



Information compression and the representation and processing of knowledge in the brain

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Abstract

The SP System, meaning the SP Theory of Intelligence and its realisation in the SP Computer Model, is the product of an extended programme of research seeking to simplify and integrate observations and concepts across AI, human learning, perception, and cognition, and related areas. Information compression is a guiding principle in the SP research because of substantial evidence for its importance in human cognition. A major discovery from this research is the concept of SP-multiple-alignment, borrowed and adapted from the concept of ‘multiple sequence alignment’ in bioinformatics. SP-multiple-alignment is largely responsible for the strengths of the SP System in several aspects of human intelligence: learning, perception, processing of natural language, planning, and more. Of course there is more work to be done but the system provides a good foundation for the development of general human-level AI. In that respect, it has many advantages compared with ‘deep neural networks’ that have been receiving so much attention. These ideas provide a conceptual framework for SP-Neural, a version of the SP Theory expressed in terms of neurons and their inter-connections and inter-communications. It turns out that SP-Neural, in a broad view, is quite similar to Donald Hebb’s concept of ‘cell assemblies’, but it differs in important ways, especially the overarching principle of information compression. Development that is planned of a computer model for SP-Neural is likely to yield more precision and more clarity in how SP-Neural would work.

Biography

Gerry Wolff is Director of CognitionResearch.org. He has held academic posts in the University of Wales, Bangor, the University of Dundee, the University Hospital of Wales, Cardiff, and a one-year Research Fellowship with IBM in Winchester, UK. He has also worked as a Software Engineer with Praxis Systems plc in Bath, UK. His first degree at Cambridge University was in Natural Sciences and his PhD at the University of Wales, Cardiff, was in the area of Cognitive Science. He is a Chartered Engineer and a Member of the British Computer Society. He has worked on the development of computer models of language learning, and later he has been concentrating on the development of the SP theory. Between early 2006 and late 2012 he was engaged full time in environmental campaigning (climate change). He has numerous publications in a wide range of journals, collected papers and conference proceedings.

Publication

1. Multiple alignment as the “double helix” of intelligence
2. Evidence for information compression via the matching and unification of patterns in the workings
3. Mathematics as information compression via the matching and unification of patterns of brains and nervous systems

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