

# USING TRANSFORMERS TO GENERATE WELLBEING QUESTIONS

## 1. Definitions

**Transformer** - deep learning model that tries to learn context by tracking relationships in sequential data [1]. Widely used for natural language processing (NLP).

**GPT-3** - OpenAI's pre-trained language model that was trained on the Internet and makes use of transformer. Current state-of-the-art tool for text generation.

**Prompt engineering** - embedding the task of the model into a natural language description [2].

## 2. Introduction

With the surge of mental health issues during Covid-19 [3], assessing well-being has become a vital part of many organizations. However, creating well-being questionnaires, and especially coming up with questions for those, still remains a challenge since it can involve significant manual labor. With the recent advances in AI and natural language processing tools, there is hope that such well-being questions could instead be synthesized by computers in an efficient, customizable and easy manner.

## 3. Research Question

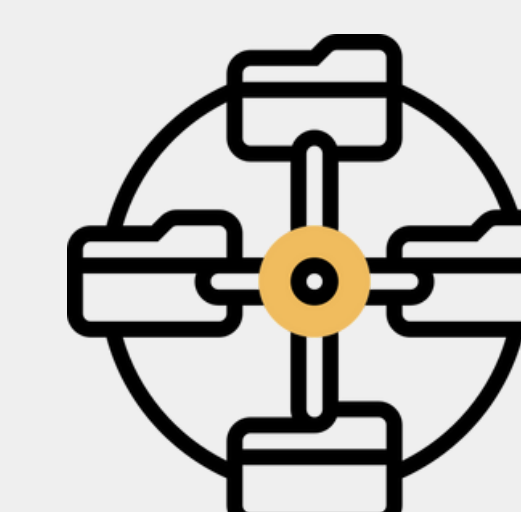
Can transformers be used to generate wellbeing questions?



**Literature review** on survey design, automated question generation and NLP



**Data collection & fine-tuning** for specific context knowledge



**Question generation** using zero-shot, few-shot, context adding & fine-tuning techniques



**Question evaluation research** to get insight into assessing generated questions



**Creating a website** to allow for easy question generation in the future

## 4. Method

## 5. Results

**Figure 1:** Zero-shot learning, no example questions

Generate from 0-10 scale wellbeing questions about student academic performance in TU Delft:

1. How motivated are you to achieve good grades in your courses at TU Delft?
2. How confident are you in your ability to succeed academically at TU Delft?
3. How much enjoyment do you get from your academic studies at TU Delft?
4. How well do you feel you are coping with the workload and stress of your studies at TU Delft?
5. How supported do you feel by your family and friends in your academic studies at TU Delft?
6. How connected do you feel to your fellow students and the academic community at TU Delft?
7. How much do you feel like you belong at TU Delft?
8. How valued do you feel by your professors and academic advisors at TU Delft?
9. How engaged are you in your academic studies at TU Delft?
10. How optimistic are you about your academic future at TU Delft?

**Figure 3:** Context added to improve questions

What you can do if you feel lonely during the coronavirus (COVID-19) outbreak? Loneliness can affect anyone at any time. During the COVID-19 outbreak, spending less time with family and friends has led to more feelings of loneliness than usual for lots of us— particularly for those who have been isolating or shielding. Adapting to changes can come with its challenges too, and it might still feel difficult to connect with family and friends, colleagues or other everyday contacts. Do more things you enjoy. Filling your time doing more things you like can stop you from focusing on feelings of loneliness and is good for your wellbeing. Creating a regular routine of checking in with others and being more sociable can be good, as it can make it easier to reach out at the time you feel lonely. You could try messaging old friends or colleagues on social media or text someone you have not spoken to for a while. Or set up a group chat on WhatsApp or Messenger if you prefer to talk with a few people at the same time. Most of us love hearing from people we have lost contact with – and that's especially true now. It may also encourage them to contact you more, or you could ask if it's OK to have a regular check-in.

Generate 5 Likert-scale wellbeing questions about loneliness during COVID-19 based on the above text:

1. How often have you felt lonely since the outbreak of COVID-19?
2. How much has spending less time with family and friends contributed to your feelings of loneliness during the outbreak?
3. How well have you been able to adapt to the changes brought about by the outbreak?
4. How often have you reached out to others (e.g. family, friends, colleagues) since the outbreak began?
5. How much has doing things you enjoy helped to reduce your feelings of loneliness during the outbreak?

**Figure 2:** Few-shot learning, match question style

Generate wellbeing questions similar to these:

"Overall, how satisfied are you with your life nowadays?"

"Overall, to what extent do you feel the things you do in your life are worthwhile?"

"Overall, how happy did you feel yesterday?"

"Overall, how anxious did you feel yesterday?"

"Overall, how stressed did you feel yesterday?"

"Overall, how much control do you feel you have over your life?"

"Overall, how confident are you in your ability to achieve your goals?"

"Overall, how optimistic are you about your future?"

"Overall, how satisfied are you with your relationships?"

"Overall, how satisfied are you with your health?"

**Figure 4:** Question generation website

**Generate wellbeing questions**

Write question topic

Student failed their Computer Organization exam

Select question type

Open

Likert question

Likert statement

Multiple choice

Add context (e.g. a news article / relevant paragraph)

(Optional)

**Output:**

How are you feeling about failing your Computer Organization exam?

What are your thoughts about what you need to do to improve your understanding of the material?

What are your plans for studying for the next exam?

Do you feel like you have a good support system to help you succeed in your courses?

Do you feel like you have the time and resources available to you to be successful in your courses?

What are your thoughts about your ability to pass your courses?

Do you feel confident in your ability to improve your grades?

What are your plans for if you do not pass your courses?

## 6. Conclusion

1. **Zero-shot and few-shot** learning methods struggle with difficult contexts for which the model has little knowledge. When **adding context**, e.g. a relevant news article, questions' relevancy is significantly improved. **Fine-tuning** struggles due to lack of quality data and lack of similarities between questions.

2. The baseline model understands very well the **different types of questions**.

3. **Expert evaluation** has the advantage of assessing transformer-generated questions compared to automated evaluation indicators or user studies.

4. The **website** can be used by survey designers to simplify and speed up the question generation process.

[1] "What Is a Transformer Model?", NVIDIA Blog, 2022. [Online]. Available: <https://blogs.nvidia.com/blog/2022/03/25/what-is-a-transformer-model/>.

[2] "Prompt engineering," May 2022, page Version ID: 1089715529. [Online]. Available: [https://en.wikipedia.org/w/index.php?title=Prompt\\_engineering&oldid=1089715529](https://en.wikipedia.org/w/index.php?title=Prompt_engineering&oldid=1089715529)

[3] A. Brodeur, A. Clark, S. Fleche, and N. Powdthavee, "Covid-19, lockdowns and well-being: Evidence from google trends," Journal of Public Economics, vol. 193, 01 2020