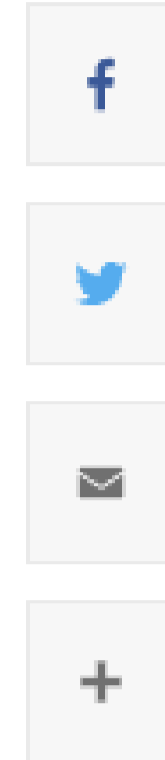


Programming tool turns handwriting into computer code

By [Louis DiPietro](#), Cornell Ann S. Bowers College of Computing and Information Science

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A Cornell team has created an interface that allows users to handwrite and sketch within computer code – a challenge to conventional coding, which typically relies on typing.

The pen-based interface, called Notate, lets users of computational, digital notebooks – such as [Jupyter](#) notebooks, which are web-based and interactive – to open drawing canvases and handwrite diagrams within lines of traditional, digitized computer code.

Powered by a deep learning model, the interface bridges handwritten and textual programming contexts: Notation in the handwritten diagram can reference textual code and vice versa. For instance, Notate recognizes handwritten programming symbols, like “n,” and then links them up to their typewritten equivalents. In a case study, users drew quantum circuit diagrams inside of Jupyter notebook code cells.

The tool was described in “[Notational Programming for Notebook Environments: A Case Study with Quantum Circuits](#),” presented at the ACM Symposium on User Interface Software and Technology, held Oct. 29 through Nov. 2 in Bend, Oregon. The paper, whose lead author is Ian Arawjo, doctoral student in the field of information science, won an honorable mention at the conference.

“A system like this would be great for data science, specifically with sketching plots and charts that then inter-operate with textual code,” Arawjo said. “Our work shows that the current infrastructure of programming is actually holding us back. People are ready for this type of feature, but developers of interfaces for typing code need to take note of this and support images and graphical interfaces inside code.”

Arawjo said the work demonstrates a new path forward by introducing artificial intelligence-powered, pen-based coding at a time when drawing tablets are becoming more widely used.

“Tools like Notate are important because they open us up to new ways to think about what programming is, and how different tools and representational practices can change that perspective,” said Tapan Parikh, associate professor of information science at Cornell Tech and a paper co-author.

Other co-authors are: Anthony DeArmas '22; Michael Roberts, a doctoral student in the field of computer science; and Shrutarshi Basu, Ph.D. '18, currently a visiting assistant professor of computer science at Middlebury College.

Louis DiPietro is a writer for the Cornell Ann S. Bowers College of Computing and Information Science.

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