Programming regret for Google: Scientists give computers 'hindsight' to anticipate the future

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Human beings are well aware that hindsight is 20/20 -- and the product of this awareness is often what we call "regret." Could this hindsight be programmed into a computer to more accurately predict the future? Tel Aviv University computer researchers think so -- and the Internet giant Google is anxious to know the answer, too.

Prof. Yishay Mansour of Tel Aviv University's Blavatnik School of Computer Science launched his new project at the International Conference on Learning Theory in Haifa, Israel, earlier this year. His research will help computers minimize what Prof. Mansour calls "regret." Google recently announced that it will fund Tel Aviv University [computer scientists](#) and economists to develop this foundational research, a nexus on the cutting edge of [computer science](#) and [game theory](#).

"If the servers and routing systems of the Internet could see and evaluate all the relevant variables in advance, they could more efficiently prioritize server resource requests, load documents and route visitors to an Internet site, for instance," Prof. Mansour says — an efficiency that Google finds very attractive.

Helping computers think better

Of course computers can't "feel" regret — but they can measure the

distance between a desired outcome and the actual outcome. Prof. Mansour recently developed an algorithm based on machine learning, or "artificial intelligence," to minimize the amount of virtual regret a computer program might experience.

"We are able to change and influence the decision-making of computers in real-time. Compared to human beings, help systems can much more quickly process all the available information to estimate the future as events unfold — whether it's a bidding war on an online auction site, a sudden spike of traffic to a media website, or demand for an online product," says Prof. Mansour. Google hopes to use the research to improve its own online technologies and businesses, such as its AdWords and Adsense advertising platforms.

Prof. Mansour adds that his algorithm will adapt to the situation at hand. Since Internet users, people, are not predictable, the algorithm in effect can study and "learn" as it is running. After the task is finished, the results are "almost as if you knew all the variables in advance," says Prof. Mansour.

The academics of Internet advertising

Tel Aviv University is highly specialized in the type of research that most interests Google, and the "regret" project strengthens existing ties between the university and the Internet giant. TAU's Prof. Mansour and Prof. Noam Nisan of Hebrew University will head the 20-person team working with Google, which includes eight Tel Aviv University scientists. The head of Google Israel is Prof. Yossi Matias, a Tel Aviv University faculty member.

Academic input in algorithmic game theory and algorithmic mechanism design will greatly benefit the industry, Google hopes. "We are asking how we can give incentives to get bidders and buyers in the auction to

behave intelligently, by understanding the dynamics of the auction process," says Prof. Mansour.

Provided by Tel Aviv University

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