Devious ways at card games

Separating signal & noise at the bridge table

A typical hand. Seven tricks are in sight – 1 in spades, maybe 2 in hearts, maybe 1 in clubs and possibly 3 in diamonds. Depending on the lie of cards, 1 heart trick, the club trick and 1 diamond trick may not materialise. We need to include the partner's strength and if spades are the 'trumps', we could beat the opponents' strength in clubs. 10 tricks are possible, but it would help if we could guess who holds the missing aces of hearts and clubs, and the king of diamonds.

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Some games are contests of motor skills and there are others that rely on strategy. Games like cricket, football or tennis do have elements of strategy, but they are mainly contests of motor skill. Chess and some card games are different. They involve no motor skill, but they call for thinking and reasoning, to evaluate and overcome an opponent's strategy.

The *New York Times* reports a case in the world of competitive bridge, where there are allegations of cheating against a team that has notched up an impressive record of wins. In motor sports, circumstances that give a participant an advantage is easily detected. But what could be a form of malpractice in contests that are said to be of mental ability? The *NYT* story relates how a strategy of "separating signal from noise" and statistical analysis could follow up on the allegations.

In the world of chess, there have been instances where players in world championships took the help, while playing, of advisers, or even computers. When such a thing happens, or is suspected, we are dealing with a gross violation of the player being assisted during the game by a physically separate entity. But what could be a case of cheating in bridge?

Bridge is a game where a pack of cards is dealt to four players, in two teams, and there is a sequence of play of a card by each player, according to the rules of the game. The specific cards that are played, each time, decide which side wins that play, and the game is to see whether a side, which won the contract to score a certain number of wins, succeeds or fails. The complexity arises from the contract having to be auctioned and won with each player having seen only her own cards, and then, for most of the game, half the cards staying concealed (the partner of the player who wins the contract opens out her hand once the opponents play the first card).

Each play of cards by the four players is called a 'trick" and with 52 cards in the pack, there are 13 of them. Each player bids for her side to win the greater part of the tricks, and the contract goes to the highest bidder when rounds of bidding stop. The process of bidding is itself a means to communicate the strength of the bidder's hand — and the bidding convention used by a team is formally conveyed to the opposite side. And again, during the play, the cards a player chooses to throw down, when tricks are won or lost, are legitimate means, known equally to the opponents, to convey or conceal information.

Cheating in bridge would be when a player communicates information by other methods. It could be by physical indications, like a twitch, a hand gesture, facial gesture, and so on. Or it could be by an undisclosed convention of bidding or play. The first kind could be prevented by physical blinds that separate players. As for the second, it must be detected when a side consistently does better, in uncertain situations, than was statistically possible within the rules — followed by analysis of the bids and cards led or discarded, to find correlation with the lie of cards.

Cheating at cards is obviously more common when the game is played for stakes of money. Bridge is a game where a score is kept, and hence can be played for money. But there are other games, like poker, or "flash" (the Indian, three-card variety), blackjack or canasta, which are played almost always for money. In the James Bond novel, the character Goldfinger claims that he has a problem facing open spaces, and when playing in the lawn outside the hotel, chooses always to face the hotel. The opponent hence plays with his back to the hotel. When one such opponent was consistently losing money, James Bond reasoned that the secret lay in the position of the players, and discovered an accomplice in the hotel room, who viewed the opponent's cards through a telescope, and passed hints to Goldfinger.

In games like poker or canasta, it is admittedly chance, or luck, that decides the winner. The skills of professionals hence lie in avoiding any show of emotion (the "poker face") or in psychologically inducing the opponent to misread the value of cards, her own, or the ones that she cannot see. And as further aids, players could use trick methods of shuffling or dealing cards, marking the cards, and so on, to turn the odds in their favour.

Competitive bridge, in contrast, eliminates the value of the hand that a player has been dealt. In this method, the real opponents of a team are not the pair they are sitting with at the table, but another pair, at another table. The hands dealt at the first table are preserved, as they were dealt, and shuffled, to conceal the order in which they fell. And the same hands are used at the second table. It is the pair at the other table, with the same hand, that each pair is playing against. And the objective is not to win more tricks than or to limit the tricks of the opponents at one's own table, but to do better than the other pair, which has the same cards.

In this sense, the money incentive to beat chance and win does not feature in competitive bridge. The greater complexity of bridge, with no role of demeanour, psychology, etc., however, makes the field highly competitive, and there is prestige in being champions. There are also sponsors who incentivise teams, and there are not a few instances of players resorting to different methods, to narrow the uncertainty of the lie of cards and hence the best line of play.

The *NYT* story is about Fulvio Fantoni and Claudio Nunes, players from Italy, who had been ranked one and two by the World Bridge Federation. Now, bridge has an element of uncertainty and the players' skill lies in finding the play for the highest probability of a win. The success of Fantoni and Nunes, however, appeared to be better than was possible with skill alone. For instance, when the bidding suggests that a particular player has high cards in a suit, the play with the higher probability of success is when this player is made to play her high card, or a low card, before others. But when a team is seen to play in the opposite way, and is seen to succeed, consistently, it looks like the team had extra information.

In 2014, the *NYT* story says, video recordings of the European Bridge Championships were publically uploaded. Maaijke Mevius, a physicist in the Netherlands, had heard reports about Fantoni and Nunes. She was not a bridge expert, but she thought her training as a scientist could help her notice features that expert analysts had missed. As video recordings capture a great many movements of the players, detecting the instances where information is being passed is challenging. But Mevius' scientific work, which involved distinguishing "signal from noise" in a lab setting, helped her classify the information that the video recordings contained.

And her review brought it out that when Fantoni or Nunes played a card, they did not place the card on the table with the same orientation all the time, but there was a pattern. She shared this with Boye Brogeland, a Norwegian who had a record of detecting malpractice in bridge. A group of experts then got to work and with the help of statistical analysis, they discovered the code that certain ways of placing the cards — for example, vertically or horizontally — passed information, whether the player had an honour card whose location was uncertain, for instance which helped the partner make the correct play!

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PLUS POINTS

Insightful research

Various governments across the world have declared climate emergencies in recent years, but do they help, or can they also have drawbacks?

This was the question posed by a global team of researchers, who sought to investigate the pros and cons of declaring climate emergencies. In the wake of recent climate disasters, such as the wildfires that ravaged Australia, Hurricane Ida in the United States, and severe flooding across Europe, more and more governments have declared climate emergencies. Over 2,000 local governments and 20 national parliaments worldwide have decided upon the measure, and it is expected that more will follow.

That said, the University of Sheffield, alongside researchers from the universities of Utrecht, Sussex, Oslo, and the Australian National University, as well as the Manipal Academy of Higher Education, found that in declaring climate emergencies, governments could actually be alienating people from taking action on climate change, as they become desensitised to the issue and may begin to feel fearful and guilty, instead of being empowered to change things.

Furthermore, there are fears that emergency frames could be used by governments to curtail people's freedoms and clamp down on political debates, but so far this has not been seen. By reviewing previous studies into the effects of declaring states of emergency, the researchers were able to look at the impacts of emergency frames around the world, and what they mean for individual societies.

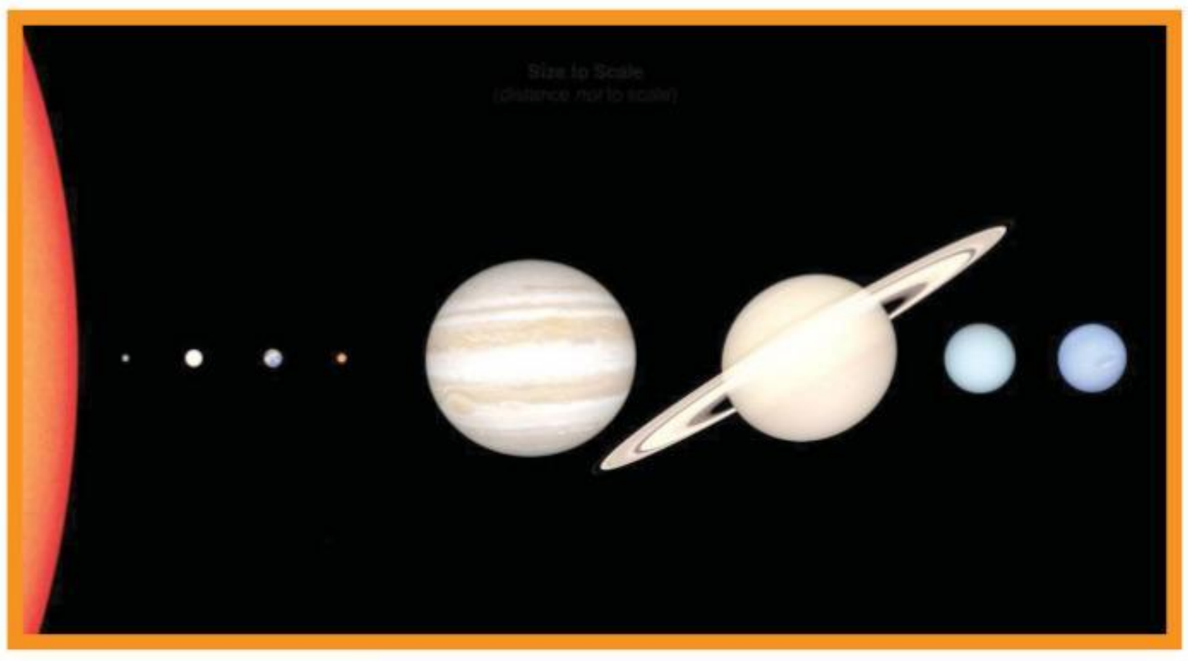
It wasn't only negative outcomes that were found though — the researchers discovered that emergency frames can help to focus public attention on an issue and build support for action. For example, the Fridays for Future movement and global trend of school strikes, inspired by Greta Thunberg, has been an influential factor contributing to the adoption of climate emergency declarations by local authorities.

It is hoped that the findings, published in *Nature Sustainability*, will help to inform governments on the pros and cons of declaring such emergencies, with the researchers calling for climate emergencies to be just "one tool in the kit" alongside other measures that support meaningful action to help tackle climate change.

Linda Westman from the Sheffield Urban Institute, University of Sheffield, said, "Historically, governments have sometimes used states of emergency as tools of oppression and even violence. There is a concern that these could be used to legitimise different forms of state control. We have, however, found no evidence of that in relation to climate emergencies so far."

MOVING AWAY TO SEE CLEARLY

A small telescope past Saturn could solve some mysteries of the universe better than giant telescopes near Earth



Dozens of space-based telescopes operate near Earth and provide incredible images of the universe. But imagine a telescope far away in the outer Solar System, 10 or even 100 times farther from the Sun than Earth. The ability to look back at our Solar System or peer into the darkness of the distant cosmos would make this a uniquely powerful scientific tool.

I'm an astrophysicist who studies the formation of structure in the universe. Since the 1960s, scientists like me have been considering the important questions we might be able to answer with a telescope placed in the outer Solar System.

So, what would such a mission look like? And what science could be done?

A tiny telescope far from home

The scientific strength of a telescope far from Earth would come primarily from its location, not its size. Plans for a telescope in the outer Solar System would put it somewhere beyond the orbit of Saturn, roughly a billion or more miles from Earth.

We'd need only send a very small telescope — with a lens roughly the size of a small plate — to achieve some truly unique astrophysical insights. Such a telescope could be built to weigh less than 20 pounds (nine kilograms) and could be piggybacked on virtually any mission to Saturn or beyond.

Though small and simple compared with telescopes like Hubble or James Webb, such an instrument operating away from the bright light of the Sun could make measurements that are difficult or outright impossible from a vantage point near the Earth.

Outside looking in

Unfortunately for astronomers, getting a selfie of the Solar System is a challenge. But being able to see the Solar System from an outside vantage point would reveal a lot of information, in particular, about the shape, distribution and composition of the dust cloud that surrounds the Sun.

Imagine a street lamp on a foggy evening — by standing far away from the lamp, the swirling mists are visible in a way that someone standing under the streetlight could never see.

For years astrophysicists have been able to take images of and study the dust discs in solar systems around other stars in the Milky Way. But these stars are very far away, and there are limits to what astronomers can learn about them. Using observations looking back toward the Sun, astronomers could compare the shape, features and composition of these distant dust clouds with detailed data on Earth's own Solar System. This data would fill gaps in knowledge about solar dust clouds and make it possible to understand the history of production, migration and destruction of dust in other solar systems that there is no hope of travelling to in person.

Deep darkness of space

Another benefit of placing a telescope far from the Sun is the lack of reflected light. The disc of dust in the plane of the planets reflects the Sun's light back at Earth. This creates a haze that is between 100 and 1,000 times brighter than light from other galaxies and obscures views of the cosmos from near Earth. Sending a telescope outside of this dust cloud would place it in a much darker region of space making it easier to measure the light coming from outside the Solar System.

Once there, the telescope could measure the brightness of the ambient light of the universe over a wide range of wavelengths. This could provide insights into how matter condensed into the first stars and galaxies. It would also enable researchers to test models of the universe by comparing the predicted sum of light from all galaxies with a precise measurement. Discrepancies could point to problems with models of structure formation in the universe or perhaps to exotic new physics.

Into the unknown

Finally, increasing a telescope's distance from the Sun would also allow astronomers to do unique science that takes advantage of an effect called gravitational lensing, in which a massive object distorts the path light takes as it moves past an object.

One use of gravitational lensing is to search for and weigh rogue planets — planets that roam interstellar space after being ejected from their home solar systems. Since rogue planets don't emit light on their own, astrophysicists can look for their effect on the light from background stars. To differentiate between the distance of the lensing object and its mass requires observations from a second location far from Earth.

In 2011, scientists used a camera on the Epoxi mission to the asteroid belt to discover and weigh a Neptune-sized object floating free among stars in the Milky Way galaxy. Only a few rogue planets have been found, but astronomers suspect they are very common and could hold clues to the formation of solar systems and prevalence of planets around stars.

But perhaps the most interesting use for a telescope in the outer Solar System would be the potential to use the gravitational field of the Sun itself as a giant lens. This kind of measurement may allow astrophysicists to actually map planets in other star systems. Perhaps one day we will be able to name continents on an Earth-like planet around a distant star.

Coming soon?

Since Pioneer 10 became the first human-made object to cross Jupiter's orbit in 1973, there have been only a handful of astrophysical studies done from beyond the orbit of Earth. Missions to the outer Solar System are rare, but many teams of scientists are doing studies to show how an extra-solar telescope project would work and what could be learned from one.

Every 10 years or so, leaders in the astrophysics and astronomy fields gather to set goals for the following decade. That plan for the 2020s is scheduled to be released in November. In it, I expect to see discussions about the next telescope that could revolutionise astronomy. Taking a telescope to the outer Solar System, while ambitious, is well within the technological ability of the National Aeronautics and Space Administration or other space agencies.

I hope that one day soon a tiny telescope out on a lonely mission in the dark reaches of the Solar System will provide us incredible insights into the universe.

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New norm

The fingerprints of climate change have been detected in two extreme weather events this year, the World Meteorological Organisation said recently.

The heatwave that fried North-west United States in June and July would have been "virtually impossible without climate change", said the WMO in its State of Climate 2021 report issued at the start of the United Nations Climate Conference COP26.

Similarly, the floods that inundated western Europe in July and killed almost 200 people, along with leaving many more unaccounted for, were made more likely by climate change, said the UN agency.

WMO secretary-general Petteri Taalas said extreme events are the new norm. "There is mounting scientific evidence that some of these bear the footprint of human-induced climate change," he said. Taalas said that at the current rate of increase in greenhouse gas concentrations, temperatures by the end of this century would increase beyond targets set out under the Paris Agreement.

The WMO said in its latest report that the last seven years, including 2021, are on track to be the seven warmest on record. The assessment was based on data for the first nine months of 2021.

— The straits times/ann