Unit 1
What is language?

Part 2

Before you complete Part 2, the print component of Unit 1, make sure you've completed Part 1 online.

Your first L101 reading is by module co-author Philip Seargeant. The reading will allow you to continue your exploration of the nature of language by contrasting the knowledge that we as humans have of using language with what computers are today capable of in terms of communication. You'll look specifically at how computer scientists teach machines to use human language, and at what the challenges involved in this can teach us about the nature of language. In doing so you'll also look at the ways in which language is a constantly evolving set of practices rather than a fixed set of rules, and the important implications this has for language's role in society.

The reading is embedded within Activity 2.1, which requires you to reflect on how everyday life already involves interacting with machines using human language, and what this experience is like.

Activity 2.1 Reading A

About 75 minutes

Before you start on the Reading A, consider questions 1–3. Write your answers in your L101 notebook.

1 Have you had any experience of interacting with virtual assistants such as Apple's Siri, Amazon's Alexa, or the 'Help' pages of internet sites? If so, how has this experience compared with talking to a human?

2 What do you think the challenges are for building a computer or robot which can use language in the same way that a human can?

3 The idea that language is always changing is one that you've probably come across before. Can you think of reasons why it's inevitable that it should be constantly changing, and why change and flexibility are an inherent property of human language?

Now complete the Reading A, keeping in mind the responses you had to the questions above and making brief notes. You'll return to these questions in the 'Discussion' section after the reading.

Reading A Teaching a machine to speak

Philip Seargeant

In 1950, the computer scientist Alan Turing wrote a paper entitled 'Computing machinery and intelligence'. The subject of this paper was succinctly summed up in an interview he gave to *The Times* a year earlier, in which he explained that the research that he and his colleagues were pursuing was aimed at 'finding out […] to what extent [a machine] could think for itself' (Hodges, 1995). In time, he argued, computers would be programmed so that they'd be able to acquire skills similar to human intelligence. At some stage in the future, they'd be able to learn in ways which went beyond simply processing the information that was input by programmers. And with this they'd develop processes akin to human thought.

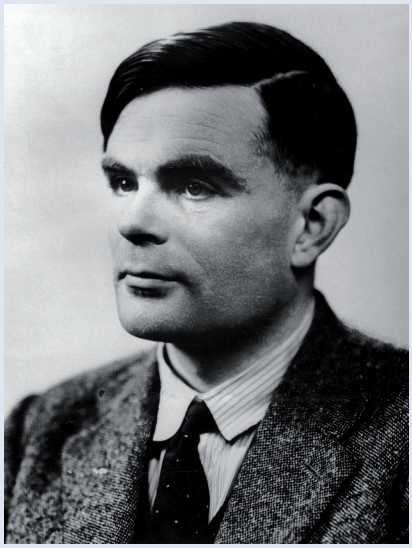

Figure 1 Alan Turing (1912–54)

In the paper he outlined what has come to be called the 'Turing test': a rudimentary experiment which was intended to gauge whether or not a computer possessed a form of 'intelligence'. The means by which he tested for this was the computer's ability to enter into a realistic conversation with a person using natural human language. The test – referred to by Turing as an 'imitation game' – was structured as follows. A human judge sits at one terminal of a computer, chatting (by means of text message) to a

number of unseen **interlocutors**. These interlocutors are all human except for one, which is a computer simulating conversation. If the judge is unable to differentiate between the human and computer interlocutors, then the computer has passed the test. Or to put it another way, if the judge can't consistently differentiate the machine from the human, the machine can be counted as possessing 'intelligence'.

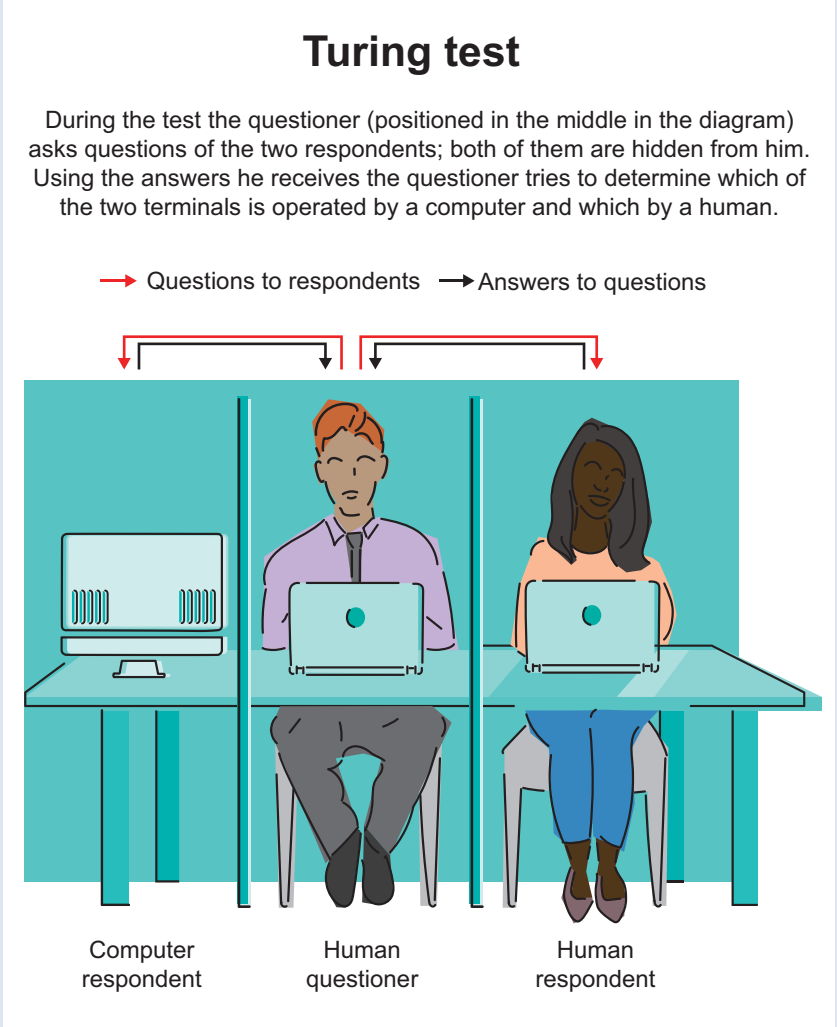

Figure 2 The Turing test

Turing predicted that a computer would pass this test in approximately fifty years. Since the turn of the millennium (that is, at the end of the window of success predicted by Turing), competitions based around the test have become very popular, and on a number of occasions people have claimed that certain programs have managed to pass the test – although always under very specific circumstances. In 2014, for example, it was widely reported that a Russian-designed program named Eugene had successfully persuaded the judges of its human-like conversational abilities (Hern, 2014). The specific innovation behind Eugene was that 'he' had the personality of a 13-year-old boy. As such, the judges didn't expect him to have too wide-ranging a knowledge of the world, and overlooked spelling mistakes and so forth. In other words, they were fairly lenient in terms of judging how human-like his responses seemed to be.

The reason the Turing test has been so influential in thinking about artificial intelligence is because language, and specifically dialogue, is such an integral part of what it means both to be a rational animal, and a social one. For a machine to be able to convincingly simulate a natural conversation with a human it needs an expert and flexible understanding of a very broad range of knowledge and competencies about functioning in the social world. Language is intimately connected not only to how we communicate, but also how we understand and conceptualise the social world, and all the conventions and practices we use to interact with each other. So by testing a computer's ability to deal with language, one is also testing its ability to deal with all sorts of other things that humans instinctively do.

These days, the scenario used in the Turing test is becoming a part of everyday life. Chatbots – or as they're sometimes more formally known, artificial conversational entities – are a common feature of computer operating systems and customer service provision today. A chatbot, in simple terms, is a computer-managed service with which you interact either through speech or text, and that's driven by a particular script or form of artificial intelligence. They include virtual assistants such as the Apple iPhone's Siri (Speech Interpretation and Recognition Interface), or Amazon's Alexa, which allow you to speak to the computer to ask it to execute simple commands or retrieve certain information ('Siri, please tell me who Alan Turing was'). The idea of these

programs is to simulate, in as convincing a way as possible, how a human interlocutor would behave in a conversation, and use this as an interface for communicating with the machine.

At present there are two different types of chatbot. The simpler sort use a set of rules to generate responses to questions. They scan the question you ask them for particular keywords, and then pull up a pre-written reply from their database which is (hopefully) relevant. If you go to the troubleshooting section of a website for example, and ask 'Why is my printer not working?', the algorithm will identify keywords such as 'printer', 'not' and 'working', and try to provide you with a general solution ('Have you made sure you've plugged it in?'). In this case the machine is hardly conversing with you – it can only ever respond to a set number of specific commands, all of which need to have been predicted by the programmers. The computer doesn't, in any sense of the word, 'understand' language in this type of scenario.

A more sophisticated form of chatbot is that which makes use of artificial intelligence (AI). In particular such chatbots draw on what's known as *natural language processing* (*NLP*), which is a means by which computers can analyse and extract meaning from human language in a far more sophisticated way than simply cross-referencing a number of keywords with some pre-prepared answers. Significantly, AI is able to 'learn' from the interactions it has with users, so that it improves its abilities the more interactions it has. Machine learning of this sort operates by means of an algorithm which identifies and incorporates conversational patterns based on experience. Rather than having to rely on extensive hand-coded sets of rules, AI can routinely learn the actual rules which govern the way that people interact in (and extract meaning from) a conversation by analysing an ever-growing database of real-life conversational examples. In other words, these chatbots 'learn' based on large databases of naturally-occurring language from which they predict the most likely interpretation based on a certain algorithm.

The technology behind this is developing at an incredibly rapid pace. By the time you come to read this unit the technological landscape will undoubtedly have moved on and some of the details will already sound dated. But behind the particulars of specific programs such as Siri or Alexa, the fundamental issues outlined above hold true. Despite the fact that the more sophisticated chatbots are learning on the job, they're still a long way from being able to fully replicate the flexibility and range of communication that even a small child can manage.

So why is this? The main issue – and the one that continues as a philosophical stumbling block for AI – is that life is dynamic, and everything in the social world is in a process of constant change. The way we deal with this, both as individuals and as a society, is by continually adapting our knowledge to new situations. No situation we come across, or action we take, is precisely the same as an earlier one. Yet we have the capacity to adapt a complex of general skills and practices so that we can make sense of, and operate in, these constantly evolving situations with relative ease.

Language is a good illustration of how this works. For the linguist Noam Chomsky, an essential property of language is that it allows people to express 'indefinitely many thoughts' and to react 'appropriately in an indefinite range of new situations' (1965, p. 3). We can use language to describe almost anything we see, feel or think about life and the universe. In formulating this idea Chomsky was drawing on an observation first made by the eighteenth-century language philosopher Wilhelm von Humboldt, who suggested that although language is made up of finite means – for example, spoken English has a set number of distinct sounds (varying according to accent), and the alphabet used for written English has only 26 letters – these can be combined in ways to create utterances or sentences which have never been produced before; and you, as audience, have the ability to understand them, despite never having encountered them before.

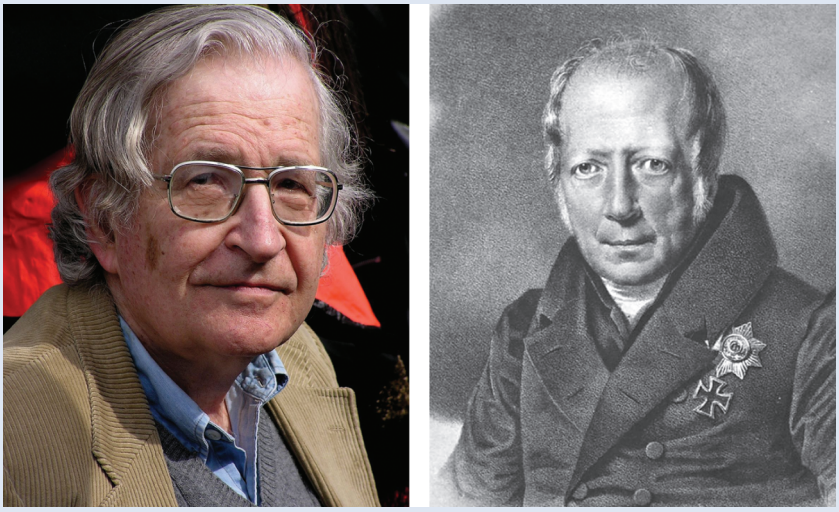

Figure 3 Noam Chomsky (b. 1928, left) and Wilhelm von Humboldt (1767–1835, right)

Equally important is the fact that language is always changing. And it changes alongside – and as a means of adapting to and dealing with – the way that society itself is constantly changing. Let's look at one very small example: the word *train*. In modern English, this is most often used to refer to what the *Oxford English Dictionary* (*OED*) defines as a 'railway locomotive'. The word has several other definitions however – 'railway locomotive' is the 22nd out of a total of 26 different meanings that the *OED* lists, and many of those are themselves subdivided into further distinctions. Then there's the fact that the word was first used (in French, before then being borrowed into English), back in the tenth century – whereas the 'railway locomotive' wasn't invented until the early nineteenth century. For several hundred years the word actually meant something quite different from what we ordinarily understand it to mean today.

The earliest meanings of *train*, all of which derive from Old French, include 'objects or dead bodies with which an area of land is strewn' (c. 1165 in Old French); 'animals of burden and carriages following an army and carrying its equipment and food' (c. 1220); or 'elongated back of a robe or skirt, also a separate piece of material attached to the back of a formal dress' (thirteenth century). What these all have in common is being what the *OED* describes as 'an elongated thing […] especially when dragged or trailed'. When the railway locomotive was invented,

this meaning was metaphorically adopted to refer to it, and through extensive use has ended up being the primary meaning of the word nowadays.

Another phenomenon which illustrates this constant adaptation of language is the *retronym*. This is a phrase which modifies a term to take into account the fact that norms in society have changed. In London, for example, one talks of *the Overground train*. There was a time when this would just have been *the train*, but with the advent of the city's underground railway system or subway, known as *the Underground train*, it was necessary to distinguish between the two, and in this context the original term *train* was modified to make it more specific. There are several examples, all attesting to societal (and often technological) change, and how language gets altered to accommodate this: *silent movie*, *steam engine*, *analogue watch*, and so on. In this sense, language evolution is an analogy for knowledge more generally, in the way it is constantly adapting to take account of (and make sense of) the world in which we're living.

What, then, are the implications of all this? A key point of note is that the reason language is such a flexible tool for communication is precisely because it is so adaptive. We don't need different words or set phrases for every possible situation we encounter, or are ever likely to encounter. What we do is draw on the **linguistic resources** available to us, often in subtly creative ways, to map out the evolving world as we understand it. There are a number of underlying processes we use to do this – and these are the sorts of theories and concepts we're going to be looking at in this module.

We can extend this same adaptive principle to learning more generally. Learning is also a process rather than something with a fixed endpoint. Often, the most useful skill to learn is how to ask the right questions, rather than simply knowing the answers to a few select issues. Our knowledge of the world is only ever partial after all, and science and knowledge are themselves always works in progress. It's for this reason that learning never stops, and why good education is as much about learning how to learn as it is about memorising a pre-prepared script.

References

Chomsky, N. (1965) *Aspects of the Theory of Syntax*, Cambridge, MA. MIT Press.

Hern, A. (2014) 'What is the Turing test? And are we all doomed now?', *The Guardian*, 9 June [online]. Available at https://www.theguardian.com/technology/2014/jun/09/what-is-the-alan-turing-test (accessed 16 November 2017).

Hodges, A. (1995) 'The Turing Test', in *Alan Turing: The Enigma* [online]. Available at www.turing.org.uk/scrapbook/test.html (accessed 16 November 2017).

Discussion

Here are some possible answers.

1 Have you had any experience of interacting with virtual assistants? If so, how has this experience compared with talking to a human?
This will depend on your own experience.

2 What are the challenges for building a computer or robot which can use language in the same way that a human can?

As the reading explains, even though we've seen huge leaps forward in the capabilities of digital technology in the last few decades we're still a long way from seeing a machine which is truly able to use language in the same way that a human can. There are several reasons for this, but one is the complex role that language plays in our lives. It is not simply a means for communicating factual information. It's also closely tied up with issues such as **identity**, with how we relate to each other, and with how we (try to) make sense of the world. In other words, for a computer to fully get to grips with human language – that is to produce and interpret language in the same way a human does – it would also need to fully get to grips with what it means to be human!

3 Why is it inevitable that language should constantly change, and why are change and flexibility inherent in human language?

One aspect of being human is coping with constant change. The world around us is always evolving, and thus our language and our

communication practices are also always evolving. This fundamental relationship between language and society will be a major focus throughout the rest of this module.

Changing society, changing language

In Activity 2.2 you'll reflect on the ways in which language changes as society changes.

Activity 2.2 Changing language

About 30 minutes

Have a look at the following terms. Each of them is retronym, of the sort discussed in the reading above. For each one try to guess when they were coined as new terms, and why it was necessary to alter the original word.

- *acoustic guitar*
- *snail mail*
- *Elizabeth I*
- *British English*.

Discussion

As explained in the reading, when norms in society change, the language we use needs to adapt. This is the case with each of the terms discussed.

- *Acoustic guitar* is first recorded in the *Oxford English Dictionary* in 1961. The term *electric guitar* is recorded as early as the 1930s – the decade in which the electric version of the instrument was first invented. But it was the rise of rock 'n' roll which led to the mainstream popularity of the electric guitar, and the need for a distinction to be made with what in previous eras had simply been a *guitar*.
- *Snail mail* is used today in contrast with *email*, the latter type of communication being instantaneous while the former is comparatively much slower. *Snail mail* was first used in this context in the early 1980s, although the mainstream use of *email* didn't come about until

the early to mid-1990s. Another related retronym is *surface mail*, to refer to what had previously been simply *mail*; the new term was coined following the advent of *airmail*.

- Prior to 1952, *Elizabeth I* was referred to in the history books simply as *Queen Elizabeth*. But with the accession of another Elizabeth the regnal numbers began being used to distinguish them. The process is not without its complications, though. The sixteenth-century Elizabeth was queen of England and Ireland only, so in Scotland, for example, *Elizabeth II* is more correctly just *Queen Elizabeth*.
- English today is very much a world language. It's spoken by up to two billion people around the globe, with a long history of usage in a great number of countries and communities. As you'll see later in the module, it can no longer be seen as the sole property of the English – and many of the different varieties of English are very well established, with their own distinct forms and associated cultures. So whereas once upon a time *English* may have referred solely or predominantly to the form of the language spoken in England, and then more widely in Britain, after the language started to spread from the seventeenth century onward the variety spoken in Britain came to be called *British English*, to signify that today this is just one variety among many.

Now return to Unit 1, Part 3, online.