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Software can now beat any human player at poker

12:41 09 January 2015 by [Bob Holmes](#)

Poker aficionados have been pondering the best strategies ever since the card game was invented. Now along comes the perfect exponent, one who knows all the optimal plays and so always wins in the long run – or so its makers claim.

The unbeatable player is a piece of software created by computer scientists at the University of Alberta in Edmonton, Canada. They say they have worked out the ideal strategy for a particular form of the game. The work could have applications to real-world situations in which people try to achieve preferred outcomes – including auctions and tightened security for air travel.



The software could mean better approaches to auctions are on the cards (Image: Eric Robison/Alamy)

Poker is a popular test bed for artificial intelligence research because, unlike games like chess or checkers, each player holds cards that other players cannot see. "The whole interesting part of the game comes from the fact that you don't have perfect information," says [Michael Bowling](#), a member of the team that devised the new software.

For several years now, poker-playing programs – including others Bowling has created – have been able to hold their own with the best human players, but no program has been powerful enough to sift through all the possible scenarios and select the absolute best play in every case.

Subtle boost

Until now, say Bowling and his colleagues. They took their previous best program, named Polaris, and made a subtle change to the way it learns from experience. The new version is more willing to make plays that had failed in the past but might still work if they form part of a bigger, more sophisticated strategy. They also fine-tuned it by optimising its use of disc space and memory.

Together, these tweaks made the new program, Cepheus, about a thousand times quicker, giving Bowling's team enough power to compute the perfect strategy for every possible situation in the two-player poker variant known as Heads Up Limit Hold 'Em. They have shown that no alternative would reliably come out ahead over a human lifetime's worth of playing.

Bowling's strategy doesn't demystify poker in such a way as to kill people's interest in the game. For one thing, the algorithms amount to 12 terabytes of data, so they're not something a human player could pore over in a weekend (or a lifetime). Players can, however, practise against the computer or querying it about particular scenarios; indeed, Bowling's team has a [public website](#) – one of many such training sites – where anyone can do just that.

Phil Laak, a professional player who has competed against computers, points out that most poker games involve more than two players and often have no betting limits. This makes the games far harder to analyse, he says.

Flight security

Bowling's techniques should prove helpful in real-world situations where parties have incomplete

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information. Milind Tambe at the University of Southern California in Los Angeles has developed software that assigns air marshals to flights in a way that terrorists cannot predict, while giving maximum protection to flights deemed most vulnerable. The software makes several simplifying assumptions, so Bowling's approach could help in building a more realistic approach, says Tambe.

Similarly, telecommunications companies bidding for newly available radio frequencies need a strategy to get enough bandwidth for least cost. "No one knows the rational way of bidding in a typical spectrum auction," says [Tuomas Sandholm](#) at Carnegie Mellon University in Pittsburgh, Pennsylvania.

Again, software may hold the answer. "If you're in a high-stakes domain like cybersecurity or auctions where billions are on the line, it would be really nice to know that you're playing optimally instead of just doing a really decent job," says Sandholm.

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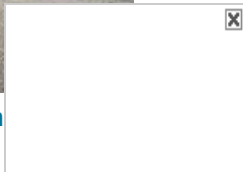
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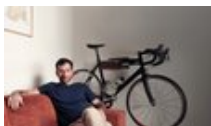
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