

Rational or Random? Model Shows How People Send E-Mails

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Luís Amaral. Photo by Andrew Campbell

In the last 10 years, e-mail has gone from a novelty to a necessity. What was once a pastime is now an essential form of communication, with many people opening their inboxes to find dozens of e-mails waiting.

But how do people respond to those e-mails? Do they act rationally, responding to the most important first, making sure the process is efficient? Or do they send e-mails randomly, when they are at their computers or when they have time, without any regard to efficiency?

These are questions that Luís Amaral, associate professor of chemical

and biological engineering in the McCormick School of Engineering and Applied Science at Northwestern University, and his collaborators set out to answer. After studying e-mails sent and received from more than 3,000 e-mail accounts at a European university during a three-month period, they created a mathematical model that shows people send e-mail randomly, but in cycles.

The findings are published online by the *Proceedings of the National Academy of Sciences*.

Amaral said he was inspired to create such an e-mail model after a recent paper said that the rational model -- where people respond to e-mails in the most efficient way -- was the correct model.

"I was not convinced, since I don't do it in a rational way," he said. But if a random model was correct, there would be a typical interval between e-mails -- which, when Amaral looked at the data, wasn't the case. He wondered if it was possible for people to send e-mail randomly but still have non-random intervals where they didn't send e-mail.

The answer, it turned out, was fairly simple: People don't send e-mails when they are sleeping.

"During the day, you send e-mails, but then you go home, or go away for the weekend, and you don't send e-mails," he said. "These data were from a few years ago, and in Europe, this was especially the case, since many people didn't have the Internet at home."

The result was a model in which people send e-mails at random, but the probability of them sending e-mails during a given period depended on what that period was. If it was in the middle of the night, the probability was near zero. If it was during the weekend, the probability was much lower than during weekdays.

"The model explains all the data, and it shows that people have cycles in which they use certain services," Amaral says. "You can then make predictions based on those cycles to know when people are going to request a service. Even though it's random, there are peaks in demand that don't look random."

Other businesses and services could use such a model.

"If you know how people access that service, you can better plan how much capacity you need, when you need it, and how to best engineer your system to supply that capacity," Amaral said. "It also teaches you how to interact with the system -- a good time to send an e-mail is just about the time that the person has arrived at work."

Source: Northwestern University

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