

Unit 13 – Computer Research Project

Aritifical Intelligence within the Automotive Industry

Matthew Crosby | 10170652

Contents

[Introduction 2](#_Toc8654381)

[What is AI? 2](#_Toc8654382)

[Where has AI been used outside of the automotive industry? 3](#_Toc8654383)

[Where has AI been used within the automotive industry? 3](#_Toc8654384)

[How AI has affected us and how it will affect us in the future? 4](#_Toc8654385)

[What challenges are there for manufacturers when making a vehicle with AI? 5](#_Toc8654386)

[Research Design and Research Methodology 6](#_Toc8654387)

[Philosophical and Theoretical Framework 7](#_Toc8654388)

[Research Methods I Chose 7](#_Toc8654389)

[Different Analytic Tools 7](#_Toc8654390)

[My Primary Research 7](#_Toc8654391)

[Reflecting on the effectiveness of research methods applied to my project 7](#_Toc8654392)

[Conclusion 7](#_Toc8654393)

[Bibliography 7](#_Toc8654394)

[References 7](#_Toc8654395)

# Introduction

(Aim, objectives, what the report is about, ethics report, supporting documentation)

# What is AI?

Artificial Intelligence is a type of upcoming technology. It has been used in the past but is now becoming more and more common as a role in our daily lives, changing the way we perceive the world and perform tasks. An AI such as Amazons Alexa can perform jobs which we can do making our lives easier such as turning lights on and off if they are Bluetooth/Wi-Fi, or even being able to shop for you, all as you would have to do is tell Alexa what you want and then the AI would purchase it and use the preferred delivery address and payment method.

Another way AI is going to take over our lives is self-driving cars. These cars do exist but are not widely used just yet. On a Forbes article about AI in cars it explains about driverless cars, one thing it states is that driverless cars have been in a thought process for decades but only recently is being put into practice due to AI being more widely available and advanced. It states that cars should eventually be able to identify how other cars behave, the weather conditions, any road issues on the journey as well as many other factors that may contribute to the journey. This means that the AI will need to be able to understand human behaviour when driver, such as how they will act as with human drivers everyone has a different skill level so some people may make more mistakes when driving, this is one factor the AI will need to understand. The article also states that cars have many assisted features to reduce human error, such as a new Nissan car, in their advertisement which I saw on TV it demonstrated someone walking in front of the car and then the car analysing this and breaking.

Another article on McKinsey also states about driverless cars as this is a big upcoming deal currently and will be more common around 2030. Another thing this article states is that AI won’t just affect how the vehicles will act and perform but also how they get built as sensors and devices will be connected to the Internet of Things. In 2016 Ai start us raised around $6 billion to fund them. With more time passing AI is getting more and more powerful as computer hardware is getting faster and able to perform more complex tasks. This article also proves that AI can be better than humans in certain ways as they are faster at doing thinking processes. If we think of all the information going through our brains as data to relate to the data that goes through an AI, we usually go through different ‘data’ before reaching the right process whilst an AI can calculate different routes, find the best one and be remembering what you have previously done to try and find a pattern to predict what will happen next. AI, such as Deep Blue, Watson and AlphaGo, has beat humans in different games such as chess, Jeopardy and Go.

The difference between these articles is that one states more about self-driving in automotive and the other states how AI will learn to do it.

# Where has AI been used outside of the automotive industry?

AI has many different uses in almost everything, whether that technology/concept exists today. An example of this is AI such as Deep Blue and Waston which I have listed above. Around 30 years ago people didn’t think it was possible to create Artificial Intelligence that could outperform people at tasks such as games. Now we are using what we have gathered from that to create more powerful AI technology to be able to perform even more advanced tasks and as these concepts become reality more concepts will emerge and overtime from the research gathered previously, we will make them reality. This allows us to be able to expand on the concept of AI and since it is so varied in what we can now do with AI each area of AI such as personal assistants or within driving is considered a completely different type of AI. Some other examples of where AI has been used include in the medical industry, these are Google’s DeepMind technology that has been programmed to detect more than 50 types of eye diseases, it does this by analysing 3D retinal scans to be able to give an accurate diagnosis of any conditions a patient may have. Another way AI affects us now is having the ability to give a precise amount of medicine to a patient based on their characteristics.

# Where has AI been used within the automotive industry?

AI has been used in many fields within the automotive industry from many different companies around the world. Most companies if not all when making a vehicle within AI have an important goal of safety alongside their main goal of adding their chosen type of AI to vehicles. All these vehicles will have different types of AI that will perform a different job. One of these jobs, and one of the most common uses for AI in the automotive industry include driver assist which puts the AI in a co pilot position, this allows manufacturers to get comfortable with AI being in a vehicle before it can drive on its own. This AI in a co pilot position monitors many sensors allowing for the AI detect dangerous situations that could occur and then alert the driver to avoid this or take control of the vehicle to avoid an accident. Another example is emergency breaking, if the car detects a hazard it can break with a faster reaction time than people. Another way which AI is being used within the automotive industry is driverless cars which at the current point in time is the most talked about AI within this field. Driverless cars need to have the ability to control the vehicles steering, braking and acceleration with the ability to judge how much do to these tasks.

The reason these driverless cars haven’t started to pop up till now is because they needed a brain to be able to perceive its surroundings. A driverless car would need to be powered by an incredibly powerful computer as it doesn’t just need to follow a set of rules and a form of algorithm but instead it will need to learn from experience. Google has also created a concept for a use of AI within cars, their concept being a driverless public transport service such as driverless taxis, and whilst this concept exists and is currently performing test drives it isn’t widely available yet due to some limits we have. This AI is called Waymo and gathers information from the vehicles lidar, radar, GPS, cameras and cloud services to be able to control the vehicle efficiently and correctly in situations. This technology can also predict what an object is going to do before it happens in order to prevent an incident, if a pedestrian is walking down the Waymo knows that they might step out in front of the car, according to Google. As well as this Google states that Waymo can anticipate that a car that has stalled whilst turning into a lane will start to move again. Tesla have also done something like this butt instead of public transport they are creating personal cars. Tesla cars use a GPS, eight cameras, ultrasonic sensors, sonar and a forward-facing radar to gather data about the car’s surroundings allowing for the car to correctly brake, accelerate and turn. Tesla has a piece of software called Autopilot which is powered by Nvidia which can look at your calendar and drive you to a meeting at a specific time. Every Tesla car comes equipped with the ability to be driverless but for this to be used it needs approval which will allow for the company to enable to software.

# How AI has affected us and how it will affect us in the future?

AI in medicine started around 60 years ago in the 1960s with the intention to automate diagnosis on patients, but back then the AI did not explain how it came to its conclusion so was not widely accepted in the medical community as ‘one of the initial observations was that doctors could not trust AI systems’ (rowanalytics.com 1/2/2019) Back in 1970 Clinical Decision Support Systems or CDSS were used and are software which has been developed to enable doctors to make decisions. They allowed for advice based on patient’s records. An early CDSS was MYCIN which focused on managing diseases within patients, this meant that it focused more on the management of the infected rather than the diagnostic of patients. Another type of AI was QMR which used a customized algorithm which was ‘modelled on the clinical reasoning of one single University of Pittsburgh internist’ (researchgate.net 1/2/2019) so initially it was called INTERNIST-I. This AI would use a large database of categorized diseases but QRM was unable to make a full determined diagnostic, instead it provided advice until a full diagnostic was made.

AI in the past 50 years has increased dramatically, things of science fiction back then included what we have today, an example of a common AI system are personal assistants. Another way AI will affect our future is by having complex AIs that will be able to perform round the clock surgery on patients without the need of humans. AI could also be used to diagnose patients and correctly treat them on the spot without the need of waiting and going to different consultants. With the ability of AI being able to spot trends, AI could eventually be able to predict diseases and cure them before the disease fully happens, an example is a simple cold, you only start getting the effects after the cold virus has multiplied enough but if an AI could detect the cold virus before this happened and isolate or destroy it before it multiplies itself them a cold will be cured before its really eve started. Another field AI will be good at is discovering new drugs quicker. How people do this is by breaking down different substances to see their makeup of compounds and then test to see how they respond to different diseases, now with an AI, it could do this task a lot faster and find new cures quicker.

# What challenges are there for manufacturers when making a vehicle with AI?

When drivers are on the road, they may face many decisions and may have to handle different scenarios. This comes down to reaction time and other factors such as the ability to predict outcomes. A driverless car would have to be able to replicate all these human behaviours and as well as this would also have to try and do them better if the goal of a company is to prevent accidents. One of the most important and hardest challenges a manufacturer will have to overcome is judgement, sometimes a driver will have to decide instantly when faced with a hazard, this could be someone walking out in the road. With a driverless car it can be simple to program it to break if something walks out itinerant of the sensors, but the car will also have to calculate the likelihood that it will be hit by cars from behind or the likelihood of causing a pileup. Another problem is ethical where a vehicle won’t be able to choose between an elderly person and a child if there is no other outcome, this could cause the car to not steer at all and hit both as it cannot decide on which to save. This is one of the biggest concerns with driverless cars. The AI within a driverless car will need a lot of trial and error to learn from itself but situations such as this do not happen often so if one does happen the car won’t have had a lot/any experience with this.

Another problem that driverless cars will have to overcome is snowy environments, that either being traveling somewhere where it is snowy or is snowing in your hometown. Snow is extremely unpredictable and can cause a car to slide at any moment, this means the car will have to detect its entire surroundings and try and correct the skid, if the car veers of the road then the car will need to manoeuvre in the safest way back onto the road. That leads to another obstacle however, snow can cover the roads so a driverless car will not be able detect where the roads are as high snow can make roads blend in with paths.

Another issue is the legal side of driverless cars, an example would be if two driverless cars crash, who would take the blame in a scenario like this. The aim of driverless cars is to prevent these crashes at all but even the manufacturers state this as a grey area as they don’t exactly know whose fault it will be, the persons or the manufacturers.

Finally, one of the biggest problems is cost, driverless cars will use advanced technology that will need to be powerful enough to support all the actions the car has to do, this means that the cost of each component required to perform these tasks will be very expensive. As well as this the price to be able to research and develop driverless cars will be very expensive. When these cars have been developed and can be used on the road there is no guarantee that people will purchase these cars due to the uncertainty of what may happen.

# Research Design and Research Methodology

A research design is a plan in which will be used to answer the main research question. A research method is a strategy that is used to carry out the research design, in my case I have used questionnaires/surveys. Research design and research methods are closely related as a good research design will help to ensure that the data I obtain from my method will answer my research question as efficiently as possible.

Which research method you should use depends on the overall question itself, the goal you want to achieve and who the group of people involved are. When deciding which method to pick you want to take in one of the main factors, that being the time it takes to gather the data needed. There are two types of research methods, these being quantitative and qualitative, quantitative is a method which is used to gather information quickly. Examples of quantitative research methods include surveys with questions such as on a scale of 1-10, observations such as how often a word is used or how often a bird type visits the area and finally secondary data which is information that has already been gathered but is being used to help aid the research question. Qualitative methods are methods that do not involve numbers or any type of numerical data, instead they aim at gathering richer information at the cost of time. There are some downsides however of choosing a qualitative solution as false information may be provided rendering the overall answer to the research question incorrect, as well as this ethics could be an issue so the questions must cause no harm to subjects involved in the research process. Examples of qualitative methods include interviews where people are questioned in person, this face to face contact helps to promote richer and truthful information. A method like this is focus groups where multiple people can share their opinions to each other, this can help to gain information based of the responses of others. Secondary research can also be involved in qualitative by using reports or written accounts of a given research topic.

There are many other types of research methods as well such as experiments, the analysis of secondary data, questions gathered from presentations and different types of surveys.

For my research question I chose to use questionnaires and surveys as my primary research, this involved me making a google forms document with a series of questions to gather both qualitative and quantitative data about artificial intelligence within vehicles. From this I got varied responses that I shall explain later. Along side this I also did my secondary research which I used the internet to read through various articles and reports related to my question, this helped me to further answer my question and be able to justify it.

# Philosophical and Theoretical Framework

# Different Analytic Tools

When we are handed a set of data one of the first thing that comes to mind is to try a find any patterns and connections. This is looking at the data to try and find meaning within it. Within research, when the data is collected the next step is to get insights from the data set. By analysing data, we can go from a mass of data to insights which are meaningful to the researcher.

When analysing Quantitative Data, the first step is to prepare the data, this involves converting raw data into useful insights as stated above. There are multiple steps to doing this, the first being validating the data, the purpose of this is to find out whether the data was collected via set standards and without bias, for example if it was a questionnaire about a popular video game, you couldn’t just ask people who play that game. Within this step there are four stages, these include fraud to see whether each person was interviewed, if the data collection method is an interview. Screening to check whether people were chosen based on the criteria of the research question. Procedure which is checking whether the data collected followed the data collection procedure. Finally, completeness which is where the interviewer asks everyone the exact same questions to ensure that all data gained can be compared to each other.

The next step when analysing quantitative data is to edit the data. Large sets of data will more than likely contain errors, these include incorrect answers to questions such as irrelevant answers and black answers where the respondent may have skipped the question. The researcher should check tis data and then edit it to minimise the chance of harming the accuracy of the results.

The third step is data coding. Data coding is one of the most important steps when preparing data, this is where responses are grouped and assigned values. An example is with ages, if the researcher wants to find out the amount of people within a certain age group they could group responses together into categories such as 11-15 or 16-20, then when analysing the data the researcher will only have to deal with this simplified group of data.

Now that the preparation is done analysis can take place. Within analysis of quantitative data there are two steps which are mainly used, these include: descriptive statistics and inferential statistics. Descriptive statistics is the first level of analysis where it helps the researcher to summarise the data and find patterns within the data. There are several descriptive statistics, these include the average numerical value within a set of values, otherwise known as the mean, the midpoint of the values, known as the median, the most common occurring value, known as the mode, and the range which is the highest and lowest values.

Descriptive statistics provide numbers and do not give any reasoning so are most useful when the research is limited to a sample and does not need to be explained. An example stated in an article by socialcops.com shows that comparing the percentage of children vaccinated within two villages.

The other method is inferential statistics where researchers will collect a set of data based on their population, from here the data is generalized to the entire population/group. This method is used to make predictions about a larger population. This method shows the relationship between different variables rather than just one variable. A few examples of infernal statistics include correlation, this is where two variables are described and if a correlation is found that that means there is a relationship between them, an example is peoples height and weight, both of these correlate to each other. Another example of infernal statistics include regression which shows the relationship between two variables, for example it could allow for us to guess someone’s weight based on their height. Finally, analysis of variance which is used to test how much two or more groups differ within an experiment, an example is being able to understand the relationship between the number of children and the social-economic status. A researcher could ask questions to the families.

Now for qualitative, which is made up of words, to be able to analyse this data first the researcher will need to get familiar with the data so they would need to read through it to understand it and from here spot patterns. From here the researcher can develop a framework based off the research objectives to be able to index the data into groups, like the age example above. Finally, patterns can be carefully analysed to find areas that need more exploration.

There are several methods of analysing data for qualitative data, these include content analysis which is the most common methods, this is where most used-on questionnaires and other forms of text. Another method is narrative analysis which is like content analysis but is mainly used when the source of data comes from interviews or focus grounds, it focuses on using stories people have shared to answer the overall research question. Another method is discouraging analysis which is used to also analyse interactions with people. This method however focuses on analysing the social context with communication between the researcher and the respondent.

Now for analytic tools, these tools help do the steps above and are used by well known companies such as HSBC and Google who both use a tool called SAS, the only problem with this tool however is that it is very pricey and deters many small to medium companies as they cannot afford it. This has opened the opportunity for many open source tools to be released which these smaller companies can use. Some of the most popular open source analysis’s tools include: R, which is the most popular analytics tool surpassing SAS in the amount of people that use it, this tool is an easy choice for companies that cannot afford SAS and over the years R has become a lot more robust and can handle larger sets of data better than it has ever been able to before. In 2015 and 2016 1800 packages were introduced in R and now R has over 8000 packages which increase the capabilities the tool has. Another tool is a popular option with programmers, this is Python, this is because it is easy to learn and fast, and with the addition of library’s like numpy and scipy it has become a powerful analytics tool offering comprehensive coverage of statistical and mathematical functions.

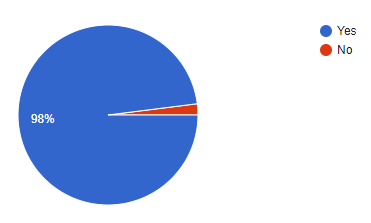
Now for bigger businesses there are commercially available tools, an example is SAS which is widely used and is a robust, versatile and easy to learn tool, plus over the years has added a lot of new modules to it. Another commercially available tool is Tableau which is an effective tool for slicing data into visualisations making it easier to understand and present, as well as this Tableau can handle large amounts of data, a lot more when compared to Excel. Excel is the most used analytics tool in the world and is used by most people so using this tool as an option can be a suitable choice for most businesses. Companies that use SAS for example include HSBC, Google, Netflix and Genpact and Tableau is used by Barclays, Dell, HP and Citibank. For the open source tools R is used by companies such as Google, Facebook and Citibank whilst python is used by Alibaba, Google, TCS and Genepact.

An analytics tool I used when conducting my primary research was Google Docs, this helped me to group up all of my answers so I could understand it easier and also view each individual response. As well as this Google Docs generates pie charts on multiple choice questions to help visualise how many people answered a certain answer compared to the other answer. In my question I used yes and no to see how many people knew what AI was and after gaining my responses I can see what the majority of people know what AI is based off looking at this pie chart. If I had set my google form questions up differently, I could also have gained insights from my data, this includes average, median and range as explained above.

# My Primary Research

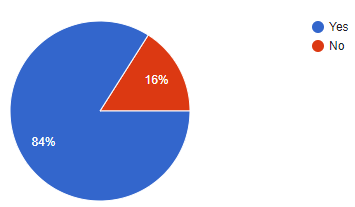
For my primary research I created a survey based around people’s opinions on driverless cars. For this survey I used Google docs to set up several questions about different areas of AI, these include people’s opinions on AI, where AI is currently being used in cars and peoples concern on safety. The questions I asked included:

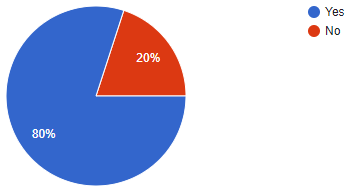
* Do you know what AI is?
* Do we need AI?
* Do you know what machine learning is?
* Did you know AI is already in some vehicles?
* Describe ways AI is being used in cars?
* Would you ever buy a vehicle with AI?
* Do you consider AI in vehicles safe?
* How soon do you think it will be before most people are using driverless cars?
* Do you agree with the statement “AI can give people who may not be able to drive at this point in time due to disabilities the opportunity to drive safely in the future?”

I handed my questionnaire out to several teachers from my secondary school to fill in and see if they could forward the questionnaire. After a few weeks I checked the replies on the questionnaire and had gained 50 responses. The respondents were aged around 25-60 and were based in the education field. Starting with question 1 asking whether they know what AI is, the pie chart generated shows me that 98% of people know what AI is, so from this I know that 1 out of a sample of 50 don’t know what AI is. As stated above this pie chart helps me to better understand and analyse the data that I have been given.

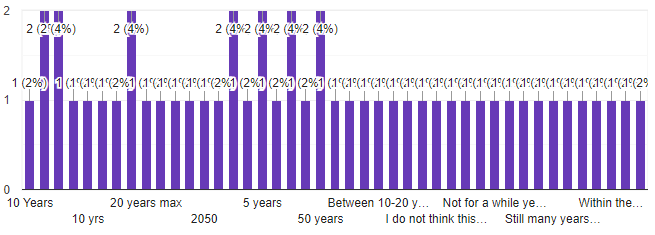
With the second question this gave the respondent the option to write their opinion by giving them a large text box to write in. The second question askes whether we actually need AI. The majority of answers were simple ones being yes or no with a few being detailed. With this data gained I can say that 34 out of 50 people said yes to actually needing AI, within this group some people did just reply with yes but some stated that AI can cut down on errors and make our lives easier and safer.

For the third question I asked if people know what machine learning is within AI, from the responses I got it was another mix between yes and no but some of the more detailed responses gave what they though machine learning was, some were correct, and some were on the right lines. This shows me that most people who have heard of machine learning know what it means thus increasing the chance AI will fit in with modern society.

Another question asks respondents whether they knew AI is in vehicles already, this had more mixed answers if being compared to question 1, forms also represented this question as a pie chart giving me easy readability to be able to analyse it. By looking at the chart I can see that 84% of people knew AI was already in vehicles and 16% didn’t. This shows that even though AI is taking over technology it wont affect everyone and some people will still use technology that requires human interaction.

The next few questions relate to the previous question as hey get people who answered yes to explain in a bit more detail. With question 7 however I asked people whether they would buy a vehicle with AI, this was slightly more spread out that the other two charts. From looking at this chart I can see that 80% of people would buy a car with AI and 20% wouldn’t which helps prove my point of AI not fully taking over and also helping me to answer my overall research question, How AI affects cars now and how it will in the future?

Another type of graphical graph that google forms has generated for me was for question 9 which asks respondents how long it will take before AI takes over vehicles. This is a short text answer with a lot of different answers, some ranging from within 5 years all the way up to 100 years. I think this has to do with how people perceive what a truly AI driven car should be like. This graph also helps me to see how many people used the same answer, 7 of them having 2 of the same response.



# Reflecting on the effectiveness of research methods applied to my project

# Conclusion

# References/ Bibliography

NVIDIA . 2019. Autonomous Car Development Platform from NVIDIA DRIVE PX2. [ONLINE] Available at: https://www.nvidia.com/en-gb/self-driving-cars/drive-platform/. [Accessed 17 January 2019].

The Official NVIDIA Blog. 2019. DRIVE AutoPilot Uses AI to Deliver Safer Vehicles Today | NVIDIA Blog. [ONLINE] Available at: https://blogs.nvidia.com/blog/2019/01/07/nvidia-drive-autopilot/. [Accessed 17 January 2019].

Brian Rashid. 2018. How AI Pioneers Will Affect The Car Industry, And Why It's A Good Thing. [ONLINE] Available at: https://www.forbes.com/sites/brianrashid/2017/05/16/how-ai-pioneers-will-affect-the-car-industry-and-why-its-a-good-thing/#29d9ee7b57c2. [Accessed 17 January 2019].

Waymo. (2019). Waymo – Waymo. [online] Available at: https://waymo.com/ [Accessed 10 May 2019].

Novosilska, L. (2019). 5 Ways Artificial Intelligence is Impacting the Automotive Industry - Ignite Ltd.. [online] Ignite Ltd. Available at: https://igniteoutsourcing.com/automotive/artificial-intelligence-in-automotive-industry/ [Accessed 10 May 2019].

Guides.lib.vt.edu. (2019). Research Guides: Research Methods Guide: Research Design & Method. [online] Available at: https://guides.lib.vt.edu/researchmethods/design-method [Accessed 13 May 2019].

Hf.uio.no. (2019). Theoretical Framework - Department of Philosophy, Classics, History of Art and Ideas. [online] Available at: https://www.hf.uio.no/ifikk/english/research/projects/cl/theoretical-framework.html [Accessed 13 May 2019].

Skillsyouneed.com. (2019). Quantitative and Qualitative Research Methods | SkillsYouNeed. [online] Available at: https://www.skillsyouneed.com/learn/quantitative-and-qualitative.html [Accessed 13 May 2019].

Smithslawyers.com.au. (2019). Seven Problems Self-Driving Cars Need to Overcome | Smith's Lawyers Blog. [online] Available at: https://www.smithslawyers.com.au/post/self-driving-car-problems [Accessed 13 May 2019].

Analytics Training Blog. (2019). 10 Most Popular Analytics Tools in Business - Analytics Training Blog. [online] Available at: https://analyticstraining.com/10-most-popular-analytic-tools-in-business/ [Accessed 13 May 2019].