

4) Theory of information

Information theory is a scientific discipline which deals with the formation, movement, transfer and processing of information. The main way in which information is transmitted is communication, therefore information theory draws upon the mathematical theory of communication, but also upon probability and statistics. Another approach treats information theory as a field of cybernetics.

A key term in information theory is entropy. Entropy can be understood as a measure of the uncertainty of a system or scheme. When entropy is high, systems are less organized and conversely highly probable; when entropy is low, systems are orderly and unlikely. We can observe that the relation between information and entropy is one of inverse proportion: as uncertainty falls, the volume of information rises. Information entropy, often called Shannon entropy, is closely related to thermodynamic entropy.

This scientific discipline has its origins in the work of the mathematician Claude Shannon, who first presented information theory concepts in his work *A Mathematical Theory of Communication*. Of course we cannot dismiss the contributions of other scientists, such as Harry Nyquist and Ralph Hartley.

A key influence on Claude Shannon was the equally celebrated Alan Turing, who is mostly known for his calculating machine and Turing test. This test is intended to demonstrate whether a computer is capable of intelligent behaviour comparable to that of a human (this test was passed for the first time by a computer in June 2014). It is also important to note that Alan Turing invented the binary system and deployed it in his imaginary machine (which we would now call a computer).

Shannon formulated his information theory over a period of years and published the results in *A Mathematical Theory of Communication*. Subsequently, the development of the field led to the formation of new word widely used in the contemporary world: bit, the basic unit of measurement of information.

After Shannon, other scientists followed who sought to establish information theory on solid mathematical foundations. Moreover, information theory led to many industrial applications, and its influence spread to many other scientific fields, such as psychology, linguistics, genetics, anthropology, economics and neurology. In first half of twentieth century, information theory enjoyed great vogue, and many social scientists started to examine it in the context of their field. Indeed, it was in this period when psychologists turned away from behaviourist models and returned to the investigation of states of mind, spirituality in particular. Various experimental psychologists (among them I. P. Pavlov, G. Mill, S. Freud, and W. James) embarked on research of this kind, and in the context of this movement, a new psychological field, cognitive psychology, emerged which combines psychology, informatics and also philosophy.

Subsequently, quantitative information theory emerged from a number of sources: the general theories of Harry Nyquist and Ralph Hartley; statistics; and the probability theories of Shannon, Wiener and Fisher. This theory deals quantitative aspects of information and eschews qualitative considerations (such as the nature of information).

The emergence of general and quantitative theories of information inspired the first developments in software, and also the development of techniques and methods of processing and storing information. In addition to this, the findings of information theory made it possible to establish a new field, informatics, which deals not only with general problems related to knowledge, but also with the implementation of the objects and processes concerned with the acquisition, processing, transmission and use of information and knowledge. In summary, information theory has opened up whole new fields of human enquiry which have enriched and transformed the contemporary world, and it was elaborated in a short space of time based on the work of one amazing scientist: Claude Shannon.

Feedback:

- You're right to repeat keywords (e.g. "information theory") but don't overdo this.

- Overall, you should make greater use of cohesive devices (therefore, however etc) in order to give your writing greater structure and clarity.
- Pay attention to the use of commas with dependent clauses and coordinators.

Literature:

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