QualiAnon - The Qualiservice tool for anonymizing text data

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Abstract

The anonymization of qualitative interview data is of high importance. For the purpose of secondary use of data, anonymized data is essential. However, anonymization procedures are complex and time consuming. This is why the Research Data Center Qualiservice at the University of Bremen aimed at providing a tool to support the anonymization of text-based research data. In cooperation with the RDC Qualiservice teh working group of Jürgen Pfeffer at the Bavarian School of Public Policy at the Technical University of Munich developed the basis for the Qualiservice Anonymization Tool - QualiAnon by starting to technically implement the Qualiservice Anonymization Concept [4][6]. Due to issues with automated processes and a lack of control that did not allow to use earlier tool versions outside the RDC, we decided to provide a tool that keeps researcher in control of their data. Automated decisions give all-in-one solutions, but studying qualitative interview data depends on the needs of every single researcher. We provide a tool that enables researcher to make individual decisions with the information needed, on the level required. In this report, we propose a solution to anonymize qualitative interview data with the purpose to create own coding schemes and individual abstraction levels. We built a tool that assists in working with textual interview data. By using the tool, processes can be optimized and important information can be obtained at the same time.

The basic elements of the Qualiservice Anonymization Tool has been further developed by the world data archive PANGAEA, cooperation partner of the Qualiservice consortium. Qualiservice currently validates the tool in different use cases. The release of the tool is scheduled for spring 2021.

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Index Terms: anonymization, qualitative social science interview data, text analysis
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Chapter 1

Technical Report

1.1 Motivation

The database of the Research data Center Qualiservice is qualitative social science data. These are currently available mostly as transcripts. In order to make this data accessible for secondary research, the personal and person-related data must be anonymized. The process of anonymizing qualitative data is costly and complex. In order to facilitate the work of primary researchers, the Qualiservice anonymisation tool - QualiAnon - was developed to implement Qualiservice Anonymization Concept [4] [6] and to allow for a feasible anonymization process. Therefore, the original documents are available to secondary users in an anonymized version. The anonymization process refers to flexible rules that meet the respective requirements of the secondary researcher. One objective is to control and implement the application of the rules to the original documents and the construction of the documents to be used for further research. Furthermore, the tool should facilitate the anonymization of qualitative research data (mainly transcripts) by providing protective measures for the anonymisation of qualitative interview data - so that this data can be used for secondary purposes. In accordance with the Qualiservice Anonymization Concept the data should remain researchable (information relevant to the social sciences, such as the size of a site or the general concept of a disease) or be reopened for specific research questions, that is "flexible anonymization" [4].

1.1.1 Objectives

One of the objective is to develop a tool that intuitively assists in text editing processes without making automated decisions. Researchers are in control to determine the objects and the degree of anonymization. Information can be extracted and changed by their meaning for the researcher. Following the Qualiservice Anonymization Concept the framework should allow for an appropriate level of anonymity whilst trying to maintain maximum meaningful information in the research data.

1.1.2 Contributions

- We build a tool with an easy to use interface that assists in the anonymization process of interview data.
- We provide a framework with which entities from text can be extracted.
1.1.3 Outline

This work is structured as follows. In a first step information about the secondary use of interview data is provided. For the purpose of secondary use anonymization characteristics will be defined following the Qualiservice Anonymization Concept. To approach different levels of abstraction during anonymization we refer methodologically to information extraction and provide our framework. This is followed by the code documentation. The technical report ends with some closing remarks. Chapter 2 contains the tool manual in which all steps containing the basic version are shown in detail with screenshots and example text. We have selected three different interview types to illustrate the functions of the tool step by step.

1.2 Background

1.2.1 Secondary Use of Interview Data

The concept of qualitative longitudinal data archives to conduct qualitative secondary analysis has been broadly discussed [8] [4]. Referring to the Qualiservice Anonymization Concepts as well as to the conceptual elaboration from a project of the University of Leeds [1] it is important to reach an appropriate level of anonymity, whilst trying to maintain maximum meaningful information in the research data. Information should not be crudely removed or blanked-out, but rather pseudonyms, replacement terms or vaguer descriptors should be used. Some data that combine many difficult features: geographically specific references, sensitive and potentially harmful content, longitudinal detail that increase disclosiveness, will be difficult or impossible to anonymize in a manner that both protects the quality of the data and the confidentiality of participants. Other strategies will be necessary for such data, for example, the anonymization of a small subset of data for illustrative purposes and might be highly valuable for methodological insights. It can be summarized that the objective for all data is to achieve a reasonable level of anonymization which is then combined with other strategies, namely consent agreements and access controls, in order to maintain confidentiality.

1.2.2 Anonymization of Interview Data

1.2.2.1 Objects of Anonymization

Objects of anonymization are personal and person-related features, e.g., personal names, place names, street names, federal states, institutions and organizations (e.g. companies, schools, institutes), professions, titles and educational qualifications, age, times/calendar dates, pictures and voices. Furthermore, indirect, but specific contextual information. Characteristics of the subjects as well as those of third parties mentioned in the interviews (also the personal rights of the interviewees, transcribers, etc. must be taken into account). Sensitive information are information on ethnic origin, political opinion, religious or philosophical beliefs, trade union membership, health or sex life.

1.2.2.2 Degree of Anonymization

The Qualiservice Anonymization Concept works with different levels of abstraction. The degree of anonymization refers to the level of abstraction. The term Pseudonym refers
to renaming people, objects etc. A third way of making research data anonymous is **aggregation**. That means to coarsen or aggregate information by creating classes or categories. This includes, for example, replacing the concrete age with age classes, replacing the concrete employer with the industry or company size class, and replacing a specific girl’s name with student. Another way to make the information anonymous is to **replace** it with information that includes the meaning for and relationship with the researcher. Following the Qualiservice Anonymization Concept, people can be described by the meaning the information to be replaced has for the interviewer, for example, girlfriend, mother, teacher. Place names can be paraphrased based on the meaning of the place to the subject, such as birthplace, place of residence, place of work. On central aspect of the Qualiservice Anonymization Concept is to replace a sensible information with information relevant to the social sciences. So you could replace a country’s name and add information such as country with high youth unemployment or welfare state.

### 1.3 Framework

#### 1.3.1 Information extraction

To approach different levels of abstraction regarding interview texts, we ask the following questions: Which categories of information, parts of a text are needed to understand content, intention, associations, relations that can be replaced, thus anonymized. Therefore, we distinguish the level of abstraction by the degree of information that can easily still be obtained. To obtain the required information coding schemes with categories can be applied. Building a taxonomy of quantitative text analysis techniques is based on two types, instrumental schemes categorize tokens in a text corpus according to theoretical or conceptually-driven frameworks (sentiment analysis based on affect control theory or narrative analyses based on story grammars). Representational schemes, on the other hand, are data-driven schemes (open schemes) that categorize tokens according to simple semantic relations such as synonymy, meronymy, hypernymy, or hyponymy [5]. To build coding schemes for text, we ask the five W’s of journalism - the who, what, where, when, why, and how of things. This kind of content analysis requires entity extraction and ontologically categorized entities [7][2][3]. The applying coding scheme refers to central replacement categories of the Qualiservice Anonymization Concept.

#### 1.3.2 Implementation

For the anonymization of objects in interview data we built a **category** scheme as mentioned in the framework. This is the core element of this tool. These nine categories are intended as default categories for anonymization: Person, location, Institution, Profession, Personal Circumstances, Time, Education, Other. Standardised lists, developed by Qualiservice [6], for the replacements of places, diseases and professions can be applied. Thus, the researcher has the possibility to use standardized information. The **degree of anonymization** refers to the labels in the category scheme: pseudonym, aggregation of information by applying classes or replacing text by adding descriptions or attributions. A category refers to the overall entity. A pseudonym replaces names and makes it easier to read and follow interviews where many different friends or siblings are mentioned. Aggregating information is more convenient for obtaining just the information. Whereas paraphrasing enables to reflect the own analysis. Furthermore, categories can be edited in
a flexible way. Categories can be re-used and are saved as XML-files. They can be edited and be part of the publication. Information in the interviews can be replaced by these categories, changed or paraphrased, depending on the researchers interest for secondary use of data. Further core elements of this basic tool are the option to design individual categories and labels. The replacement scheme is visible at any time. Identical text passages can be marked with different labels. And different text passages can be marked with the same labels. The replacements are stored individually at the corresponding text passages and not globally. Encoded saving to new text can be applied. Exported categories and text can be part of publications and can be shared with a research data center and within the community. The table for replacements includes the originals, the category, pseudonym, replacement and the number of occurrence and can be exported for a first analysis. Codes of different interviews can be compared.

1.4 Code Documentation

1.4.1 Used technologies and libraries

1.4.1.1 Maven

Maven is used to manage the various libraries of the program. Maven makes it easy to add different libraries via the pom.xml file. Maven also builds the final jar file.

1.4.1.2 Libraries

- **JavaFX** is used to create the graphical user interface (GUI). JavaFX uses among other things fxml.files, which serve as the basic framework for the GUI. Each window has its own fxml.file, which communicates with the rest of the program via a controller object. SceneBuilder was used for visual editing of the fxml.files. SceneBuilder was used for visual editing of the fxml.files. Furthermore, JavaFX allows the use of CSS stylesheets to change the interface design. CSS was hardly used in the program.

- **RichTextFX** extends the TextArea of JavaFX and makes it possible to highlight text sections in such a TextArea.
1.4.2 Class-Diagram

![Class-Diagram]

Figure 1.1: Class-Diagram reduced to Data-Objects and their Entities

The program is divided into 4 packages as shown in Figure 1.1:

1. **gui**: In this package all classes are united, which take care of the interaction with and presentation on the GUI. This includes all controllers as well as GUILogic, which is a logic component that prepares the data for the GUI or prepares the input from The GUI for storage.

2. **util**: Different auxiliary classes are combined in this package. Thus the FileHandler takes care of the interaction with the operating system file system and a view object describes the view selected by the user.

3. **doc**: All classes that represent the structure of the opened documents are combined in this package. So an opened project has several documents, which in turn contain markings. Each of these markings will be replaced by a referenced replacement.

4. **cod**: To allow loading Projects independent of the encoding, the classes that contain the encoding categories are located separately from the doc-package in the cod-package. While CodingCategory represents a user-created category, a ListCodingCategory is created from a csv-list and has predefined replacements.

1.4.3 Text storage

To allow different views of the document text, the text is stored in two ways. First, the unchanged original text of the document is saved. On the other hand the coded text, in which the places to be replaced are replaced with the ID of the corresponding marker. Together with the lists of markings and replacements, a third text, called ExportText, can be created. This text is created dynamically depending on the selected view. Figure 1.2 shows an example of the differences in the different texts.
1.4.4 GUI-Controller

This chapter lists which fxml files, which controllers are used in the code and which functions the windows have.

- **mainGUI.fxml/Controller.java**
  - Main window
  - The replacement table and file list are filled dynamically
  - Dynamically created pane for the categories

- **editMeta.fxml/ MetaController.java**
  - Allows the user to change the meta information of a document
  - No dynamic GUI components

- **exportFile.fxml/ ExportController.java**
  - Allows the user to export the currently selected document
  - Choice of different levels for export
  - The different levels are added dynamically

- **loadCategoryList.fxml/ ListController.java**
- Allows to select the desired labels for the new list category
- Divided into 4 pages
  1. Selection of the identifier
  2. Selection of a pseudonym (optional)
  3. Selection of labels
  4. Level assignment for the labels
- The selection options are created dynamically the frame is fixed in the fxml file
- Every time you turn the pages, the interface changes

*singleListMarker.fxml/ SingleListMarkController.java*
- Allows to select a replacement from a loaded list
- Statically Built from the fxml file
- However, the table is filled dynamically during the search

*editCategories.fxml/ EditCategoriesController.java*
- HelferObjekt: CodingCategoryGUIBuilder.java
- Except for the frame and the “+” tab, everything is created dynamically

### 1.5 Conclusion

In cooperation with the RDC Qualiservice we built a tool that assists in working with interview data. This tool was the basis of the new Qualiservice Anonymization Tool which will be released in 2021. The conceptual framework of the Qualiservice Anonymization Tool allows to reach an appropriate level of anonymity, whilst trying to maintain maximum meaningful information in the research data. Studying qualitative interview data depends on the needs of every single researcher. Deciding individually which information to anonymize was the main scope of this project. For further information regarding the Qualiservice Anonymization Tool ”QualiAnon” please contact the RDC Qualiservice via www.qualiservice.org. The basic elements of the tool presented here has been further developed by the world data archive PANGAEA as part of the Qualiservice consortium. Qualiservice currently validates the tool in different use cases. The release of the tool is scheduled for 2021.
Chapter 2

Tool Manual

2.1 Installation

To use the tool, the latest version of Java should be installed in advance: https://www.java.com/de/download/.

2.2 Starting the program

After downloading the tool, a double click on the jar file should be sufficient for execution. Otherwise the jar file can also be opened via the Jar Launcher.

2.3 Work with existing projects

In this tool a project is equivalent to a folder on the computer. All interviews, but also all other files like files for categories and lists are stored in this folder. Therefore, the first step after starting the program is usually to define the project folder.

2.3.1 Set Project Folder

Clicking on File Set Project Folder, the folder in which the files are located is defined.
By default, there are nine categories imported from the project folder.

2.3.2 Import of categories
Categories can also be imported manually opening the Categories.xml.
2.3.3 Editing categories

Categories can be edited. Working with the editor allows to build an own category scheme.
Categories and parameters can be added, edited or deleted. With a pseudonym names, places or events can be renamed. To coarsen or aggregate information classes can be build by adding new labels that refer to the inteded category. For anonymization purposes, information can be replaced that includes the meaning for and the relationship with the researcher.
2.3.4 Import of lists

Importing lists allows to enrich replacements with standardised information.

When opening the Location txt-file, select the variable as identifier to define which information from a column of the list is needed and choose a colour.
2.3.5 Import of text files

Import one or several interviews or other text data as txt-files from the project folder.

The txt-files titles appear subdivided in Projects, marked red, which means they are still unsaved. Clicking on the project, the text appears in the text editor field.
2.4 Working with interviews

2.4.1 Marking text

After defining the respective categories and importing the interviews as txt-files, words or passages of text can be marked. Simply click on the word to be anonymized and mark it by moving the arrow to the end. Use the category drop-down to get to the respective category. Whenever text is marked and assigned to a category, it appears in the replacement table. To use this data for secondary analysis, the anonymization steps are the following: for the purpose of this interview with Ruth Bader Ginsburg information should be aggregated by using the default categories and classes. Person is to be anonymized and we replace it just with information such as gender and role. It’s Category - Person - Pseudonym would be Person1, that can be counted with the fill in button C and fortlaufend S and mark the respective person once or all. A subcategory or class is gender and the person is given a replacement, here Justice.

In this way several information in the interview regarding person, education profession, location, time and personal circumstances can be anonymized. If there are changes to be made for already marked texts, simply click on Edit, add or edit information and click on Edit again to save the changes.
For the purpose of the next interview with Gloria Steinem, places, persons and events are given a pseudonym, hence are being renamed. Gloria Steinem becomes Anna Blau, a movie is renamed accordingly and other persons are given different names. In this way the readability of a text for secondary analysis can be obtained.

For the purpose of this interview with Adele originals in the text were replaced. And since this refers strongly to the researchers own meaning, the category Other was chosen to
2.4.2 Save categories

The default categories only need to be saved if they have been changed using the editor. Click on Categories Save Categories.
And save them in the project folder.

The categories can be reopened as xml-file in a text editor.
2.4.3 Save files

The interview texts are saved as text files. It can be saved one file, all files or as a different file.

When the file is saved it is marked grey.
2.4.4 View

Clicking on View enables to see the different anonymizations in the text. Different combinations of abstraction are possible. For anonymization purposes of the interview with Ruth Bader Ginsburg Level2 - the replacements - is chosen to see the different labels that were assigned.
For the interview with Gloria Steinem the Pseudonym as anonymization was chosen. So, in View the Pseudonym is chosen and in the text the renamed persons and events are anonymized.

In Adeles interview again Level2 - replacements - is chosen.
2.4.5 Meta information

Information about the interviews can be added by clicking on Meta Information on the top right side.

A text field opens where information regarding the interviews can be added.
2.4.6 Search

With the search function a specific word can be searched.

2.5 Export

2.5.1 Exporting text files

Exporting text files enables archiving anonymized interviews for secondary analysis. Comparisons of anonymizations can be done across different interviews. When exporting the files, the connections to the original interview will be lost.
A new window opens and the information to be exported can be chosen.

Now it is saved in the Project Folder and can be used for other purposes such as publications or sharing schemes.
I have a young woman wearing a black shirt and white pants standing in front of a white background. The woman is smiling and appears to be presenting a slide or a chart. The slide contains text, but due to the resolution, the specific content is not legible. The woman is using a pointer to indicate different points on the slide. The background includes a logo or symbol, possibly representing a company or organization. The setting suggests a professional environment, possibly a conference or a meeting room. The woman's posture and expression indicate she is engaged and confident in her presentation.
2.6 Analysis

2.6.1 Create replacement list

For an initial analysis, the anonymized information for each interview can be listed in an Excel file. Click on Analysis and Create Replacement List...

![Image of Excel file screenshot]

It can be saved as an Excel-file in the project folder.
The file can be sorted, for example, by column, comparisons can be made if things have been coded similar or the same concepts differently (template provided by Qualiservice).

2.6.2 Comparing Codes

To compare codes across interviews, click on Compare Codes...
And save it as an excel-file in the project folder.

Comparing codes allows to see how often a coding occurs in which document.
Bibliography


