Language Development and Growing Spanning Trees in Children Semantic Network

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Abstract : In this study, we target to exploit Maximum Spanning Trees (MST) of children's semantic networks to investigate their language development. To do so, we examine the graph-theoretic properties of word-embedding networks. The networks are made of words children learn prior to the age of 30 months as the nodes and the links which are built from the cosine vector similarity of words normatively acquired by children prior to two and a half years of age. These networks are weighted graphs and the strength of each link is determined by the numerical similarities of the two words (nodes) on the sides of the link. To avoid changing the weighted networks to the binaries by setting a threshold, constructing MSTs might present a solution. MST is a unique sub-graph that connects all the nodes in such a way that the sum of all the link weights is maximized without forming cycles. MSTs as the backbone of the semantic networks are suitable to examine developmental changes in semantic network topology in children. From these trees, several parameters were calculated to characterize the developmental change in network organization. We showed that MSTs provides an elegant method sensitive to capture subtle developmental changes in semantic network organization.

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