A Physicist Turned Fraud Detective

Renate Pazourek develops software tools that Austrian government agencies use to audit tax returns and other financial documents.

By **Rachel Berkowitz**

Renate Pazourek's day job detecting financial fraud in official documents for the Austrian government is a world apart from the one she had in academia exploring attosecond physics. Pazourek says she enjoyed her time as a postdoctoral researcher at the Vienna University of Technology and then Louisiana State University simulating the interactions between short pulses of light and atoms such as helium. "When you do theory, and other people do experiments, and it all fits together, that's a very nice thing," she says. But a desire to broaden her mind and return to Vienna—her hometown—required that she look for jobs outside of her increasingly niche specialization of physics research.

Now, instead of spending her days writing simulation code to clock the ultrafast emission of electrons from atoms, Pazourek develops machine-learning-based software that can sniff out potential fraud in financial documents. *Physics Magazine* chatted with Pazourek about her nonacademic career path and about how physics students can keep broad their future career options.

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All interviews are edited for brevity and clarity.

What exactly is fraud detection?

In the context of my work, fraud detection involves the real-time examination of the correctness of tax returns, customs documents, or any other financial document that a government institution wants checked. For that, we develop risk-analysis systems. Think of credit card payments: For each payment, an automated system checks if the payment is legitimate. These checks involve analyzing patterns in previous payments, for example. In the case of a business filing a tax return, it is also helpful to have an efficient way to select a case for audit. The software I have helped develop assists in this process, for example, by flagging tax returns that have a high likelihood of being fraudulent. A person can then jump in and audit those documents.

How is this flagging done?

We use what's called predictive analytics, which involves using historical data of a system to predict future outcomes of that system. The historical data—past tax returns, for example—are used to create mathematical models that are then applied to current data. The future behavior is then what a company's next tax return should look like.

A challenge I frequently deal with is poor data quality, which can limit the effectiveness of the models we use. Examples are incomplete documents or database entries, mismatches, and errors introduced when data are entered manually to a central

system. One of the key ways to deal with these kind of errors is to have a robust data preparation process.

How did your physics background prepare you for this job?

I don't need to numerically solve differential equations anymore, nor do I need to know the laws of physics, but I do use the soft skills I developed during graduate school, as well as some of the theoretical tools I worked with. For example, a skill I use frequently is translating a problem from a conceptual idea to a quantifiable tool, as well as tackling a problem with an interdisciplinary team. As a student, I didn't realize that I was developing these soft skills, or how important they are.

What other soft skills do you use?

Initially, I got the job at the Federal Computing Centre by demonstrating my skills in analytics and data science. I now have a management position. The role has a social component—interacting with colleagues to set up projects, for example—so good communication skills are key.

Any thoughts for students interested in making a similar move out of academia?

You won't be developing the fanciest algorithms! For the software that I help develop, the most important thing is that the whole system works together, and we make sure security requirements and ethics standards are met. An experienced colleague once told me that what matters is not to have the perfect solution but to solve the right problem. That's a rule I find to be true in my work.

How do you feel about having left academia behind?

I'm in a field that is very much growing, and my work never gets boring, which is something that I like very much. And although I've left academia, perhaps I haven't really left physics behind: After all, this year's **Nobel Prize in Physics** went to two scientists for their work on machine learning.

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