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Identifying the visual features of European Paleolithic cave art that are diagnostic of object category and time period

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Abstract

Humans in the Upper Paleolithic period were among the earliest people to produce figurative art. Analyzing variation across works of art from this period could provide insight into the distinguishing features of various *technocomplexes*—cultures defined by different use of stone-working technologies. Here we analyzed 140 Paleolithic cave paintings of animals found in four cave sites in Monte Castillo, Spain. Using all available evidence, archaeologists determined what kind of animal was depicted in each painting (Horse, Bison, Deer, or Ibex) and which time period it was from (Gravettian, Solutrean, or Magdalenian). We used multiple vision algorithms (ResNet-50, ViT, SigLIP2) to investigate to what degree their visual properties alone were sufficient to distinguish depictions from different time periods, cave sites, and spatial contexts within each cave. Our findings highlight the promise of such tools for analyzing variation in cultural artifacts across the Paleolithic period.