provide insight and add to estimation, though in our case the results were very similar.

The rouge score of map summarization is:

'Rouge1': precision = 0.447, recall = 0.501

'Rouge2': precision = 0.171, recall = 0.192

'RougeL': precision = 0.171, recall = 0.192

Compared to it a plain multi-document summarization score is:

'Rouge1': precision = 0.357 , recall = 0.441

'Rouge2': precision = 0.052, recall = 0.064

'RougeL': precision = 0.123 , recall = 0.152

We see that results are slightly better for map summarisation, although the significance of the difference is unclear as we have only one example.

Empiric Results

Our goal wasn't to perform a full scale study, but we felt that some human evaluation is necessary as we have only one example on our hands and can't really rely on the ROUGE score.

We have asked about 15 of our friends to read both summaries (with map adaptation and without such), to describe their impression of them and to choose the one that felt more comprehensive. The link to the survey is provided in the appendix.

All of our participants were unfamiliar with the details of Greece's financial crisis.

In *fig 4* we have shown the word clouds from the responses. The map summary is perceived as more comprehensive, coherent and clear, whereas the regular summary is seen as confusing, hard to follow, with too many facts.



Fig 4 : on the left: no map adaptation summary, on the right: summary with map adaptation

We have called the summary without map adaptation Text 1 and the summary with map adaptation Text 2. As you can see from *fig 5* more than 80% of the respondents chose the text with map adaptation.

What text in your opinion described the situation more fully, was more comprehensive?

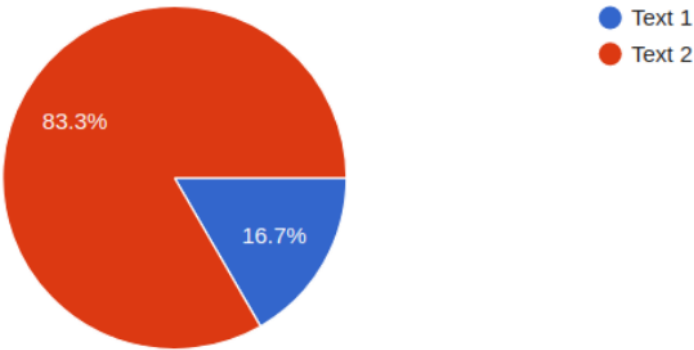


Fig 5: the pie chart of the text preferences of survey participants

Future Work

Our model can be improved by several adjustments:

- Using an abstractive events timeline summarization as suggested in [\[Chen et al., 2019\]](#). Instead of concatenating the summaries of articles of a graph one after the other, we can summarize them abstractively into a single, fluent text.

Events	Michael Jackson (dubbed as “King of Pop”) was born on August 29, 1958 in Gary, Indiana.
	In 1971 , he released his first solo studio album “Got to Be There”.
	In late 1982 , Jackson’s sixth album, “Thriller”, was released, where videos “Beat It”, “Billie Jean” in it are credited with breaking racial barriers and transforming the medium into an art form and promotional tool
	In March 1988 , Jackson built a new home named Neverland Ranch in California.
	In 2000 , Guinness World Records recognized him for supporting 39 charities, more than any other entertainer.
Bad summary	Michael Jackson on August 29, 1958 in Gary, California . In 1971 , his first album “ Thriller ” was released. In 2000 , Guinness World Records recognized him for supporting 39 charities.
Good summary	Michael Jackson was born on August 29, 1958 in Gary, Indiana . His sixth album “ Thriller ” was released in 1982 . In 2000 , Guinness World Records recognized him for supporting 39 charities.

Fig 6: Example of timeline summarization from Chen et al., 2019

Unlike traditional document summarization, timeline summarization needs to model the time series information of the input events and summarize important events in chronological order. They propose a time-event memory to establish a timeline, and use the time position of events on this timeline to guide the generation process. Besides, in each decoding step, they use a word-level attention to avoid confusion between events.

- Instead of a simple extractive multi document model, use an abstractive supervised model, e.g. [\[Li et al., 2020\]](#) that was introduced above.

Discussion

The results obtained in this project show that there is value in using metro maps for multi-document text summarization, although the generalization based on only one metro map is impossible. Our work could be seen as a proof of concept that shows the worth of expanding and testing on multiple queries.

There are numerous possibilities for improvement in every stage of the summary process as discussed previously: in-line summarization, between-line summarization.

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Appendix

The handmade 'gold' summary:

"Since Greece's credit rating was downgraded, it's new social government was trying to fight back. They claim that no bailout is needed and they will reduce the deficit and control the debt. The measures, including freezes in public sector salaries, cuts in pensions and higher sales taxes were proposed. Civil servants went on strike to protest the suggested solutions. 'We won't pay for their crisis'- say the demonstrators. Although many of the protesters admit that changes are needed, the pickets are numerous and marred by violence. Greece is known for low tolerance for change and high tolerance for protests. The country's insatiable situation is delaying investment decisions and weighing on business confidence. Greece may only have enough money to pay pensions for a year. People are concerned about whether they would get their salary. They name corruption, the underground economy and tax evasion to be the reason for the crisis. Moreover, the previous government is accused of mispending the EU money. This situation affects the stability of the euro and brings concern to the European Union, fears of a spill-over effect on other weak, heavily indebted countries in the euro zone, have been voiced. They demand Greece to prove that it's deficit reduction program is working. If the program proves to be inefficient, more cuts are expected. The European commission demanded an explanation on sophisticated financial instruments that were used to conceal the scale of the deficit. They suspect that investment banks may have misrepresented debt figures. Greece also faces a possibility of legal proceedings. According to EU laws, the government can't enter into fictitious derivatives transactions. The Greece finance minister denied such accusations. It is clear that in order to get any financial help from the EU, Greece has to persuade Germany first. Germans are reluctant to offer a bailout as they themselves had a difficult fiscal year, however it's deficit is way below its neighbors. After weeks of hesitation, Germany decided that help should come from the International Monetary Fund (IMF). This would represent a new and potentially humiliating twist in Greece's financial drama. Greece markets have undermined the euro, and in order to protect it, Germany is proposing changes to euro zone laws. Britain suggested that it need not block efforts to allow more sanctions against countries that break the euro's rules, like Greece. With that, Britain's new prime minister David Cameron has stressed that he won't allow the shift of power from London to Brussels."

The metro-map based summary:

"Concerns that investors would shun Greek bonds and force a default shook markets worldwide last month but eased recently after Germany and other members of the European union signaled they would come to Greece's aid if necessary. The international monetary fund seemed more likely to lead any rescue of Greece after diplomats on Monday struggled to avoid a rift among European union leaders over aid to the heavily indebted country. There is little chance of agreeing on an aid package at the meeting on Thursday, though they hope to secure consensus on the system that would be called upon if the Greeks sought financial assistance. Officials from the United States, South Korea and Brazil urged fellow members of the international monetary fund on Saturday to move forward on a stalled measure to redistribute voting power within the organization. Concerns that investors would shun Greek bonds and force a default shook markets worldwide last month but eased recently after Germany and other members of the

European union signaled they would come to Greece's aid if necessary. Britain suggested Friday that it need not block efforts to allow more sanctions against countries that break the euro's rules. Greece's financial problems have also provoked talk about a possible bailout by the European union and fears of a spill-over effect on other weak, heavily indebted countries in the euro zone. Greece faced increased pressure Tuesday over its use of complex financial instruments to mask its rising debt. Fears of default in Greece and other struggling European countries have roiled financial markets around the world in recent weeks. Greece has faced a new wave of labor discontent since the socialist government's harsh new austerity plan was introduced last week. The long-term target is to bring overspending below the eu ceiling of 3 percent of gdp in 2012. a general strike last Friday was marred by violence during a large protest March. Hundreds of demonstrators took to the streets in Greece on Tuesday. The measures, including freezes in public sector salaries, cuts in pensions and higher sales taxes, amount to a cultural revolution in the social contract between state and citizen. As officials across europe continued managing the effects of Greece's debt crisis."

The plain multi-document summary:

"Over the past month, Karl-Theodor zu Guttenberg, the new conservative defense minister, has had to explain to a skeptical and pacifist public what exactly happened on the night of Sept. 4 in Kunduz, when a German commander on the ground called in NATO aircraft to bomb two tankers that had been hijacked by the Taliban. There is really no alternative to the path Germany has taken, Axel Weber, president of the Bundesbank — whom some see succeeding Jean-Claude Trichet as the president of the European Central Bank — is quoted as saying in *The Euro: The Politics of the New Global Currency*, by David Marsh. "We want, if there is an unjustified speculative attack against Greek bonds, to know that one of these institutions that have the substantial means to absorb such market products will come and say 'look here, I am buying Greek bonds at this price, with this interest rate,'" Pangalos told private Mega TV. At a news conference in Brussels, the Spanish prime minister, José Luis Rodríguez Zapatero, rejected the idea that his country - which is headed into a second year of recession with a soaring budget deficit and an unemployment rate of 20 percent - might also require a Greek-style bailout. Common in Greece even during better times, such protests are expected to increase dramatically once the government introduces austerity measures in its 2010 budget, including wage freezes and scaling back on public-sector hiring, which it says are needed to bring Greece's finances under control. After winning by a wide margin in October, the Socialist government of George Papandreou announced that the country's budget deficit was 12.7 percent of the gross domestic product, more than four times the 3 percent ceiling set by European monetary union and twice as high as previous estimates. Under intense pressure from the European Union to quickly show fiscal improvement, the government announced an additional euro4,8 billion (\$65.33 billion) in savings through public sector salary cuts, hiring and pension freezes and consumer tax hikes."

Example of a single branch summary:

“ever since greece 's credit rating was downgraded last week , its new socialist government has fought back<q>it said it has the mettle to tackle the soaring deficit and structural woes that have earned it a reputation as the weak link in the euro zone<q>we will control the debt , and there will be no need for a bailout,000<q>the greek finance minister , george papaconstantinou , said in an interview in his office here last week<q>the new government has to win over greece greece 's deficit-cutting plan is ambitious but achievable<q>a top european union official said monday, while warning that athens might have to take additional measures to shore up its finances<q>the gap in its public finances has prompted a series of downgrades by rating agencies and unnerved financial markets worried that athens may not be able to pay its debt obligations<q>greece 's financial problems have also provoked talk about a possible bailout by the european union and fears of a spill-over effect on other weak, heavily indebted countries in the euro zone

greece faced increased pressure tuesday over its use of complex financial instruments to mask its rising debt<q>european officials demanded detailed explanations by the end of the week and said they could extend their inquiry to other countries<q>the finance ministers said tuesday that it will have to show by march 16 that spending cuts it is planning can bring its deficit down from 12.7 percent of gross domestic product, to 8.7 percent this year<q>there was no public discussion tuesday on what form that could take<q>the use of such instruments was first reported in the new york times

paul koptides , who works in a car rental agency here , sees far too much mismanagement and corruption<q>some say their country may have been unprepared to join the european union in the first place<q>some focus on how european union funds sent to greece were spent on wasteful projects<q>the day+s newspapers on wednesday carried huge headlines suggesting that the country was on the brink and that time was running out<q>a newspaper that is supportive of prime minister george a. papandreou took aim at the eu , saying it was going too slowly in extending a 30 billion euro loan (about \$39 billion) to help greece pay its bills”

The link to evaluation survey: [google forms](#)

The link to the code: [colab](#)