

Recurrent and Interactive Recurrent Neural Network Computational Models

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In this study, the recurrent (RNN), interactive recurrent neural network (IRNN), interactive Turing machine (ITM) and ITM with advice (ITM/A) computational models are introduced and compared. The computational power of the RNN is shown to be equivalent to Turing machine. Rational and real-valued IRNNs are defined and their computational power is compared to ITM. Rational IRNNs and ITMs are shown to have the same computational power. Real-valued IRNNs and ITM/A are shown to be equivalent. Furthermore, Real-valued IRNNs are shown to be strictly more powerful than ITMs. Hence, real-valued IRNNs are capable of super-Turing computations.