

## EDITORIAL

# Empiricism and non-empirical research

Empiricism, the doctrine that knowledge is derived from experience, is a dominant feature of the natural sciences which primarily seeks to understand natural phenomena occurring in the world we live in. In contrast, formal sciences (of which mathematics is the foremost example) deals with abstract structures which may or may not be applicable to real world phenomena.

There has always been a close connection between mathematics and natural science. Galileo Galilei (1564–1642) expressed the view that nature is written in a mathematical language. The development of computers was historically connected with the attempt to carry out mathematical calculations using a machine rather than the human brain. Modern developments in computer science and technology have resulted in the development

of powerful tools such as machine learning (a field within artificial intelligence), which are beginning to be applied to complex problems, particularly those involving vast amounts of data, in many fields of natural science.

A key issue in machine learning models is generalizability. Problems with regard to application of machine learning models in health care have been highlighted recently in the literature. It is reported that many models are unreliable when applied to data from outside the training data set. The JNSF, in keeping with its focus on natural science have introduced with the current issue new guidelines for authors submitting papers on computing and related areas such as artificial intelligence and machine learning, which emphasize the need for empirical evaluation of research findings.

**Ajit Abeysekera**