

# An introduction to natural language

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*You can take away the whole and still have some left. You can take away some and still have the whole left. What is it? (Anon)*

## A funny logic joke

Three logicians walk into a bar. The bartender asks “do you all want beer?” The first logician says “I don’t know”, the second says “I don’t know”, the third says “Yes.”

## Introduction

Natural language is central to all human activity and therefore most people feel fairly confident with their grasp of how language works. However this is not always the case. Consider some simple sentences:

- Would you rather a crocodile attack you or an alligator?
- No head injury is too small to ignore. I hit my head - what should I do?

In the next two weeks we will cover how natural language can be used to communicate, specify and argue. These are all essential activities for any computer scientist. However, before we get too deeply into any technical content it is worth pausing and considering what we mean by language. This lecture will give a quick introduction to some of the areas which will be addressed in the following weeks and some examples to motivate you.

## What is language?

A simple definition:

“A language is a system of signals which encode and decode information.”

Is this definition good enough? Consider the following: German, Classical Music, Jazz, bird song, the noise of rain on the window during a storm.

Natural Languages have three essential features: Intention, Convention, and Categorisation.

### Intention

The purpose of language is to communicate information. Communication has to be done intentionally. Suppose I see black clouds on my way to work and conclude that later there will be rain. Is this an example of communication? Is it an example of natural language communication?

The above is an example of natural meaning. Other natural meanings include the noise of footsteps meaning that somebody is approaching and the sight of somebody shivering meaning it is cold. Most people would not claim these are examples of linguistic action. According to Grice

(1957) this is because these examples lack *intentionality* i.e. the communication of non-natural meaning has to be done intentionally.

Intentional communication works the following way. Suppose a speaker says “P”. For the hearer to understand the speaker, the hearer must recognise the speaker’s intention to communicate P. This is recursive since the speaker must intend that the hearer recognise his intention.

This definition might seem confusing but consider the following example: during a coffee break I reach for the milk jug but its slightly too far away. How can you tell whether I’m simply reaching for the jug or requesting that you pass the jug to me?

### **Convention**

Any natural language has to have conventions. For example, communication would be impossible if the english word “snow” meant sunshine to me but rain to you. For this to happen natural languages have to have a community of language users who agree on certain things - for example that the word “snow” denotes frozen water which has fallen from the sky.

Who decides the conventions? Dictionaries? Academics? Linguists? Society?

Languages change and conventions change. For example words can change their meaning over time via metaphor. c.f. “salt versus salary”

Convention does not mean that we have to agree completely. I might use a word differently from you. For example due to my northern dialect I tend to eat “breakfast” followed by “dinner” followed by “tea”. I might have even have “supper” before I go to bed. Some of you might disagree with this but you can still understand enough about my eating habits because we share enough common knowledge of English and have similar world views. Wittgenstein (1953) wrote “If a lion could speak then we would not understand it” - it’s worth considering why that would be so.

Different types of language use require different levels of agreement. Consider if you were asked to design a large computer system, obviously the level of specific description required to describe its functionality and purpose would have to be far higher than discussion of my eating habits.

### **Categorisation**

One function of language is to categorise the world. For example Borges describes “a certain Chinese Encyclopedia the Celestial Emporium of Benevolent Knowledge, in which it is written that animals are divided into:

1. those that belong to the Emperor,
2. embalmed ones,
3. those that are trained,
4. suckling pigs,
5. mermaids,
6. fabulous ones,
7. stray dogs,
8. those included in the present classification,
9. those that tremble as if they were mad,



This is a valid argument in that as long as the premises are true then the conclusion must follow. This example can be easily translated into logic. In fact as we shall see most declarative statements can be translated into a logical statement which is either true or false.

This is not true for all examples however. Consider the following:

- Paris is the capital of France
- Today is tuesday.
- This afternoon is going to be wonderful weather.
- I bet you five pounds that Liverpool will win the premiership.
- The King of France is bald.
- Everything I say is false.

Which of these sentences are true or false?

### **Is declarative language logical?**

Some song lyrics

- “We don’t need no education. We don’t need no thought control.”
- “I can’t get no sleep.”
- “Well, I ain’t never done nothing to nobody.”

In classical logic two negatives cancel each other out. Is this the case in natural language? This matter is (still) controversial in philosophy. Some philosophers regard double negatives as simply a sign of sloppy usage. Others disagree (for example Grice (1957) argues that double negatives in natural language actually increase the level of negativity.).

### **Some final puzzles**

**a.**

You are lost in a forest. The forest is between two villages. In Liegama live only liars, they always lie. In Truesama, people always tell the truth. You want to go to Truesama. Then you see a man from either Truesama or Liegama. You can ask him only one question.

Which question will you ask him to know for sure where Truesama is?

**b.**

You came to river with two bridges. Each bridge is guarded - one by a member of the Liegama tribe and one by a member of the Truesama tribe. You also know that only one bridge is safe - the other is certainly a trap for unwary travellers. As per tradition, you are only allowed one question and then must choose a bridge. What question do you ask?

### **References**

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