

## Thematic Analysis in Python

In this paper we aim to build a thematic analysis without provided entire context by using key topics extrapolated from a dataset. A thematic map is then built to describe a gestalt picture for what the dataset's original context had been about.

### Data and methods:

The research data set has been provided to us in Word format so we first start by converting the word document into csv using Python's 'Docx2Csv' and from there, several ETL tools can then implemented in order to determine NLP patterns within the text. Most prominent among the python packages is the SpaCy module and the NetworkX module, used to build a robust method for clustering sentences into their most similar counterparts. A graph depicting this cluster is then plotted with matplotlib where the drawn graph is overlayed with the sentences and responses from the panelists.

From there, the steps taken to create the graph are as follows:

- 1)From SpaCy include a separate dataset which converts takes as input the csv values (e.g the responses from the panelists) and appends column vectors which represent a parsed version of our sentences to include: parsed\_doc, comment\_lemma, comment\_tokens, and pos\_pos.
- 2)The parsed\_doc column is then plugged into NetworkX and then iterated over in order to create a relational fully connected graph.
- 3)This is then repeated for each Panelist at the same edge weight from the total and if there are no clusters, the edge weight is then reduced (X, Y, Z, T, R).
- 4)We then clean the data via requiring the minimum edge weight connecting any two nodes on the graph, where each node represents any sentence from the Panelist's responses, to be above a minimum threshold, thereby making the sentences legible enough to read on the plotted graph.
- 5)After cleaning the code, we then implemented an overlay, which allows our graphed vectors from parsed\_doc to be used as labels for the cluster of similar sentiments.

### Results:

For the first plotted graph, the total value is considered. We can see the graph suggests the sentence, "I think it's extremely important to bring people from outside of the physics department in Quantum Technology." represents this node to be the strongest connected node for the cluster created.

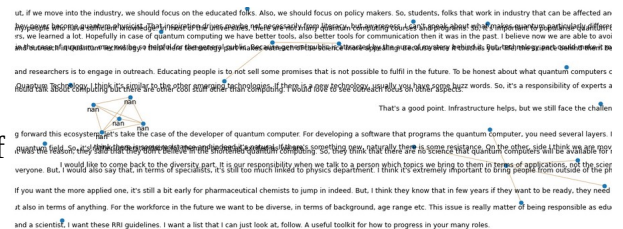
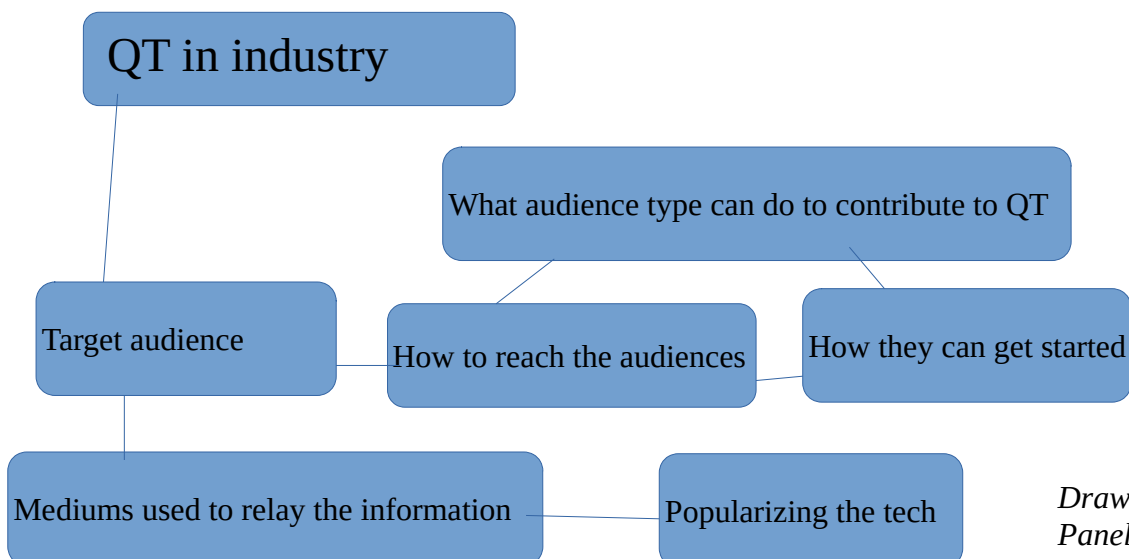


Figure 1: Total responses



Drawing 1: Thematic map of Panelist Discussions

## Conclusion:

In closing, we can see that for the entire dataset, that X trails the discussion with relevant sentiments found across all questions, providing the strongest argument for the central tenet of this discussion-- Quantum technology in Academia. Each Panelist contributes to the conversation and seems to build on top of each question by starting with how to get the the tech popular, why it is useful in general, how the layman can make use of it, how people in STEM academia can make use of it, what newcomers can do to get started, and lastly, how educating all parties is relevant to the future workforce.

## References:

- 1)Kaggle.com. 2018. *Thematic text analysis using spaCy, networkX*.. [online] Available at: <<https://www.kaggle.com/code/caractacus/thematic-text-analysis-using-spacy-networkx/notebook>> [Accessed 1 July 2022].
- 2)Maguire, Moira, and Brid Delahunt. *Doing a Thematic Analysis: A Practical, Step-by-Step Guide for Learning and Teaching Scholars.*, 2017.

## Additional Data:

...t many people who have sufficient knowledge. In most of the universities, there are not many quantum computing courses and programs. So, it's important to popularise quantum computing and to make it more accessible to the masses. ...

...I have and outreach in QT. I think here technology part makes outreach of the science more appealing. Because once it touches your life, the science behind them becomes much more interesting with a broader audience. The challenge of outreach in QT is that it is an extremely complex topic. We need to find different language and approach to explain these technologies to a broad audience.

Figure 2: The analysis of Question 1 suggests the topic was on accessibility of Quantum computing to the masses

...technologies, without getting familiar with them. And the outcome is counter-productive.

...n. What I mean by a support system is a local company/group/institute that takes care of providing an infrastructure, and helps to the communication process. This local infrastructure takes various technologies, if there is a new technology, usually you have some buzz words. So, it's a responsibility of experts and researchers to look up for the false news, and trying to explain what it focus on computing. We should talk about computing but there are other cool stuff other than computing. I would love to see outreach focus on other aspects.

...think it's extremely important to bring people from outside of the physics department in QT. Because the future of QT will only be possible if we could include others. If we want this ecosystem to help, but we still face the challenge of putting people together who trained in different areas.

Figure 5: The analysis of Question 3 suggests it is both a segway of question 1 and focuses on how to communicate QT in terms of practical use to the general population

...greater than even the combined quantum field. So, it's rather understandable for them to be not as excited as we are.

...quantum computing is kind of a competitor because of the model they use. They are used to their model, and learning a new one, as they explained me, was tough. Fabia, which type do you think they need to start now. So, it's the beginning of the field, and they need to be aware of what's going on, and indeed there is interest. But, for the present applications that we have, they think that there are science that quantum computers will be available for near future. Computer science domain is still growing so fast that even two years from now it's a new era.

...hat they do have a background in quantum. They are not starting from zero.

...side I think we are moving on this direction. As for chemistry, there is an initial interest, and there is for sure some resistance. I think it is definitely compatible, it just needs a bit of work.

Figure 6: The additional question's analysis seems to be what the panelists suggests users new to the field should do to break the barrier to entry. This question was also the least vague.

...which topics we bring to them in terms of applications, not the science. Because we are shaping the attitude in this way. Without over or underestimating other technologies, we have to talk it to every individual in a different level according to their age, or their educational background. We have the responsibility to meet people at their level. How you get your message across is important.

...ut what quantum computers can do, how they can help to society: support science and industry in general. Not to oversell is very important, but to engage in outreach, and educate people about QT diversity, reducing the hype are called by other panelists. So, I would highlight it's point. There are often overpopulation of men and less by women, we should really point towards diversity.

Figure 3: Question 2's analysis suggests the topic was on use cases of quantum computing as a trade

...ifferent roles for pushing forward this ecosystem, let's take the case of the developer of quantum computer. For developing a software that programs the quantum computer, you need several different roles. Short answer would be everyone indeed, but for a specific group, I believe that outreach should be directed to researchers. PhD students and students in the workforce, one needs to do outreach to students, PhD students, and even the post-doctoral students where the qualification comes. If you want an interdisciplinary field, the experts of other areas are needed.

...Population wise, I think we should focus on students. But, if we move into the industry, we should focus on the educated folks. Also, we should focus on policy.

Figure 4: The analysis of question four suggests the topic focuses on how to aggregate users of QT based on their native trade, most notably, post-docs.

...urgence of QT to the emergence of other technologies in the past. I believe that as a community of researchers, we learned a lot. Hopefully in case of quantum computing we have better tools to help us in this. For me as an outreach communicator and a scientist, I want these 100 guidelines. I want a list that I can just look at, follow. A useful tool for how to progress in your many roles. I want to be in terms of background, but also in terms of anything, for the workforce in the future we want to be diverse, in terms of background, age range etc. This issue is really matter of being more inclusive.

Figure 7: The analysis of the last question suggests its topic was on what is being done to convey QT education to future adoptors of the tech.

uture we want to be diverse, in terms of background, age range etc. This issue is really matter of being responsible as educators and people work in outreach. Also it's our responsibility to no  
I think there is some resistance and indeed it's natural. If there's something new, naturally there is some resistance. On the other, side I think we are moving on this di  
it's still too much linked to physics department. I think it's extremely important to bring people from outside of the physics department in Quantum Technology. Because the future of Quantum  
ing a software that programs the quantum computer, you need several layers. Imagine this as sort of a shell. At the very core, you have a programming language, and it doesn't require any  
So, it's the beginning of the field, and they need to be aware of

Figure 2: The graph analysis of X suggests they are a physicist

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Figure 4: Similarity of R's data suggests they may be an advocate of quantum computing, emphasizing popularization of the tech.

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of chemists where I work. In advanced chemical modelling there is a lot of quantum mechanics in it. So, their perspective for quantum computing is kind of a competitor because of the mod  
cations, not the science. Because we are shaping the attitude in this way. Without over or underestimating other technologies, we have to talk more about diversity

Figure 7: The analysis of Y suggests they are a chemist and active in community outreach.

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Figure 3: Similarity of Z's data suggests they stay current with trends in computing and are likely a coder

ms of what the community is doing wrong. I think there is too much focus on computing. We should talk about computing but there are other cool stuff other than computing. I would love to s  
y never become quantum physicist. That inspiration drives maybe not necessarily from literacy, but awareness. I can't speak about what makes quantum particularly different because I don't  
One thing about chemists, that they do have a background in  
acity the better off we will be. We don't have to limit quantum into just a small subset  
ople. It's not just lying to people, but making sure that you are meeting them at a level. I talk to every individual in a different level according to their age, or their educational background. W

Figure 5: Similarity of T's data suggests they are good with people and likeley and non stem businessman

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Figure 8: Similarity of Y's data suggests they are a chemist and prominent in community development.