

Everyday Belief-Acquisition

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Abstract. People need a vast amount of knowledge in order to live in an advanced technological society. Most of this has to be obtained from others by believing what they say and write. Androids and sophisticated AI systems would also have to be able to learn in this way. Before we can program this ability into them, however, we need to understand human belief-acquisition. Elsewhere I have proposed a two-stage model of belief-acquisition. The first stage consists in the employment of a defeasible rule to believe others. The second stage consists in the use of a sophisticated critical methodology. In this paper I develop one part of this model in more detail. I look at the factors that cause us to override the defeasible rule to believe others in the situation when we are listening to someone making assertions.

1 Introduction

It is well known that human beings have the ability to learn from others. They have the ability to acquire knowledge and beliefs by listening to what other people say and by reading what other people have written. This ability is not optional. In order to live in a human society, especially an advanced, technological one, a person needs a vast amount of knowledge and information. He needs to know, for example, many things about money and how it works, how goods are bought and sold, where various goods can be bought and so on. He also needs to know some basic facts about electricity, so that he can turn lights on and off and work various electrical appliances safely. He would also need to have some knowledge about different kinds of electrical appliances such as the television, radio, dishwasher, washing-machine, microwave, telephone, computer and so on. A person would also need to know something about the legal and political system of the society in which he lives and something about its social institutions as well. In addition, he would need to know something about the transportation system of the country he lives in. There are also many further things that he would need to know, but I hope that the above gives a flavour of the knowledge required to live in a technologically advanced human society.

It is impossible for a person to acquire all the knowledge that he needs in order to live in a human society by himself. Most of this knowledge has to be obtained from other people. It is acquired by believing what they say and by trusting what they have written. Furthermore, it is impossible for any person to

check every piece of information that he receives and that he has to make use of in his life. This is because it is usually very time-consuming to investigate the truth of an assertion that we hear or read and so a person just does not have the time available to thoroughly test every statement he needs to make use of. In addition, the critical evaluation of a statement itself involves taking for granted very many other statements which themselves have not been thoroughly checked out. It simply is a fact, that some people may regard as unfortunate, that we have to accept most things on trust.

Although most of the information that we need in order to live in a human society we obtain by trusting others, this does not mean that we have to accept an authoritarian theory of knowledge. It is a truism that even the most respected authorities can make mistakes. Although a person cannot check *every* piece of information that he accepts, he can test *some* of the assertions that he hears and reads. The way in which I accommodate these observations is by proposing a two-stage or two-phase model of belief-acquisition. This model was introduced and explained elsewhere (Diller 1999) and I say a bit more about it in the next section of this paper, but here I just want to mention that anti-authoritarianism appears in the second stage of my model. That stage involves the acceptance of the principle that no belief or theory is beyond criticism and may, in fact, be criticised and revised if necessary.

Most of a person's belief-system has been obtained by believing other people, but this does not mean that that person accepts absolutely everything that he hears or reads. Believing every assertion and theory that a person encounters would very quickly lead him to have a massively inconsistent belief-system. By this I mean that he would have a large number of obviously inconsistent beliefs. For example, listening to a socialist he would adopt socialist beliefs, listening to a liberal he would adopt liberal beliefs, without giving up his socialist beliefs, and so on. Thus, he would end up believing every political ideology he encountered and similarly for non-political beliefs. My proposal is that the first phase of belief-acquisition involves making use of a defeasible rule to the effect that we accept other people's assertions at face value. There are many features concerning the making of an assertion and its content that make us wary of accepting it outright. For example, a person may be very wary of accepting the assertions of a government spin-doctor when these are presented in the context of a press briefing. Any feature that we take into account in the first stage of belief-acquisition has to be, of necessity, easy to recognise. It does not involve thoroughly testing an assertion before it is accepted. Such a factor has to be easy to recognise because we hear and read so many statements every day that we have to decide very quickly whether or not we are going to accept them. To use some computing metaphors, our decisions have to be made in real time and on-line. Because these features of assertions have to be straightforward to recognise, they cannot be very sophisticated. This means that people do end up having quite a few false beliefs and several incorrect pieces of information. This is another reason for holding a two-phase model of belief-acquisition. In the second stage we look more carefully at a small number of our beliefs and

thoroughly check them out. In this way we can try to minimise the number of false beliefs that we have about issues that are particularly important to us.

So far in this introduction I have been writing about human abilities. An android or AI system that was sufficiently advanced to be capable of interacting with human beings, talking to them, learning from them and maybe also teaching them would clearly have to have similar abilities to those described briefly above. In order to produce an android with these abilities, we first need to have a good understanding of them and that is what I am after. In this paper I make a start on the task of looking in more detail at one aspect of the first stage of belief-acquisition. I look in detail at the features of assertions made by other people in our hearing that make us wary of accepting them and I isolate many of the factors that cause us to override our default principle to accept other people's assertions. My long-term goal is to formulate these things in sufficient detail so that they can be programmed into an android or AI system.

2 The Two-Phase Model

2.1 Motivation

In this paper I develop a two-phase model of belief-acquisition. The first phase consists in the employment of a defeasible rule, whereas in the second stage a sophisticated critical methodology is used. In order to illustrate the way in which the first-stage rule is employed and to contrast this with the utilisation of the second-stage methodology I look at part of Watson's personal account of the discovery of the structure of DNA. Hopefully, this will convince the reader of the necessity to adopt such a two-stage model. Further considerations are presented elsewhere (Diller 1999).

During the time leading up to the discovery of the double helix Watson tried out various ideas. One of these was the like-with-like idea in which adenine coupled with adenine, cytosine with cytosine, guanine with guanine and thymine with thymine. The possibility of such couplings was a consequence of information contained in respected textbooks. Watson was excited by the model he was able to build on these assumptions and mentioned it to Jerry Donohue who said the idea would not work. Watson (1968, p. 192) recounts his reaction as follows:

Though my immediate reaction was to hope that Jerry was blowing hot air, I did not dismiss his criticism. Next to Linus [Pauling] himself, Jerry knew more about hydrogen bonds than anyone in the world. Since for many years he had worked at Cal Tech on the crystal structures of small organic molecules, I couldn't kid myself that he did not grasp our problem. During the six months that he occupied a desk in our office, I had never heard him shooting off his mouth on subjects about which he knew nothing.

Thoroughly worried, I went back to my desk hoping that some gimmick might emerge to salvage the like-with-like idea.

The considerations that Watson adduces are all what I would call first-stage ones. However, they are not the sorts of consideration that would convince the scientific community. They are the kinds of reasons that all of us consider and take seriously in our day-to-day research work, but they are not the stuff of which properly scientific argumentation consists. The reasoning contained in the famous article “A Structure for Deoxyribose Nucleic Acid” by Watson and Crick (1953) is completely different from that contained in the above passage. This is to be expected. In that paper they employ arguments which conform to the critical methodology that they accept. The employment of such a critical methodology is something that occurs in the second phase of belief-acquisition and I have discussed that in more detail elsewhere (Diller 1999, pp. 17–28).

2.2 Interaction Between Components

It is not only our belief-system that undergoes modification each day as we listen to other people and read what they have written, the collection of factors that make us wary of accepting an assertion that we encounter also undergoes frequent modification because of the interplay between these factors and our beliefs. The defeasible rule to the effect that we should believe what we hear or read is the gatekeeper that lets beliefs in or keeps them out or tags them as worthy of later investigation, but the factors that cause us to override that rule themselves make use of our current belief-system. For example, one of the ways in which we assess assertions is by considering the character of the person making the assertion, but our views about his character are themselves beliefs that may undergo change as a result of information that we receive.

The second stage of belief-acquisition may also interact with a person’s collection of first-stage overriding factors. For example, we may have trusted Jones in the past and treated him as a reliable source of information, but Green, who we also consider to be reliable, has told us that Jones has a tendency to overestimate the distance between places. This may be of sufficient importance to us that we investigate it using our second-stage methodology and conclude that it is correct. We then incorporate this information into our belief-system and as a result of that it also forces a change in the factors that we use to assess Jones’s assertions on-line.

It is possible to do things to decrease the number of new false beliefs that we acquire. One of the things that can be done is to alter our first-phase overriding factors in the light of new information that we receive. That is to say, we change the criteria that we use in order to allow beliefs into our belief-system. We do not have much control over the overriding factors that we acquire during our enculturation into society in childhood, but when our critical faculties develop we begin to exercise more control over the features that we take into account.

3 On-Line Assessment

In order to live in a human society a person needs to be in possession of a great deal of information. Most of this knowledge comes from other people. It

has been acquired by interacting with others, listening to them and reading what they have written. It is mainly philosophers who have investigated the issues involved in this, but the problems associated with acquiring knowledge by believing what others say have tended to be relegated to the periphery of epistemology. Centre stage has been occupied by issues relating to how we acquire knowledge from perception. Some progress in understanding how we learn from others has, however, been made.

We have a very strong tendency to believe what other people tell us and what we read. This has been known for some time. For example, Thomas Reid formulated a principle of credulity in section 24 of part VI of his book *An Inquiry into the Human Mind on the Principles of Common Sense* (1764). This 'is a disposition to confide in the veracity of others, and to believe what they tell us.' (Reid's principle of credulity is quoted from Alston's article on it in *A Companion to Epistemology* (Dancy and Sosa 1993, p. 366).) Everyday life would be impossible without some such principle. It enables us to make use of a great deal of information that we could not acquire for ourselves in any other way. That is the advantage of having some such principle, but its disadvantage is that we also acquire some false beliefs as a result of it. There are many examples from the history of science of people holding beliefs in the past that we today regard as false. To mention just a few: the theory of spontaneous generation, the caloric theory of heat, Aristotelian mechanics, the theory that light moves infinitely fast, Ptolemaic astronomy, the theory that the chemical atom is indivisible and the phlogiston theory. We thus need to be able to explain how it was discovered that these theories were false and I accommodate that by developing a two-stage model of belief-acquisition. In the second stage of this model a sophisticated critical methodology is employed to thoroughly examine theories that are important to us and to reject them if they are found wanting and replace them with better theories. Reid would find it difficult to explain how this is possible given the power of his principle of credulity. Furthermore, Reid does not explicitly say that his principle of credulity is defeasible and he does not investigate the circumstances in which it is overridden.

We assess the assertions that we hear and read in at least two different ways. We have some criteria that we use on-line and we have a methodology that we use off-line. We must have some easily applicable criteria because in everyday life we have to make decisions in real time about what to believe and what to reject (or suspend judgement about). I think that it is best to conceive of these on-line criteria as factors that cause us to override the defeasible rule to believe what we hear or read. Price (1969) came close to saying this. Most of his discussion of how we learn things from other people in lecture 5 of his book *Belief* centres around the awkwardly phrased principle, 'What there is said to be (or have been) there is (or was) more often than not' (Price 1969, p. 116), but at one point Price (1969, p. 124) says:

There is however another way of interpreting the principle we are discussing. Perhaps it is not itself a proposition which we believe, still less a proposition believed with complete conviction. Instead, it may be more

like a maxim or a methodological rule. In that case, it is better formulated in the imperative than the indicative mood. We might put it this way: ‘Believe what you are told by others unless or until you have reasons for doubting it.’

Price’s methodological rule is too general. It lumps together and treats in the same way every assertion that we encounter. It does not, for example, distinguish between different sources of information and the contexts in which we may encounter them. It applies to the answer we receive when we ask a stranger the time and also to the assertions made in an article published in a learned journal. It encompasses the gossip we hear from a friendly neighbour and also the information presented at a lecture at a prestigious conference. It covers the case when we are told that someone close to us has died and also the situation in which we hear that it is snowing in Scotland. We do treat the information we receive in different ways depending on its content, the source of the information, the context in which it was received, etc. Furthermore, although Price is aware that we do not believe every assertion we encounter, he tries to capture this by qualifying his rule with the phrase ‘unless or until you have reasons for doubting it’. I think it is much better to have a two-stage model in which the first stage involves using the defeasible principle ‘Believe what you are told by others’ and the second stage involves employing a sophisticated critical methodology in order to thoroughly check out a small number of beliefs that are particularly important to us.

In the next section I consider some of the factors that cause us to override the defeasible rule ‘Believe what you are told by others’. We receive information from a variety of sources, but here I only have space to consider one of these and I have chosen to look at the factors involved when we assess information that we receive from one other person. In future papers I plan to look at the additional factors that are needed in order to assess the information that we get from the media, from the Internet, by reading articles and books and so on.

4 Assessing Personal Communications

Some of the information that we acquire we receive from other people face-to-face. Human beings can be thought of as having a rule to the effect that they should believe what they hear. This rule, however, is defeasible. If someone rigidly applied this rule and believed everything that he heard, then he would very quickly end up with a massively inconsistent belief-system. Given that the rule ‘Believe what you hear’ is defeasible, we need to enquire into the circumstances when it is in fact defeated. What factors relating to an assertion make us wary of accepting it outright?

Hume was aware of some of the factors involved in assessing the reliability of information conveyed in this way. In section X of his *An Enquiry Concerning Human Understanding* (1748) he mentions various factors that we take into account when assessing the truth or otherwise of what other people tell us. He says that we consider the character of the person involved. If he is of doubtful

character, then we do not necessarily accept his testimony. We consider whether or not the person has an interest in what he tells us. We also take into account the manner of the person's delivery. If he either hesitates or presents his testimony with 'too violent asseverations', then this may arouse our suspicions. Hume also says that we take into account the number of witnesses involved and whether or not they contradict themselves. Hume's observations are as relevant today as when he first made them and they are a good starting-point, but they need to be supplemented by some further considerations. In this section I consider the situation in which we receive information from one other person. The factors that we take into account in this case can be grouped into five categories. These relate to the *context* in which the assertion is made, any relevant knowledge that we have about the *speaker*, the manner of *delivery* of the utterance, some of the characteristics of the *content* of the message and how the information we receive affects the *recipient* or the knowledge he has. I will look at each of these in turn.

4.1 Factors Relevant to Context

- There may be features about the context in which an assertion is made that makes us wary of accepting it outright. In talking about the context of an assertion I mean the social situation in which it is uttered. For example, assertions can be uttered in the course of a theatrical performance of a stage play, during the pitch made by a market trader or some other kind of salesman, by a member of a religious sect as he tries to convince us of the truth of his faith, as part of the chatting-up ritual, during the role play that is part of some counselling training, in a court of law, during the course of an informal conversation with a friend or a stranger, during the delivery of a lecture, in an academic or other sort of conference, in the course of a televised debate, during a government press briefing and so on. If we are watching a play, say, then we do not accept as being factually accurate anything asserted by the actors about the fictional world that the characters that they are portraying inhabit. (It is possible, however, for the dialogue of a play to contain correct information about the real world and most people are able to recognise this when it happens.) The way in which the context usually influences our assessment of the assertions that we hear is through the fact that in most formal social situations the people involved have definite social roles. For example, we are very likely to accept the assertions of a person if he is giving a lecture. If the very same assertions are uttered by a stranger in a pub, we are less likely to accept them outright. We do this because the credibility of assertions increases if they are made by someone in the role of a lecturer in the social situation of a lecture. Other factors, however, may counteract this tendency. There are, for example, gender differences in the way people respond to a lecturer's assertions. One, noted by Tannen (1992, pp. 168–169) is that women tend to ask questions which are supportive or which are requests for further explanation or personal information, whereas men tend to ask questions which are critical. On the whole, women see access to an expert as an opportunity to learn inside information and to

make personal contact, whereas men see it as an opportunity to challenge the expert. Perhaps an extreme case of how the context or social situation in which an assertion is made influences its reception is that in which the Pope says things while speaking *ex cathedra* on matters of faith or morals. Almost ever Roman Catholic would accept such utterances as being infallible, though non-Catholics are unlikely to believe them so readily.

4.2 Factors Relating to the Speaker

- If the person talking to us belongs to a different social, cultural or religious group, then our initial reaction may be to be more critical of what he says, though we may, for various reasons, seek to counteract this tendency.
- We may have some knowledge about the character of the person making an assertion that makes us wary of accepting it straightaway. We do have a tendency, for example, to think of people as being reliable or unreliable. To take an extreme case, we are unlikely to believe what a person we know to be a habitual liar tells us. A person might acquire a moral reputation, say, like the Dalai Lama, and because of this we may take that person's assertions very seriously, even if we happen not to be Buddhists.
- If we know something of a person's goals or his agenda in talking to us, this may make us wary of accepting his assertions uncritically. For example, talking to a salesman we know that he wants to sell us something and so we are very wary of any claims that he might make about the product that he is selling. A woman being chatted up by a man in a nightclub has a good idea of what he is after and this influences her assessment of what he says. In addition, if we think that a person wants to deceive or mislead us, then we take that into account when considering the likely truth of what he tells us.
- We take into account the person's intelligence, experience and expertise. For example, we are wary of the pronouncements of a person about a specialist topic that he is not an expert on. Of course, on some occasions this tendency of ours might prevent us from learning something useful.
- On occasion a person might play devil's advocate in a conversation and then we would not accept his assertions at face value.

4.3 Factors Relating to the Manner of Delivery

- We take into account the manner in which the person gives us the information and his body language. Thus, we might suspect that someone is lying if he makes more eye contact with us than is usual or if he makes a lot of meaningless hand movements. With experience or by being taught, we may look out for other aspects of a person's non-verbal communication that may tell us he is not telling the truth.
- If someone is inarticulate or lacks charisma, this may make us wary of accepting his assertions. With experience, we may realise that some very charismatic people are far from being truthful. Many politicians and charlatans

messiahs, for example, are extremely articulate, but they usually have other goals than an honest quest for the truth.

4.4 Factors Relating to the Content of the Message

- The content of the assertion that we hear may have characteristics that make us wary of believing it without further ado. One consideration concerns the coherence of the message and its internal consistency. Thus, we would not accept an inconsistent message or an assertion that was inconsistent with something the speaker says earlier (and that might cause us to reassess the earlier assertion). People rarely utter straightforwardly inconsistent assertions, like ‘It is raining and it is not raining’, but may utter two or more assertions that others may, being more logical and rational, see as being inconsistent.
- We would be wary of accepting an assertion if it was the sort of thing that people often lie about. For example, I recently came across a book entitled *101 Lies Men Tell Women and Why Women Believe Them* (Hollander 1997). Some of the things the author mentions are the following: ‘You’re the only one’, ‘I love you’, ‘Honestly honey, it’s just for the guys—none of the wives go to the conference’, ‘I’m ready to make a commitment’, ‘I’ll call you’, ‘You’re the only one who understands me’, ‘I’m going to leave my wife’ and ‘I’ve got to work late at the office tonight’.
- The content of someone’s assertions may create an intense emotional reaction in the hearer and this may influence the way in which that person assesses further assertions from the same person.
- The content of an assertion may be so out of the ordinary that we are very reluctant to accept it without further ado. For example, we may get into conversation with someone who claims to have been abducted by aliens. There are, of course, individual differences between people and not everyone would react to an account of alien-abduction in the same way.
- There are topics about which disagreement is expected and tolerated. A person who makes an assertion about such a topic might not do so because he wants the hearer to believe what he says, but rather he wants the hearer to know where he stands. For example, a person might say, ‘My position is that computers will never be conscious’, and although from this we know that he believes that computers will never be conscious, he does not expect everybody to accept what he says. The person who hears such an assertion, thus, knows that it is such a position-stating assertion and treats it accordingly.

4.5 Factors Relating to the Recipient of the Message

- We consider the importance of the message and its relevance to us. We tend to be less critical of assertions that are not particularly important to us than those that are really important to us. For example, if a person has little or no interest in rugby football and he hears by accident that Moseley have won their latest game, he is likely to simply accept this. However, if he has

published articles about BSE in which he contends that it is caused by a virus and someone tells him that it is really caused by a prion, he is unlikely to accept this there and then.

- Whether or not we accept another's assertion may be influenced by our pre-existing knowledge. For example, if the assertion is straightforwardly inconsistent with what we already know and we are confident of the truth of the statements that it is inconsistent with, then we are unlikely to accept the assertion outright. We may, though, flag it as something we should investigate more fully later. This consideration includes the case when our knowledge is that of what this speaker has already told us either earlier on this occasion or on a previous one.
- We consider the obvious consequences and repercussions of accepting the message. The consequences of accepting an assertion that we hear may be so significant that we insist on getting further information before accepting it. For example, if the message is such that accepting it would have a profound effect on my current plans, my life-style or my belief-system, then I am unlikely to accept it outright, even if it comes from a reliable source who shows no signs that he is lying. In such a case I would probably flag the assertion as one that I need to consider thoroughly at some later time. To consider another example, a conscientious juror taking part in a murder trial will be more reluctant to accept outright what he hears than he would be if he heard those selfsame assertions made outside the courtroom.
- The character of the recipient may influence his assessment of assertions that he hears. For example, a creative person may be willing to entertain wacky and unusual ideas which a less creative person would be very wary of accepting or even spend time thinking about.
- A person's maturity may influence his assessment of the assertions that he hears. Thus, an adult is likely to be far less credulous than a child. Experience would have taught him that people are not always as truthful as they should be.

4.6 Remembering the Source

The main options available to us when we hear an assertion are to accept what is heard, to reject it or to flag it as something worth investigating more thoroughly later. Whatever we decide to do with the assertion, we usually remember who made that particular assertion. Thus, if Jones tells us that it is safe to eat beef, then, whether we decide to accept what he says or reject it or flag it as worthy of further study, we will tend to remember that Jones told us this and we will usually also add the belief that Jones told us this to our belief-system with some indication of when he said this. Such information may come in useful later in helping us to decide whether or not to treat Jones as a reliable source of information.

5 Conclusion

There are very many problems to overcome if we are ever going to build a humanoid robot with intellectual abilities analogous to those possessed by human beings. Although it may be impossible to design and build an android whose abilities replicate those possessed by human beings, it is sensible to design androids, at least initially, whose abilities are similar to human intellectual ones. In designing an android it makes sense to design one that human beings can interact with. If the android was very different from us, then this would not be possible. In this paper I have concentrated on some of the problems that arise from the fact that human beings need a great deal of information in order to be fully-functioning members of any human society. It is impossible for them to generate all this knowledge for themselves. Most of this knowledge comes from other people. Any android that we design and build would be in the same position. Before we can even begin to design an android we have first to understand the abilities that humans have. In this paper I have made a start at investigating one aspect of how human belief-acquisition works. I have employed a two-stage model of belief-acquisition. The first stage consists of a defeasible rule. On the whole we tend to believe what we are told and what we read. We need to have a reason not to believe something that we hear or read. If we decide not to accept an assertion, but we consider the matter sufficiently interesting, then we can decide to flag the assertion as something that we should investigate more thoroughly later on. The second stage is that in which this more thorough checking takes place. In this paper I have concentrated on the first stage of this model and in particular at the factors that people take into account when they decide to override the rule to believe others. Belief-acquisition turns out to be far more complicated than most people realise.

There is a lot of interaction between a person's belief-system, the factors that incline him to override the defeasible rule 'Believe what you are told' and his second-stage critical methodology. The following is a list of the three main ways in which these elements interact:

1. Beliefs are added to a person's belief-system if they have no features which make that person wary of accepting them.
2. The factors that make us wary of accepting an assertion often depend on some of our beliefs and so can change as the person's belief-system changes. For example, the person may rate a particular reference work very highly until he discovers a number of errors in it. From that time on information gleaned from that source will be treated differently from the way it was treated before the person's opinion was revised. Furthermore, such a change in evaluation may entail a revision of beliefs obtained from that source in the past.
3. Beliefs are also added to a person's belief-system and removed from it as a result of the operation of that person's critical faculties.

When we come to accept a new statement or theory, this may have a knock-on effect on our pre-existing knowledge. We may have to revise some of the things

that we previously believed. This is an issue that I have not looked at in this paper, because my interest was focused elsewhere.

It is impossible to check everything and so, even when a person is thoroughly checking out a selected position, he has to take on trust a vast amount of information that he could never himself investigate properly. Such knowledge was largely obtained from other people and it had only to pass through the person's first-stage rule.

A great deal of work still needs to be done if we are ever going to get close to the goal of building an android with human-like abilities, but I have given some indication in this paper of what we are aiming at in the case of belief-acquisition. I have identified the main factors that make us wary of accepting what we hear. I hope that some people reading this paper will join me in the task of further analysing and refining these factors so as to produce results detailed enough to allow them to be programmed into an android or AI system. It is possible that experiments would have to be done with human beings in order to better understand what factors induce them not to believe what they hear.

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