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Classifying Between Congenitally Blind and Sighted Adults with Natural Language Processing Features Using Support Vector Machine

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Abstract

Semantic memory, the capacity to store and retrieve conceptual knowledge, is central to cognitive science. A key debate concerns how sensory experience shapes conceptual processing and whether semantic representations require sensorimotor simulation. To test this, we trained a Support Vector Machine classifier on natural language features from a Property Listing Task. Recursive Feature Elimination with Cross-Validation selected six optimal features. Univariate analysis revealed no significant differences between congenitally blind and sighted groups for any feature ($p > 0.05$). Classifier F1-scores did not differ significantly from chance ($p = 0.26$). However, prediction errors for the six-feature classifier were asymmetric. Accuracy for predicting blind participants (0.31 ± 0.31) did not differ from chance ($p = 0.508$), whereas accuracy for sighted participants (0.80 ± 0.18) was significantly above chance ($p = 0.029$). This pattern supports greater semantic heterogeneity in congenitally blind individuals and shows how classification errors can reveal structure in conceptual knowledge.