

THE EMERGENCE OF COMBINATORIALITY IN THE CULTURAL TRANSMISSION OF POP SONGS IN A CHILDREN'S GAMESHOW

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One of Hockett's (1960) design features of language, duality of patterning, says that the speech stream is composed of meaningful recombinable units (compositionality), which themselves are composed of meaningless recombinable units (combinatoriality). Kirby, Cornish, and Smith (2008) have shown that compositional structure can emerge under the iterated learning paradigm. Recent work by Verhoef (2012) has suggested that iterated learning can also explain the emergence of combinatorial structure. However, it would be useful to have more data to support this claim.

Copycats is a children's gameshow produced by the BBC in which two teams compete in games based on Chinese Whispers (also known as Broken Telephone). In one of the games, the teams must pass along a pop song from one team member to another by imitating it using a plastic kazoo, a simple musical instrument. The team is awarded points based on how far the members manage to transmit the song. This game has clear parallels with iterated learning and shares similarities with Verhoef's (2012) experimental setup. Since 2009, 156 episodes of *Copycats* have been broadcast, potentially yielding data for 1,560 players. This kind of sample size is unparalleled by current lab-based experiments, so the gameshow provides a good opportunity to further study iterated learning, albeit without the control that lab-based experiments provide.

Data has been collected from 100 episodes of the show for a total of 200 diffusion chains of 5 players each. The methods used to analyse this dataset follow Verhoef (2012). Learnability is measured by taking the Derivative Dynamic Time Warping (Keogh & Pazzani, 2001; Sakoe & Chiba, 1978) distance between consecutive players' songs. Combinatoriality is measured by clustering the segments of a song into building blocks and then calculating the song's entropy (Shannon, 1948). This estimates the compressibility of the song, which is assumed to indicate the level of combinatorial structure.

The results substantiate the findings of Verhoef (2012). The learnability of the songs tends to increase with each iteration. Furthermore, the level of com-

binatorial structure in the songs also increases, supporting the idea that iterated learning can offer a cultural evolutionary explanation for the origins of combinatoriality. Although there are several benefits to using this dataset, this presentation also considers its various limitations, including the lack of experimental control, the short length of the chains, and the fact that chains are initiated with material that is already structured. Suggestions for other ways in which the dataset could be analysed under the iterated learning framework are also discussed.

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