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Hints of the future?

Mining the next big thing

Patent citations could help predict where technology is headed

HORIZON scanning. Strategic prediction. Futurism. Whatever you call it, companies need to anticipate the next hot technologies ahead of time or they will be beaten to the punch by more agile competitors. But what's the best way to do it?

Usually the answer is to pore over societal, environmental, technological and economic trends and come up with a forecast of which technologies will be in high demand. Now futurists may be getting a new tool that automatically helps them predict emerging technologies, thanks to an innovative data-mining technique.

Developed by Péter Érdi at the Hungarian Academy of Sciences in Budapest and colleagues, it works by analysing the frequency with which patents are cited by other patents. Each new filing is required to cite previous inventions, or prior art, that the new idea builds upon.

Plotting how the frequency of these citations changes over time shows that patents can be grouped into related clusters. These clusters evolve, sometimes branching into new disciplines, sometimes merging with one another.

Érdi's team have written software that not only charts this evolution, but

also hits the fast-forward button on the rate and type of citations to help predict whether existing technological fields can combine or diverge to create new areas of innovation.

"Patent citation data seems to be a gold mine of new insights into the development of technologies, since it represents the innovation process," says Érdi. They tested their algorithm on old data from the US Patent and Trademark Office's "agriculture, textiles and food" category of inventions and found that it predicted

> **"Patent data seems to be a gold mine of insights into the development of new technologies"**

the emergence of a field recently created to cover nonwoven textiles – fabrics whose fibres are squeezed or forced together, often using solvents as bonding agents.

Using old data to predict the new has its risks, though. Had the team's method existed during the internet boom of the 1990s, for example, it might have predicted that a hot topic among filings at the time – business method patents – indicated an emerging field of technology. Not so.

The influx of patents was shortlived, reflecting the fact that companies were figuring out how to do business online – with ideas too similar to prior offline methods, or just plain obvious.

"Our methodology provides just one way to extract information from this patent data mine," says Érdi. "We hope to convince companies to use our methods to solve their specific problems." In making innovation slightly more predictable, they hope to take some of the risk out of futurism.

They will have their work cut out, says Sheryl Connelly, futurist at the Ford Motor Company in Dearborn, Michigan. Because companies using the system would be seeking clusters of new invention types, she says, they would be running with the pack, rather than going it alone with standout, exclusive innovations.

Connelly concedes that the technique may have a place in the forecaster's armoury. "It sounds like a great antenna for what is happening in the marketplace, and the kind of discussions people are having," she says. "But I would caution anyone from ever relying on a single source like patents, even if it seems a good predictor of what's on the horizon." **Paul Marks** n

AI football manager picks a winning team

IS YOUR Euro 2012 fantasy football team sliding down the league at an alarming rate? If you thought Chris from the office was hard to beat, watch out – soon you might be competing against a computer.

Sarvapali Ramchurn, a computer scientist at the University of Southampton, UK, and colleagues have developed an artificial football manager that ranks in the top 1 per cent of the 2.5 million players on the official English Premier League fantasy football game.

The AI manager evaluates players' previous performance statistics to predict how many points they will receive during the forthcoming week. It then picks a squad that will maximise the expected fantasy-football score while adhering to the rules of the game, such as how much it costs to buy or exchange a player.

Humans do the same, of course, but the AI manager goes into more depth than even the most dedicated fantasy football player. "It cares about every single decimal point," says Ramchurn. The AI also plans weeks ahead, so it can take into account the impact its decisions will have in the future. "Just like Garry Kasparov playing chess against Deep Blue, it was about the machine being able to look ahead many more moves than the human," he adds. Jacob Aron n

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