Fuzzy cognitive modeling: Theoretical and practical considerations

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Fuzzy cognitive maps (FCMs) are knowledge-based neural systems comprised of causal relations and well-defined neural concepts Since their inception three decades ago, FCMs have been used to model a myriad of problems Despite the research progress achieved in this field, FCMs are still surrounded by important misconceptions that hamper their competitiveness in several scenarios In this paper, we discuss some theoretical and practical issues to be taken into account when modeling FCM-based systems Such issues range from the causality fallacy and the timing component to limited prediction horizon imposed by the network structure The conclusion of this paper is that the FCM?s theoretical underpinnings need to be revamped in order to overcome these limitations Closing the gap between FCMs and other neural network models seems to be the right path in that journey.

Complex systems

Fuzzy cognitive maps

Interpretability

Neural cognitive modeling

Simulation

Fuzzy inference

Fuzzy neural networks

Fuzzy rules

Knowledge based systems

Large scale systems

Cognitive model

Fuzzy cognitive map

Fuzzy cognitive maps (FCMs)

Interpretability

Network structures

Neural network model

Prediction horizon

Simulation

Cognitive systems