Task 5 (study not a thesis)

When a study necessitates volunteers, all necessary steps must be followed to ensure that the data given by the study is regarded as valid. Participants should be picked based on the study's needs; for example, if a study is being run on software that is specifically advantageous to dentists, all of the study's participants must be dentists, as only they can provide valid input. In a study like the one described above, it's also necessary to figure out the interests of the different participants as if a participant is reluctant to use technology as the data they would provide would be biased. Expertise is important when sampling the community because study participants should have a skill set similar to the target population. When sampling the community, expertise is vital because study participants should have a skill set similar to that of the target population. Expertise is frequently divided into two types: experts in their disciplines and those who are domain experts who understand the systems and tools utilised in their careers. In the previously mentioned study, if the software is a new form of software that the target population (the whole number of individuals in the target group, i.e. all dentists) has never used before, it would be ideal if the study participants were advanced computer users who were novices in the domain. If a study is undertaken when the target market and participants in the study have different levels of knowledge, the study's conclusions will be inaccurate and difficult to comprehend.

A study was conducted in 2010 on the differences between e-Learning, online learning and distance learning environments (Moore). Participants for this study were approached to engage in a discussion regarding the topic. The researchers did state in their study that ‘a small incentive was used so that there would be more willing participants prepared to discuss the topic with the researchers. Unfortunately, the researchers did not specify the incentive; ideally, this information would have been provided so that readers could understand what kind of incentive the participants received. Those who appeared to be interested in the initial discussion were asked to complete a survey in which they could express their opinions on the subject. This is done by the researcher to guarantee that all of the study participants are interested in the topic at hand and are not being coerced to do so. The survey would take participants about 10 minutes to complete, which is reasonable because it isn't too long; otherwise, it would be difficult to find willing volunteers. The participants in the study came from a total of twelve different countries. This is a great research topic for determining how different cultures understand these terminologies and the various connotations they have in various countries. Given the vast nature of the topic, it is desirable that the researchers have a sample population from different countries. The participants were first asked if they had any prior experience with distance, online, or e-Learning. Fifty-six percent of the participants said they had participated in all of the different types of learning. While the remainder stated that they had engaged in at least one sort of learning. It was taken as criteria that all the participants had experience with at least one of the technologies. This type of data demonstrates that the information provided by these participants is reliable since it comes from individuals who have previously experienced this type of learning and can distinguish between other different types of learning. Sampling Design was taken into consideration in this study as 51% of the participants were students and 49% were instructors. It is important to take into consideration that the sample you are designing is relative to the study being researched. In this study, they focused on the two core groups that make use of such technology while making sure they had experience using at least one of the technologies.

Ethics (My thesis)

All required checks were completed prior to the study to verify that the technology being utilised would not infringe on anyone's rights or have the potential to harm the general public. Because the dissertation is concerned with face recognition, it's worth noting that before the dissertation began there was a news article about how the Chinese government used facial recognition to identify Muslim settlers in China who were later detained (https://www.nytimes.com/2019/04/14/technology/china-surveillance-artificial-intelligence-racial-profiling.html). This was an ethical question to consider before beginning the study. It was taken into account and mitigated by choosing a dataset with individuals of various ethnicities and races.

It was ensured at the outset of the study that the dataset selected was adequately balanced between different groups of people based on gender, ethnicity, and race. To stay true to the dissertation's title, the dataset had to be made up of images acquired in the wild, which means they weren't taken under perfect conditions or under any specific settings. There are various datasets with such photos that have been licensed to researchers so that they can test them, some of which are private and others are public. After reviewing what previous researchers had done, the faces in the wild dataset was chosen because it is publicly available and any results obtained using it could be easily replicated. The dataset was published to help researchers achieve breakthroughs in facial verification, and should not be used to verify commercial algorithms before deployment, according to the terms of use on the faces in wild website. It is ethical for the dissertation to use this dataset because research is being conducted.

When collecting data from models, it is ethical to save all of the data offered by the models so that readers may better comprehend the outcomes. This could also be a safeguard because if the data is tampered with, experts in the field will detect that the data is incorrect and that it was either edited or that there was a mistake in the implementation or otherwise. The models and the distorted images in the dataset were saved after each test was completed so that the dissertation results could easily be repeated. Another possibility to make sure the data was not tempered is to implement Blockchain technology where the data is written in a ledger that is not editable.

When analysing the study's data, it's critical to try to mitigate any bias that may occur. It's also critical that the results are explained fairly and not skewed in any manner to give the idea that the study was a success. When writing the analysis, it's also crucial to keep in mind the study's scope and avoid using absolute terms. It should be noted that the number of datasets chosen for this study is minimal, hence the results cannot be considered absolute.

The results will be reported in a scientific way so that the communication is reliable and credible. The thesis will be as transparent as possible so that researchers can easily recreate the results. That is the main reason for choosing this dataset as it was recommended in other research to use an open/free to use dataset so that results from the algorithm can easily be edited.

**Task 6**

**Experimental protocol design**

The experimental protocol design is a plan on what is required for an experiment to be carried out in research. The initial step for the researcher is to have a clear idea of the reasons behind conducting the research being considered. Often times researchers conduct research to answer research questions or hypotheses. The next step in the plan is to consider if the materials/resources required to conduct the research can be acquired. Often researchers will create a checklist of items required for the study and make sure all of the items can be acquired. The third step in the plan is to consider how and what is going to be performed during the experiment. For instance, if you are carrying out a study with participants there are different approaches researchers might take such as the between-group design or within-group design, in this step researchers need to choose which approach fits their type of research best. There are other elements researchers need to consider such as the number of experimental groups, the environment the experiments will be held in and if they will control any of the variables in the environment and how to effectively measure the results produces by the research. In the fourth step of the plan, it is important to identify the dependent and independent variables and how these will be altered throughout the research. The plan's final stage is to assess what researchers want to do with the research data acquired and how that data will be exhibited for easy comprehension by readers. In my dissertation all of the steps in the plan were taken into consideration, first, the scope of the research was defined which was to increase the accuracy of CNN models in images that have been distorted. Next research was conducted on finding datasets that are available to use that are public, after reading some research it was clear that a particular dataset is used when attempting to research the topic I was considering, therefore, I chose that dataset which is free to use and publicly accessible. I also made sure that the models I was thinking of using were available. In the third step of the plan, I identified how the testing will be carried out the models will first be tested with no distortions on the training dataset and would then be tested with distortions on the dataset. Next, I identified the dependent and independent variables in my dissertation the dependent variables being the accuracy of the models while the independent variables were the distortions used on the images. The results of my research will be displayed on charts and underneath the charts, there will be an explanation of the results and what is implied by such results. This is done so readers can easily understand the results achieved and make their own conclusions about them.

**Dependent and Independent Variables**

In studies that conduct quantitative research, it is critical to comprehend variables; distinctions between different types of variables must be made. A variable is an attribute or property of an object that can be measured or observed and varies throughout the research. Independent variables cause influence or impact the desired outcome, while the independent factors influence dependent variables; they are the outputs or results of the independent variables (W.Creswell, 2009). In the desertation, the CNN’s accuracy is the primary dependent variable, and the different types of distortions employed to explore the influence on the dependent variable are the independent variables.

**External validity of an experiment & Sampling types**

External validity refers to the degree to which a study's findings may be applied to other situations or populations. A good sample is essential to produce good results in terms of external validity. A good sample should be representative of the total population and provide each member of the subset being studied an equal chance of being chosen. If this is accomplished, the sample will be considered unbiased. There are two types of biased samples: convenience samples, in which a researcher only includes those who are most convenient to him in in the sample, and voluntary biased samples, in which people are allowed to join the sample. In voluntary biased samples, problems can arise because if there is a group of people who are interested in the subject being researched, the results will be biased to their point of view. The basic random sampling method, the multi-stage sample method, and the stratified random sampling method are three approaches for attempting to obtain a good unbiased sample. Simple random sampling is a type of probability sampling in which a researcher selects a subset of participants from a population at random, with each member of the population having an equal chance of being chosen. The population is separated into clusters in the multi-stage sample, and then a subset of the clusters is chosen at the first stage. Next, those selected clusters are divided into smaller clusters at each successive level, and the procedure is repeated until the final phase is reached. In stratified random sampling, the population is dived into strata which refers to the similarity between the subsets in the population from each stratum a simple random sample is taken. In my dissertation to try to make the prototype as universal as possible the images that were in the dataset were images taken at random (in the wild i.e under different conditions) so if the prototype was used in a different application it could be easily implemented to all type of images. The individuals chosen in the dataset were also from different ethnicities and races to make the prototype models as universal as possible and not focus on a particular group of people.

**Coding**

Coding assists researchers by systematically categorising unstructured information into smaller sections. Researchers can use coding to uncover patterns and common themes in the data they've analysed as described in the book coding manual for qualitative research by Johnny Saldana. It can also help researchers evaluate their own biases and discover a certain section of their research quickly because it is organised methodically and systematically. Coding is primarily employed throughout the research analysis and report writing phases of research. Codes are labels that are allocated to specific areas of text from qualitative data labels that can be applied to entire paragraphs, sentences, or even a single word. The researchers utilised open coding and axial coding, which are two different techniques of coding, in a study conducted in 2010 on the differences between e-Learning, online learning, and distance learning environments (Moore). They discovered six themes after analysing data from an in-depth survey using their coding strategy: No Difference, Difference, Hierarchical Relationship, Access, Interaction, Media Type, and Correspondence.

**Research triangulation**

Triangulation can be used in both qualitative and quantitative research it aims to improve a research topic's credibility (how trustworthy the research is) and validity (how accurately the study reports and assesses the data being produced). Triangulation is a strategy for reducing fundamental biases in a research study by combining theories, methods, and observers. Convergence, complementarity, and divergence are the three types of triangulation that can be used to analyse datasets separately. Convergence occurs when it is assumed that two datasets are evaluating the same hypothesis and will provide similar or identical knowledge about it. A quantitative survey, for example, can be used to validate qualitative interviews. When you have complementary triangulation, you have distinct data from multiple datasets that complement each other. The data from the datasets does not have to be similar, but when utilised together, they should support the claims being made by the researcher. Divergence is another type of triangulation it aims to mitigate mistakes taken when gathering data and to find inconsistencies with the data collected. In my study triangulation was attempted by analysing the data from various different studies and finding consistency in the data. I also checked the different conclusions made by researchers and checked if they were backed up by other researchers.

Task 7

In a study conducted by Aghdam et al (2019), it was discovered that fine-tuning the dataset using the VGGFace 2 Datasets improved the model's accuracy in photographs obtained under mismatched conditions compared to off-the-shelf models. I agree with the findings of this study because it used a decent sample size of 130 people and divided photos from the probe (test) to the gallery images (Train). To ensure fair testing, all of the off-the-shelf models were trained on the same dataset. The results for each model were all written down, making it simple for researchers to compare them. Also since the study used a public dataset the images can be seen to fit the main focus of this research which is images taken under mismatched conditions.

In 2016, researchers investigated how blur, noise, and occlusion affect CNN model accuracy (Karahan et al). The results highlight the effects of these factors on models using graphs that indicate the model's accuracy as a function of an increase in a certain number, such as the degree of noise blur on the photos. I am confident in these findings because the researchers demonstrated the input that they are feeding the models in order to calculate the models' accuracy rates. They also demonstrated how the rise in visual distortions has an impact on the accuracy of the models. The testing was similarly considerable, with over 4249 faces in the training dataset and 3143 faces in the test dataset, ensuring that no photos in the datasets were duplicated.

In the same study by Karahan, it is indicated in the conclusion that adding deterioration to the testing images makes the models more resistant and allows them to obtain higher accuracy on degraded images. I agree with this assertion since when Aghdem et al. attempted it in 2019, they discovered that fine-tuned models with degraded photos helped to obtain higher model accuracy. Adding distortions to both the training and test images appears to considerably enhance accuracy rates for pre-trained models, according to preliminary testing conducted in my dissertation.

Ghaleb et al (2018) tested model accuracy in CCTV footage after utilizing feature extraction with pre-trained models and score normalization to get an accuracy rate of 86 percent. The researchers go into great depth about how feature extraction and face alignment were done, as well as providing graphics to help readers visualize it. In the study, several photographs from the dataset were exhibited. The images were acquired from CCTV cameras that were utilised to test with. Some training images which were taken under ideal conditions were also shown in the study.

In the same study, I didn’t agree with the number of subjects chosen in this study due to the size of the dataset tested. Whereas some research employed hundreds or even thousands of images, this study used only 90 different subjects. Because the dataset isn't identified by name and hasn't been made public, determining the type of photographs utilised in this study would be difficult. Although some photos from the collection are displayed, it would be ideal if all of the images could be viewed.

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