Quantum Natural Language Processing & Compositional Intelligence

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Our Oxford-based CQ-team first performed Quantum Natural Language Processing (QNLP) on an IBM quantum computer [1a, 1b], and more recently also did so our own trapped ion hard- ware. Key to having been able to achieve what is conceived as a heavily data-driven task, is the observation that quantum theory and natural language are governed by much of the same compositional structure – a.k.a. tensor structure.

Hence our language model is in a sense quantum-native, and we provide an analogy with simulation of quantum systems in terms of algorithmic speed-up [forthcoming]. Meanwhile we have made all our software available open-source, and with support [github.com/CQCL/lambeq].

We will also introduce the notion of compositional intelligence, exploiting the fact that the compositional match between natural language and quantum extends to other, such as patio-temporal perception and embodiment [2a, 2b], we will argue that a new generation of AI can emerge when fully pushing this analogy, while exploitingthe completeness of categorical quantum mechanics / ZX-calculus [3a, 3b] for novel reasoning purposes that go hand-in-hand with modern machine learning.

References

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