Can visual salience help predict economic decisions?

You are riding your bike to work and with your peripheral vision you see on the sidewalk a man wearing a yellow suit. In all likelihood, you spontaneously turn your head to look at his unusual clothes and at the bright red shoes he is wearing, notwithstanding the danger of paying less attention to the traffic ahead. In our everyday life, while carrying out an important goal, we are often distracted by conspicuous "bottom up" visual stimuli that stand out due to their unusual color, shape, orientation etc. Can such visual cues influence economic choice? Not in standard economic theory, in which tastes are based on the intrinsic properties of a good or an action. Yet, selling strategies and marketing campaigns often seem to leverage on this force, using color and other visual features to attract consumers' attention to certain qualities of a product.

At the IGIER seminar of October 19th, Colin Camerer from the Caltech, a pioneer in economics and psychology, illustrated a research program based on measuring visual attention and in using such measurement to predict economic choices. He focused on how visual salience can shape individual decisions in strategic situations. In a nutshell: Visual perception meets game theory.

In the eighties, Nobel prize winner Thomas Schelling argued that salience may play an important role in coordination games. Coordination games are pretty simple: you want to choose the same strategy of the other player – and vice versa – but there is no opportunity for the players to communicate, which makes the problem difficult. To give an example, imagine you and your friend decided to meet at 6 pm in Piazza Duomo in Milan but you have not managed to pick an exact location (e.g. because your mobile phone died). Where should you go? This is a coordination game: you and your friend "win" by independently picking the same location. Of course, the problem is that there are many such possible locations. Which one do you choose? Here salience turns useful: you would probably choose to go in front of the Duomo, because it is a salient, conspicuous spot. In fact, it is so for both you and your friend, which makes it a good candidate as a place where to meet.

The research by Camerer and Li seeks to put predictive content in this theory. Can we predict, in *any* situation, where two players will choose to meet (say, when consulting a map) based on an independent measurement of the visual salience of a certain location? To test this idea, they run an experiment online and in the laboratory in which subjects play coordination (and other) games. They have to independently choose locations in an image shown on a computer screen. In textbook game theory, any location on the image is a candidate Nash equilibrium. Camerer and his collaborator take a different route. They use a Saliency Attentive Model (SAM) algorithm developed, among others, by researchers at the University of Modena and Reggio Emilia. This algorithm takes an arbitrary image as an input and predicts, based on the working of human visual attention, where people's free gaze will look at. This algorithm has not been constructed for the games Camerer and collaborators are interested in. It is instead constructed to capture general properties of visual salience on the basis of color, contrast, orientation or intensity.

Camerer and collaborators then ask: are the locations determined to be visually salient by the SAM algorithm also those that are chosen by players as places "where to meet"? Can visual salience improve predictability relative to Nash equilibrium? The answer is yes. In the Nash Equilibrium, the matching probability in the visually salient location is around 7%, but in reality

players coordinate on it roughly 64% of the times! The SAM algorithm is a good tool to predict where people's gaze is directed, and this in turn helps us better predict strategic behavior.

In this simple task visual salience helped both players to reach a better outcome, but what happens in different games? To answer this question, Camerer and Li studied also hide and seek games. In these games players must again independently choose locations on an image. However, now the seeker wins if he chooses the same location of the hider, but the hider wins if he manages to avoid the seeker. Standard game theory tells us that the best strategy for all players would be to pick any spot at random. The probability of a match, which in this case means the seeker winning, is then again 7%. What Camerer and Li found is that in the data the matching rate is higher, equal to 9%. This is because both the seekers and the hiders tend to pick the visually salient location more often than according to Nash. Here visual salience does not benefit everybody: it helps the seeker but it hurts the hiders.

The overarching theme of this research is that: 1) our choices are influenced by somewhat irrelevant factors like colors and position, and 2) this influence can be systematically predicted using visual salience measures developed in the cognitive sciences. This research can shed light on important real-world phenomena. Many studies show how politicians or marketing campaigns judiciously choose how to place products in a website, or how to design a label, or how to present an election candidate, in order to direct our attention to the most desirable attributes, increasing sales and votes. As in the hider seeker game, this may come to the benefit of some and the detriment of others. But visual salience can also be used to improve choices, playing a beneficial role as in coordination games. For instance, visual salience could be used to place structure and predictive content on Nudges, helping people pick healthier food in a canteen or increase participation in health screening programs. As more studies on visual salience are done, broader and exciting applications can be discovered.

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