

Learning Programming at Scale


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Who am I, and how did I get here?

- Undergrad+masters in Electrical Engineering & Computer Science, MIT (2001-2006)
- Ph.D. in Computer Science, Stanford (2006-2012)
- Software engineer at Google (2012-2013)
- Postdoc at edX and MIT (2013-2014)
- Assistant Professor of Computer Science, University of Rochester (2014-2016)
- Assistant Professor of Cognitive Science, UC San Diego (2016-present)

Philip Guo - Assistant Professor x

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PHILIP J. GUO

[ACADEMIC](#) [PUBLICATIONS](#) [C.V. \(PDF\)](#) [OLD PHOTOS](#)

My research spans [human-computer interaction](#),
online learning, and computing education.

Summary of my recent work: [Learning Programming at Scale](#)

[Publications](#) | [Google Scholar](#) | [Curriculum Vitae](#)

What is research in Human-Computer Interaction?

Studying how humans interact with computers, and ***building*** better ways for humans to interact with computers.

Programming is one of the most powerful, yet hardest to learn, forms of human-computer interaction.

<http://blogs.uw.edu/ajko/2014/03/25/programming-languages-are-the-least-usable-but-most-powerful-human-computer-interfaces-ever-invented/>

My high-level research goals:

Studying how humans interact with programming, and ***building*** better ways for humans to interact with programming.

My current research (2014-present): Learning Programming at Scale

1. *Studying* why and how people from diverse backgrounds are learning programming
2. *Building* new kinds of programming environments to support learners
3. *Building* new kinds of programming-related instructional materials

Studying why and how people from diverse backgrounds are learning programming

- Why are older adults (age 60 and over) learning programming? (Guo, CHI 2017, honorable mention paper award)
- How do female programmers use the popular Stack Overflow coding Q&A website? (Ford et al., FSE 2016)
- How do students learn at college hackathons? (Warner and Guo, ICER 2017)
- Are there people who want to learn programming but don't actually need to write code for their job? (Chilana et al., VL/HCC 2015), (Chilana et al., CHI 2016)

Building new kinds of programming environments to support learners (1 of 2)

- How can we visualize the inner-workings of the computer to help learners build mental models?
(Guo, SIGCSE 2013) <http://pythontutor.com/> (3.5+ million users from 180+ countries)
- Can multiple learners simultaneously interact with and chat about visualizations? (Guo et al., VL/HCC 2015)
- How can a single tutor simultaneously monitor and help dozens of learners as they code? (Guo, UIST 2015)
- Can we visualize everything about what a piece of code does on-screen at once? (Kang and Guo, UIST 2017)

Building new kinds of programming environments to support learners (2 of 2)

- How can we detect learner frustration in a scalable and cost-effective way? (Drosos et al., VL/HCC 2017)
- How can we help novices get started with learning pair programming, testing, and version control? (Warner and Guo, CHI 2017)
- How can we use open data on the web to help novices get started with learning data science? (Zhang and Guo, UIST 2017, honorable mention paper award)

Building new kinds of programming-related instructional materials

- How do learners interact with digital textbooks?
(Warner and Guo, EDM 2015)
- What are the shortcomings of MOOC forums for discussing programming questions? (Zhu et al., VL/HCC 2015)
- Can learners work together to create step-by-step annotated code examples? (Gordon and Guo, VL/HCC 2015)
- Can we easily generate step-by-step tutorials for multi-application command-line and GUI tasks?
(Mysore and Guo, UIST 2017)

Where are we at now, and what's next?

- Starting 4th year of assistant professoring
- My lab: 6 graduate students
(2 cognitive science, 4 computer science)
- What's next? Looking into broader groups of non-traditional learners, removing unnecessary barriers to getting started, expanding more to data science education