Port: A software tool for digital data donation

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Summary

Recently, a new workflow has been introduced that allows academic researchers to partner with individuals interested in donating their digital trace data for academic research purposes (Boeschoten, Ausloos, et al. 2022). In this workflow, the digital traces of participants are processed locally on their own devices in such a way that only the subset of participants' digital trace data that is of legitimate interest to a research project are shared with the researcher, which can only occur after the participant has provided their informed consent.

This *data donation workflow* consists of the following steps: First, the participant requests a digital copy of their personal data at the platform of interest, such as Google, Meta, Twitter and other digital platforms, i.e., their *Data Download Package* (DDP). Platforms, as data controllers, are required as per the European Union's General Data Protection Regulation (GDPR) to share a digital copy with each participant requesting such a copy. Second, they download the DDP onto their personal device. Third, by means of *local processing*, only the data points of interest to the researcher are extracted from that DDP. Fourth, the participant inspects the extracted data points after which the participant can consent to donate. Only after providing this consent, the donated data is sent to a storage location and can be accessed by the researcher, which would mean that the storage location can be accessed for further analysis.

In this paper, we introduce Port. Port is a software tool that allows researchers to configure the local processing step of the data donation workflow, allowing the researcher to collect exactly the digital traces needed to answer their research question. When using Port, a researcher can decide:

- Which digital platforms are investigated;
- Which digital traces are collected;
- How the extracted digital traces are visually presented to the participant;
- What is communicated to the participant.

Statement of need

In our everyday lives, we leave more and more digital traces behind on digital platforms: for example, by liking a post on Instagram or sending a message via WhatsApp; when we tap our electronic card on public transportation or complete an online banking transaction. The promise of digital humanities and computational social science is that researchers can utilize these digital traces to study human behavior and social interaction at an unprecedented level of detail (King 2011).

However, while the amount of digital trace data increases, most are closed off in proprietary archives of commercial corporations, with only a subset being available to a small set of researchers at a platform's discretion, through initiatives such as Social Science One (King and Persily 2020)), or through increasingly restricted and opaque APIs (Bruns 2019; Freelon 2018; Perriam, Birkbak, and Freeman 2020).

An alternative approach to gain access to digital traces is enabled thanks to the GDPR's right to data access and data portability (Ausloos and Veale 2021). Thanks to this legislation, all data processing entities are required to provide citizens a digital copy of their personal data upon request in, where that is appropriate, electronic form. We refer to these pieces of personal data as *Data Download Packages* (DDPs).

This legislation allows researchers to invite participants to share their DDPs. A major challenge is, however, that DDPs potentially contain very sensitive data. Conversely, often not all data is needed to answer the specific research question. To tackle these challenges, Boeschoten, Ausloos, et al. (2022) developed an alternative workflow: First, the participant requests their personal DDP at the platform of interest. Second, they download it onto their own personal device. Third, by means of local processing, only the features of interest to the researcher are extracted from that DDP. Fourth, the participant inspects the extracted features after which they can choose what they want to donate (or decline to donate). Only after selecting the data for donation and clicking the button *donate*, the donated data is sent to a storage location and can be accessed by the researcher. See Figure 1 for an overview of these steps.

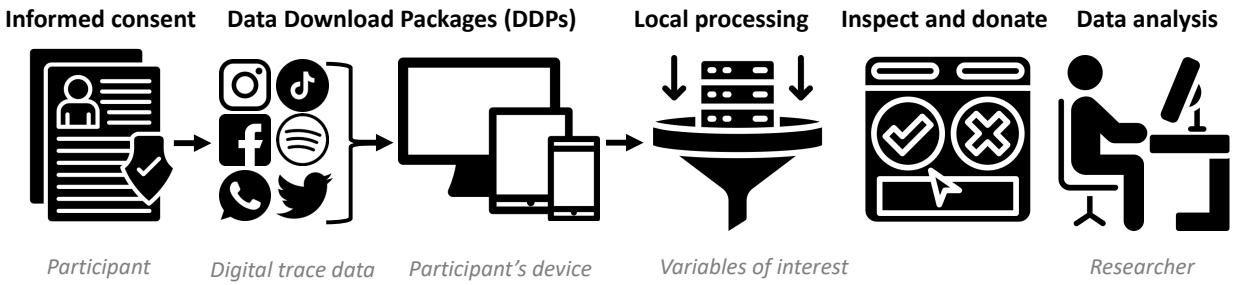


Figure 1: Figure 1: An overview of the participant's data donation flow as presented by Boeschoten, Ausloos, et al. (2022).

In the last years, researchers have used multiple approaches to deal with the privacy issues related to donation of DDPs. For example, van Driel et al. (2022) requested participants to share their complete Instagram DDPs, which were immediately de-identified prior to further analyses (Boeschoten et al. 2021). Kmetty and Németh (2022) asked participants to visit a research site, where participants downloaded their DDPs which were then de-identified under the participant's supervision. Araujo et al. (2022) developed software that allows participants to decide per data instance within a DDP whether they want to make it available for donation. Boeschoten, Mendrik, et al. (2022) introduced a proof-of-concept of the software Port, allowing for local processing of DDPs which results in aggregated, de-identified data.

In this paper, we introduce a new version of Port. It is open-source and allows for researchers to fully configure their own data donation study. It creates an app that guides participants through the data donation steps. Researchers can tailor this app to the DDP of their platform of interest and process these in their desired ways. In addition to local processing, key features from OSD2F are also integrated, allowing participants to decide per data instance whether they want to exclude it from being donated. Note that researchers always ask permission from their own Ethical Review Boards (ERBs) and Data Protections Officers (DPOs), and that using Port does not dismiss researchers from these obligations. The purpose of Port is to enable researchers to access platform user data with a GDPR compliant approach.

Which digital platforms are investigated?

Port is a tool that allows researchers to collect digital traces through donation of DDPs. In practice, this means that Port can be configured to process DDPs from any data controller. i.e, any legal entity that processes personal data. However, collection of digital traces through data donation using Port can only be a viable approach for data collection if the platform acting as data controller meets certain criteria.

First, in order for data donation research to occur, a platform must comply with the individual data access request that was submitted to it, meaning that platform compliance with the GDPR is a condition sine qua non for effective data donation research. Second, the process to request a copy of one's personal data should be standardized to a certain extent such that researchers can provide study participants with instructions on how to do this. Third, the file format of the DDP should ideally have a certain level of standardization

as well. It is not possible to plan the procedure or extraction data from the DDP if it is unknown to the researcher where the data of interest can be found within the DDP.

How are digital traces extracted?

Port consists of two distinct elements, which are both fully controlled by a Python script that runs locally in the browser of the participant. This Python script is specifically tailored for each data donation study. The first element is the data donation study flow. The goal of this part of the Python script is to provide explanations or instructions to the participant at various steps of the flow. The second element is the data extraction process. The goal of this part is to make sure that only the digital traces that are of interest to the researcher are extracted from the DDPs and that were agreed upon by the participant.

To run a custom Python script, Port makes use of Pyodide (The Pyodide development team 2021). Pyodide is a Python distribution for the browser based on WebAssembly (WebAssembly 2021).

Running the custom Python script using Pyodide in the browser of a participant works as follows:

- The Python script starts and begins to run synchronously, until:
    1. The script reaches a Python class resembling a UI element that should be shown on screen, a React component (React 2022).
    2. The script yields and communicates with the app which UI should be rendered on screen.
    3. The participant interacts with the UI element.
    4. The outcome of the interaction is passed back to the Python script and can be handled accordingly.
- Steps 1 through 4 are repeated until the end of the Python script.

A Python script for a data donation study typically contains the following steps:

- The welcome screen for the data donation process is shown.
- The participant is asked to submit their DDP.
- The input is validated.
- The digital traces of interest to the researcher are extracted from the DDP.
- The extracted digital traces are placed in a table.
- The table is rendered on screen.
- The participant clicks on the 'Yes, donate' or 'No' button.
- The closing screen is shown.

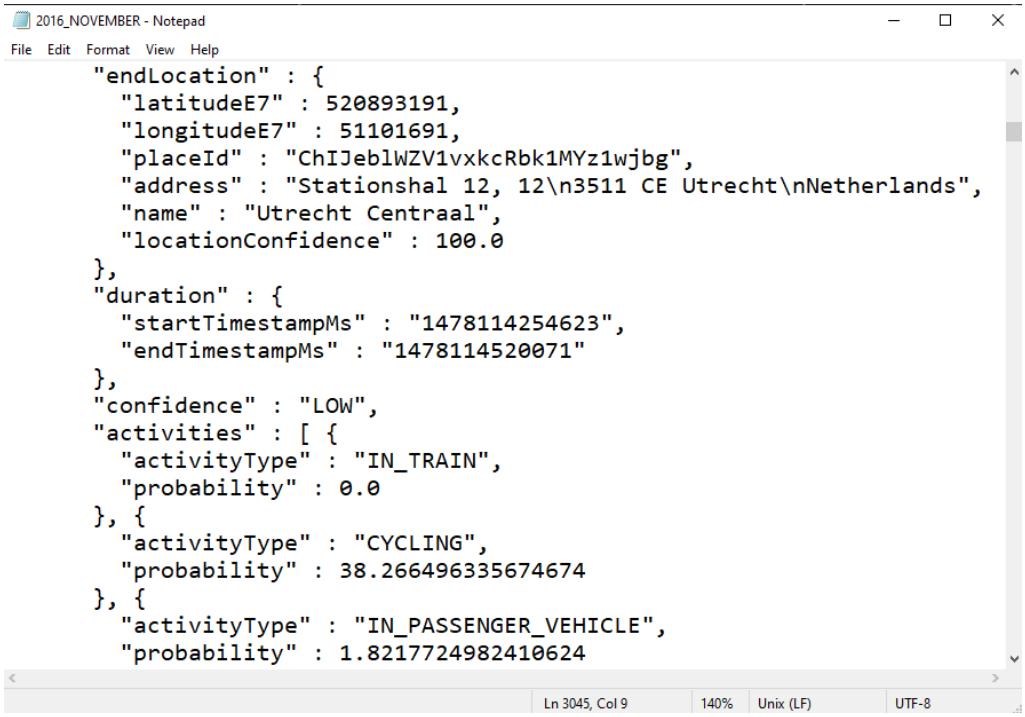
The benefit of having a Python script running inside the browser is that the researcher has familiar tools to design the extraction process in such a way that the privacy of the participants is preserved as much as possible. For this purpose, the researcher can make use of two important features. First, besides extracting digital traces from the DDP, it is also possible to further process these to better match the research question. Figure 2 shows an example of raw Google Semantic Location History (GSLH) data that is locally processed to only extract the duration and distance of the various activities tracked by GSLH per month.

Second, a local interaction between the participant and the DDP can be added as well, so that the participant can provide context to the data. Figure 3 shows an example using a DDP of a WhatsApp group chat. The Python scriptextracts the names of all people in the chat, which are then presented to the participant in a way that they can select their own name. This functionality can for example be used to identify the participant within their WhatsApp group in order to extract the messages that were written by the participant and discard all others in the group chat, or to count the number of messages to and from the participant. This functionality allows for the preservation of the privacy of other people in the group chat by asking feedback from the participant, since these people have not consented to the use of their data.

How are the extracted digital traces visualized?

After data extraction and potential further processing (as for example shown in Figure 2), the data is shown on screen for the participants to review, so that they can determine whether to donate the data. The data

A. Snippet of the Google Semantic Location History (GSLH) DDP



B. Locally processed to extract the distance travelled and duration per activity type

Cycling

Year	Month	Duration (hours)	Distance (km)
2016	11	5.32	91.49
	12	12.98	199.51
2017	1	8.60	121.26
	2	13.40	308.93
	3	12.43	198.12

Figure 2: A. shows an example of a location visit in the Google Semantic Location History (GSLH) Data Download Package (DDP). B. shows how this DDP[4] was processed into a frequency table presenting the distance and duration per activity type per month.

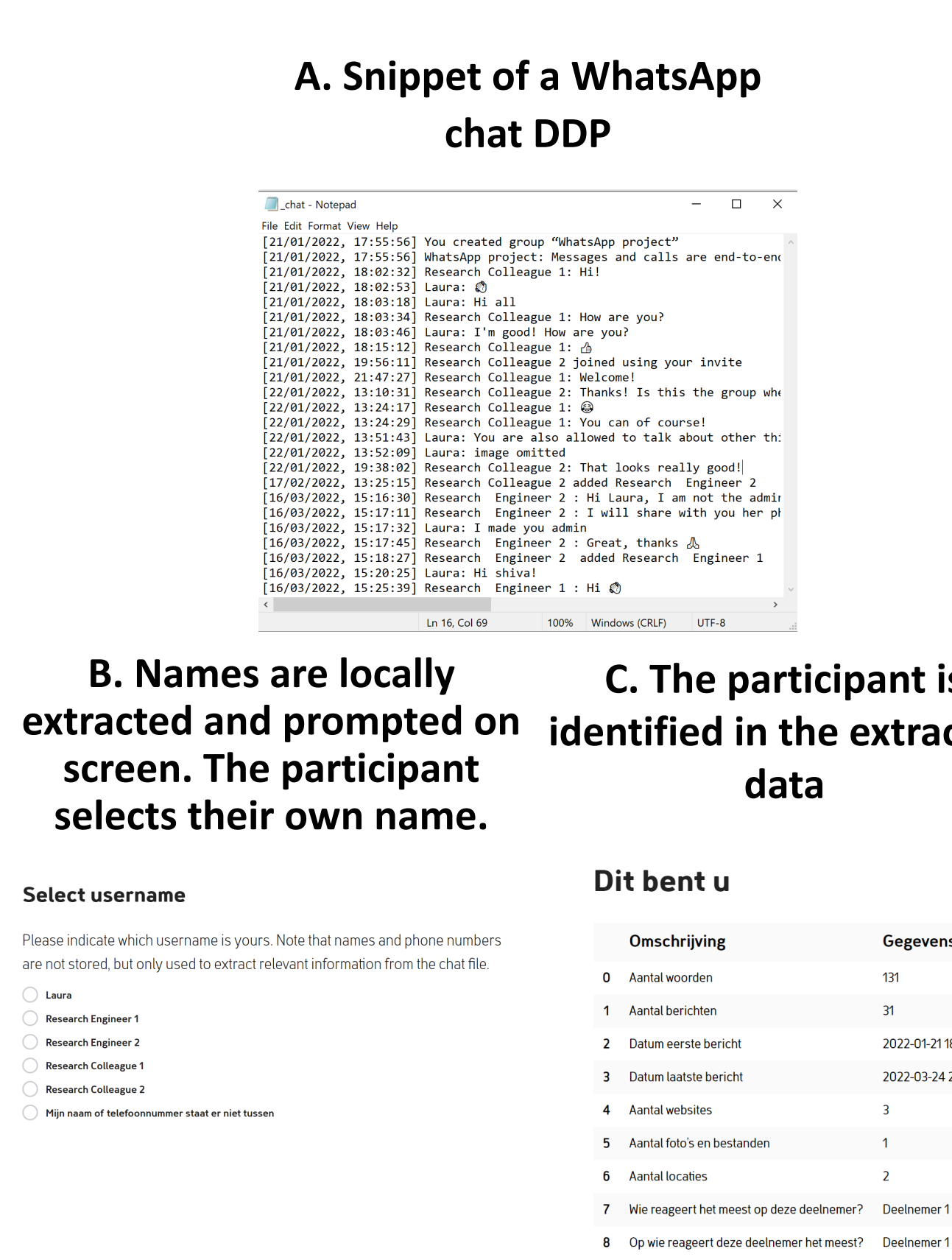
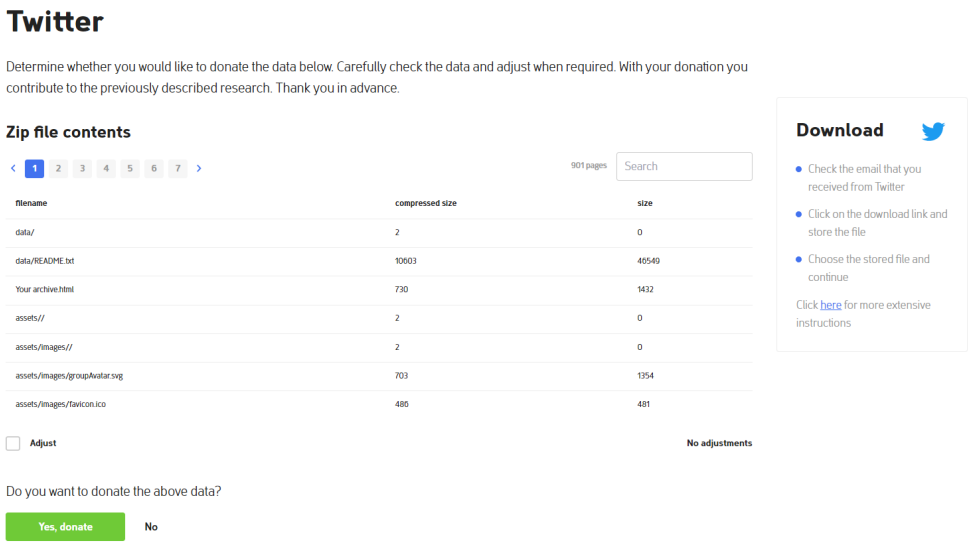


Figure 3: A. shows an example of a WhatsApp chat Data Download Package (DDP). B. shows how first only the usernames of the members in this chat were locally extracted. The participant can select their own username from this list. C. shows how this DDP was processed into a frequency table presenting among other things how often the members respond to each other's actions. Here, the participant is identified, the others receive anonymous labels. Note that the output is presented in Dutch

A. Data extracted from a Twitter DDP



B. Delete rows from the extracted data prior to donation

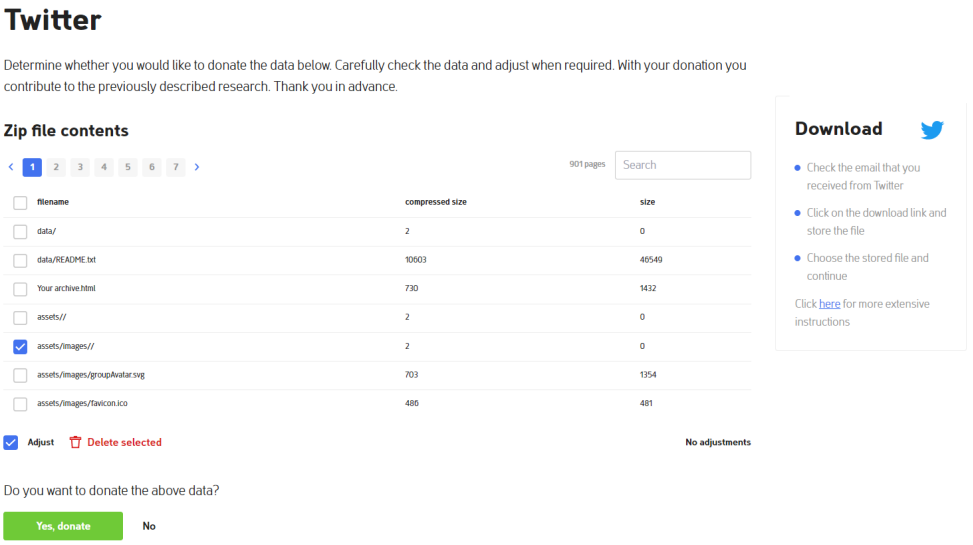


Figure 4: The left image shows an example of data that is extracted from a YouTube DDP, and is presented to a participant prior to providing consent. The participant can click on the 'adjust' button, after which rows can be selected for deletion (see right image).

is shown to provide participants insight into what they share exactly, in order for them to provide a truly informed consent when deciding to donate this data to the researcher. This visualization step also provides the participant with more autonomy over what is shared, as they can select specific data instances and delete them prior to donation (see Figure 4). Providing participants with this option is particularly interesting when working with sensitive data, such as text messages. Researchers that receive the donated data are informed by Port that data was deleted, but not which data was deleted. Custom user interface elements could be developed to allow for other types of interactions, such as labeling the data, or to present the data in other formats, such as in histograms, if suitable.

What is communicated to the participant?

Where a researcher invites participants for a data donation study, they may communicate their intentions to inform the individual participants. For example, researchers can generally inform participants in a more generic privacy policy about the purpose of the study or about the instructions on how to request and download the DDP of interest. Yet, to obtain unambiguous, specific and informed consent from individual participants, a researcher's consent form should indicate the specific purposes of the processing for which the use of a participant's personal data is intended. To communicate this information for a specific data donation study, all text that is prompted on screen can be adjusted. Currently, two languages (Dutch and English) are supported. There is room to link to external documents, which we have used in multiple studies to refer to the privacy policy and a document with data request and download instructions. Finally, Port collects paradata such as time stamps, information on clicks and navigation during the donation process. This paradata can be used to monitor if the information provided to the participants is clear or if there are problems with particular aspects.

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