An Empirical Investigation for Patterns of Belief Change in Human Reasoning - Student Full DMP

1. Project Details

PROJECT NAME - Replicate the title of your project, dissertation or thesis exactly as it appears in your proposal document.

An Empirical Investigation for Patterns of Belief Change in Human Reasoning

PERSONAL DETAILS - Indicate the name(s) and student number(s) of the student(s) who will be involved in this project, dissertation or thesis.

Mr. Clayton Kevin Baker. Student number: bkrcla003.

SUPERVISOR(S) DETAILS - Indicate who will supervise this project, dissertation or thesis. If you do not yet have a supervisor, leave this section blank.

Prof. Thomas Meyer

2. Project Summary

RESEARCH SUMMARY - Briefly summarise your study. Include the study's objectives, design, and methods.

Research aim:

I aim to provide empirical evidence in support of human reasoning being consistent with two forms of belief change in Artificial Intelligence (AI), namely belief revision and belief update. This research will extend previous work by Da Silva Neves et al. (2002) who investigated empirically patterns of non-monotonic inference in the context of defeasible reasoning.

Research questions:

- To what extent is human belief change consistent with the postulates of AGM belief revision?
- To what extent is human belief change consistent with the postulates of KM belief update?

Description of data collection:

This research involves conducting three surveys which require responses from human subjects. The surveys will be developed on Google Forms. Participants will be asked to read several statements and rank the degree to which the believe the information contained in it to be possible. They will indicate their beliefs on a Likert-scale (1= strongly disagree, …, 5 = strongly agree).

The first survey comprises 5 smaller surveys each of which presents 6 pairs of statements such as “To what degree do you judge that Paul is a butcher and Paul does eat meat?” and “To what degree do you judge that Paul is a butcher and Paul does *not* eat meat?”. These statements take on general assumptions of people and their behaviours in certain professions. This survey will be posed to 30 participants. We estimate that each small survey will take 20-30 minutes to complete. The outcome of this survey is to select the general statements which reasoners perceive as plausible.

The plausible reasoning rules selected from survey 1 will be used to derive the statements for survey 2 and survey 3, according to the logic of two forms of belief change in AI: AGM belief revision and KM belief update. We will ask 50 participants to take survey 2 and a further 50 participants to take survey 3. We estimate that it will take 60 minutes to complete survey 2 and that it will also take 60 minutes to complete survey 3.

All three surveys will be hosted on Amazon’s Mechanical Turk platform as Human Intelligence Tasks (HITs). We will recruit participants through Mechanical Turk and screen participants by specifying 1) participants must have a success rate of >= 98% for previously completed HITs on Turk and 2) the location of participants will be limited to the United States.

Chosen participants will be provided with a survey code which provides them with access to the survey on Google Forms. Each survey will include a consent form, description and the survey questions. Once the survey has been opened, participants will be asked to agree to the terms stipulated in the consent form. The body of the consent form will be included as the home page of the survey. A link to the digital consent form will also be provided on Mechanical Turk to give participants an indication of the nature of the survey and what their rights are. Participants will have the right to exit the survey at any point without consequence. The personal data required from each participant will be limited to their WorkerID (unique

Mechanical Turk identifier) to eliminate duplicate responses and to identify rogue participants. During the survey, participants will be authenticated through a captcha (“I-am-not-a-robot” test). Participants will be presented with questions in a random order. Upon completion, participants will receive a verification code which they need to enter on Mechanical Turk in order to receive remuneration.

3. Description of the Data

DATA REUSE DESCRIPTION - If you re-used data from third-party sources in your study, record pertinent details here such as the source of the data, the extent of the data, usage rights or restrictions pertaining to the data, and how it was incorporated into your study.

- I have not used existing data in my study (skip question)

Not applicable.

DATA DESCRIPTION - Describe the data you have gathered for your study. Briefly describe the nature, scope and scale of the data you have produced.

I intend to use surveys as the primary tool to collect data about human belief change patterns. For each survey, participants will be provided with sets of statements about the world. For each statement, participants must rank on the scale the degree to which the believe each statement. Once participants have given a quantitative measure of their belief, they must also choose an explanation for their belief, or provide their own. In total, there will be 3 surveys. The first survey is for evaluating general beliefs. The second survey is for evaluating beliefs of the AGM belief revision postulates, once instantiated by the plausible general beliefs. The third survey is for evaluating beliefs of the KM belief update postulates, once instantiated by the plausible general beliefs. 30 participants will be recruited for survey 1. 50 participants will be recruited for surveys 2 and 3.

4. Formats and Quality Control

QUALITY CONTROL - Describe what measures you took to ensure the data you collected were of high-quality.

Each survey will require participants to enter the Mechanical Turk WorkerID. I will use this to screen responses for duplicates, identify rogue participants and verify the identity of each participant as a true Worker on Mechanical Turk. The survey on Google Forms will have required sections for pertinent sections. I will include a captcha test for participant authentication. Surveys will be divided into sections, with each section listed as a task on Mechanical Turk which can be completed independently. I will do this to reduce participant fatigue.

FILE FORMATS - Indicate the formats in which your data will be collected and processed. Clarify whether these formats require specialised proprietary software to access or if they will be produced in or converted to more open, accessible formats for long-term accessibility and preservation. In the case of physical data objects (such as artworks or models) indicate whether these will be digitised or otherwise preserved for accessibility.

.xls / .xlxs / .csv (I intend to use the Microsoft Excel software and NVivo for processing my collected data)

5. Data Management, Documentation and Curation

CURATION (MANAGING AND STORING) DATA - Describe how you organise and manage your data. Specify any file-naming conventions or community data standards you have adopted.

Data will be stored on the researcher's laptop in a folder labelled "Data collection". Within this folder there will be three subfolders for each of the three surveys "Survey 1", "Survey 2", "Survey 3". For each survey, the original data will be stored. For each survey, the cleaned and final data will be stored. In addition, for each survey, I will also produce a codebook in which I will clean and refine my collected data.

BACKUP AND STORAGE - Describe how your data is being stored and backed-up. If you are using a data service provider, provide details on for how long they will retain the data.

Data is stored on a folder on the researcher's laptop. The folder syncs and backs up to the researcher's personal Google Drive cloud storage service. Deleted files on Google Drive will be kept for 30 days after deletion.

METADATA STANDARDS AND DATA DOCUMENTATION - Articulate what metadata and documentation you have produced about the data you have generated, collected or re-used.

I intend to publish our raw collected data for this project in a repository on Github, once stripped of personal identification information. The repository has a README.txt file to account for the collection of files and file types in the repository. Part of the repository will include planning documents used for setting up the survey as a Human Intelligence Task (HIT) on Mechanical Turk and the parameters chosen to recruit participants.

6. Data Security and Confidentiality of Potentially Disclosive Information

SECURITY - Indicate to what extent your data can be considered sensitive or at-risk. Describe how you will control access to your data. Indicate whether you anticipate a need for encryption or password-controlled access, and if so, how you will enforce that access.

The data collected is considered low risk, as no personal information will be revealed about any participants. Participants' Mechanical Turk WorkerID is the only personal information that I will collect. The original data will be stored on the researcher's laptop, which is password protected. The backup service used for the raw data is controlled by a gmail account with a username and password. On Github, I will publish freely our final data, once stripped of identifiers.

ETHICS AND PRIVACY - Describe, as per your Ethics Clearance form or other similar documentation, any ethical or privacy issues that your data are subject to (if any). Summarise the main risks to the confidentiality and security of information related to human participants, the level of risk, and how this risk will be managed. If your project did not require ethical clearance, you may ignore this section.

The ethical issues in my research pertain to the fair compensation of participants in my survey. My supervisor, the Faculty of Science Research Ethics Committee and I have agreed on the amount $7.5 per hour or R120 per hour ($1 = R16). Best practice has been followed in terms of survey length and criteria for recruiting participants on Mechanical Turk.

7. Data Sharing and Open Access

USE OF EXISTING DATASETS

- I have not used existing data in my study

Not applicable.

DATA OWNERSHIP - If you have used existing datasets, note down any restrictions the data providers have indicated regarding data sharing. Otherwise, leave blank.

Not applicable.

DATA LICENCE - Indicate under which licence you intend to share your research data. If you are not sharing your data, provide the appropriate justification as per the UCT Research Data Management guidelines.

- CC BY

I will share the properly de-identified data from my study under a CC BY licence.

DATA PUBLICATION - Indicate where you intend to publish your research data at the end of your project.

I will share my de-identified quantitative and qualitative data on Github at the end of my project.

8. Relevant Institutional or Study Policies

Indicate the relevant departmental, unit, or institutional policies that influence your data management activities.

The following policies apply:

- UCT Open Access Policy
- UCT Intellectual Property Policy
- UCT Research Data Management Policy