

# Computer Science Circles

## Python in your Browser

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with thanks to Graeme Kemkes, Andy Kong



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# Goals

Get **everyone** to have experience in programming / thinking algorithmically

- can #people exposed to using programming  $\geq$  #people exposed to using musical instruments?

Aid enrichment in schools

Robust self-learning for university students/adults

*Experience should be*

- fun, hassle-free
- engaging/interactive
- effective



# An Empty Niche

Great existing services:

- for strong programmers: IOI, TopCoder
- math exercises & videos: Khan Academy

Need better services for beginners, ideally with

- no software installation  $\Rightarrow$  happy admins
- no back-and-forth between textbook and IDE
- interactive engagement, exercises for mastery

# Short Accelerated Tour

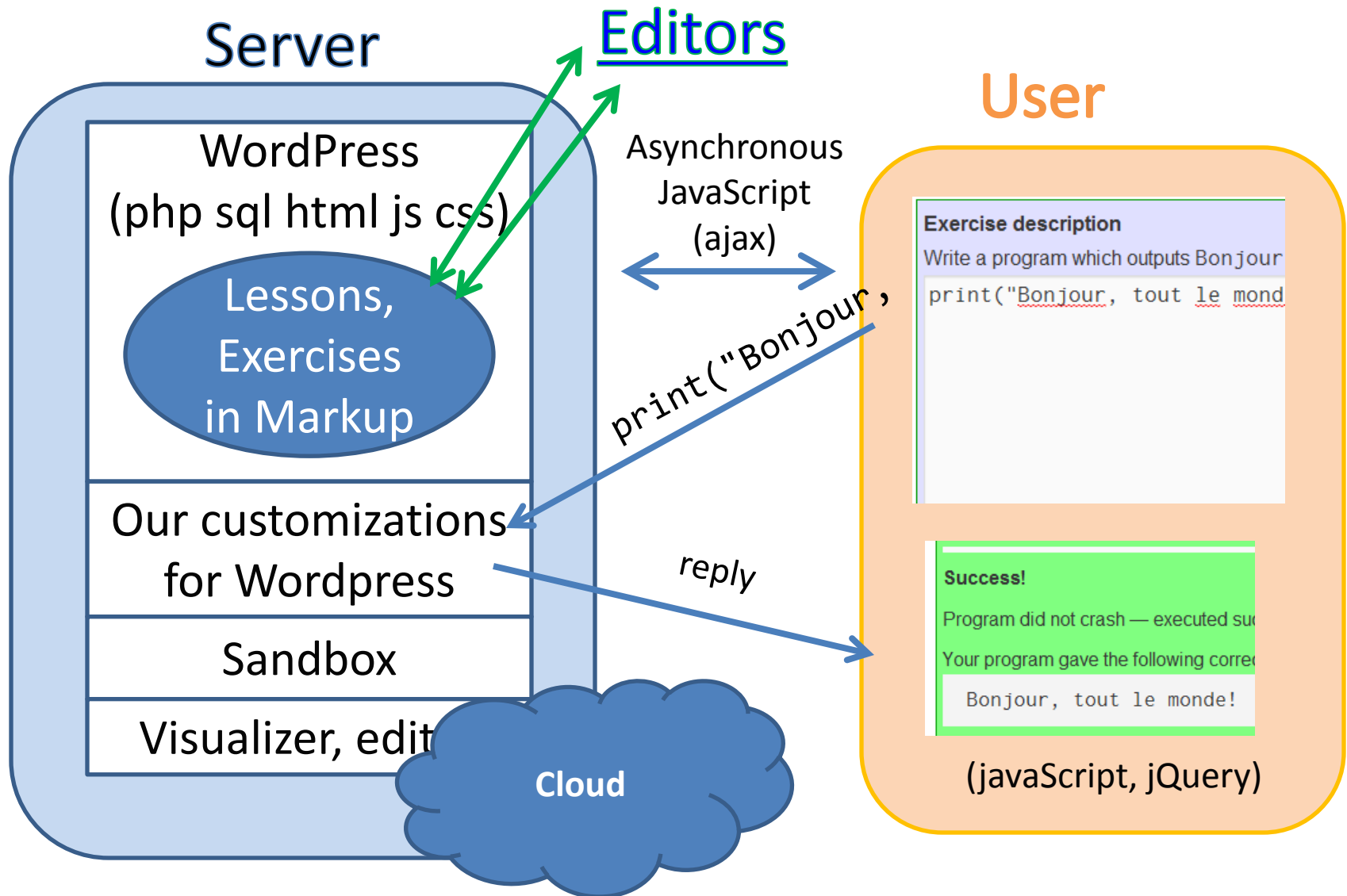
- Lesson 0: Example code
- First exercise, output grader, checkmarks
- Hint boxes & UI; History & “Help me!”
- Lesson 1: Short answer, drag and drop, accordion UI
- Variable grader
- Console, visualizer, “My Progress” page
- Lesson 10: Function grader, rich editor
- Content: 30 lessons up to encryption and recursion

# Grader

- More exercise modifiers:
  - Randomized test cases
  - Edit distance limit
- Sandbox
  - setrlimit to limit time and memory, setuid, chroot, iptables
- C++, Python, PHP



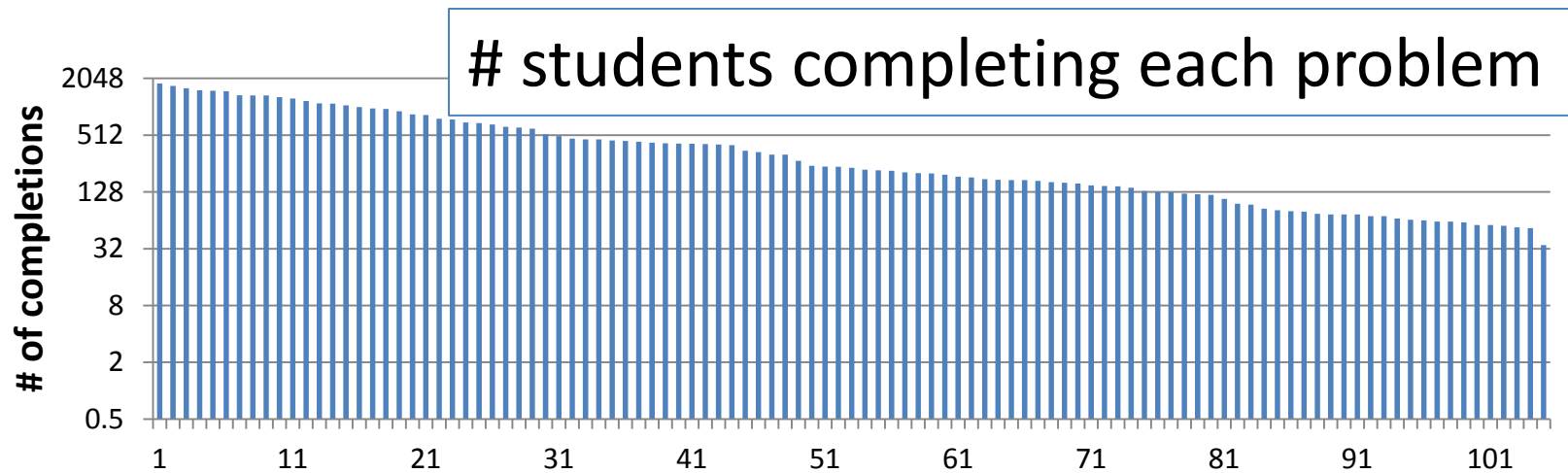
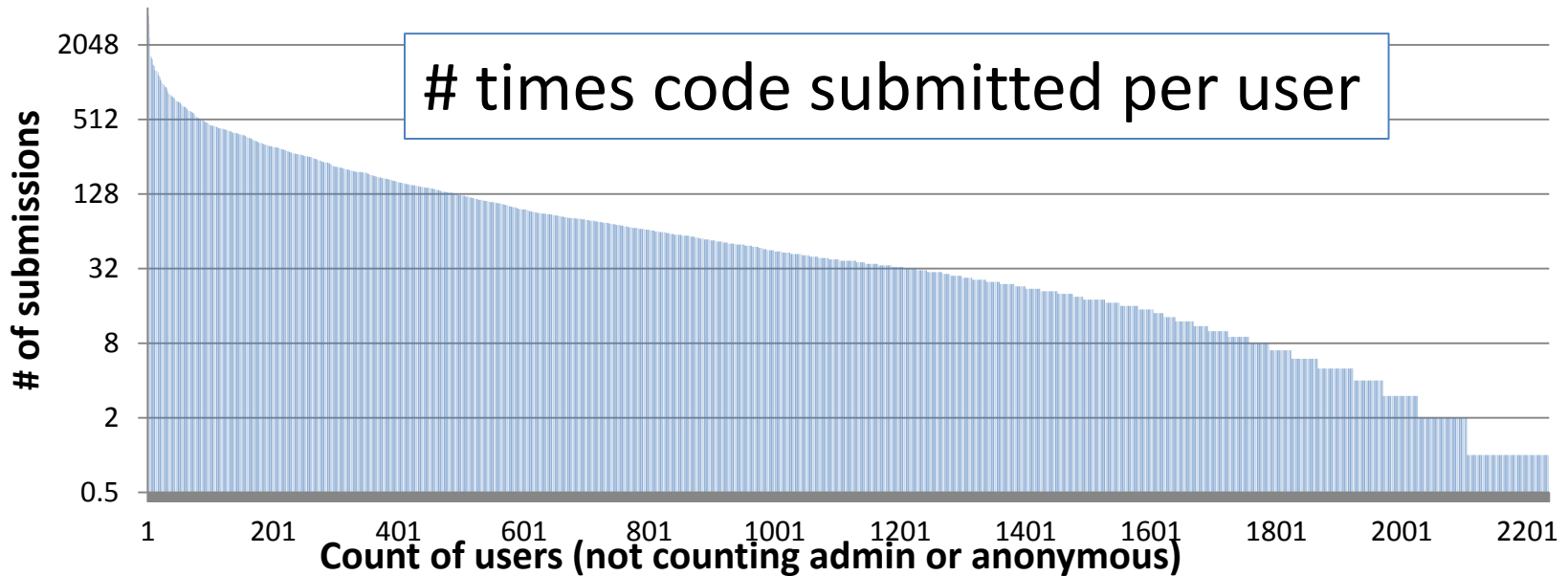
# Under The Hood



# Under The Hood

- WordPress
- WordPress plugins:
  - Contact form, google analytics, google search, polylang, role scoper, WP LaTeX, WP/jQuery UI
- Mooshak sandbox
- Flexigrid for database queries
- CodeMirror rich editor
- Python Visualizer (P. Guo & P. Wentworth)

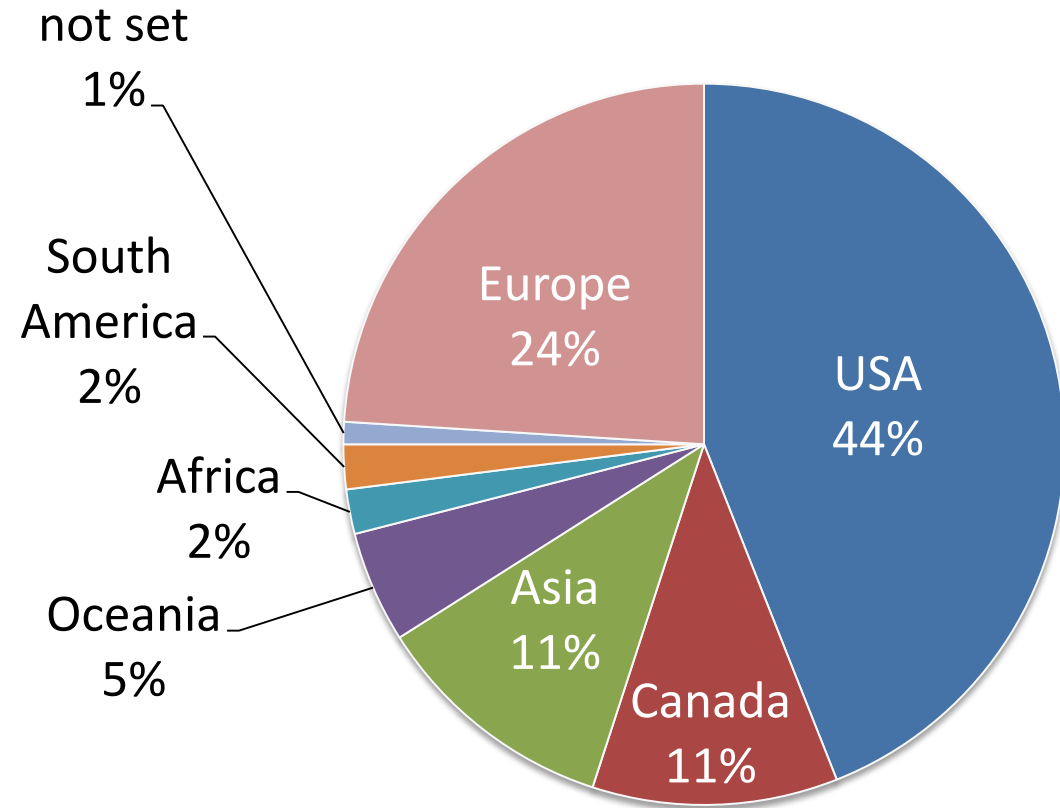
# Usage Statistics



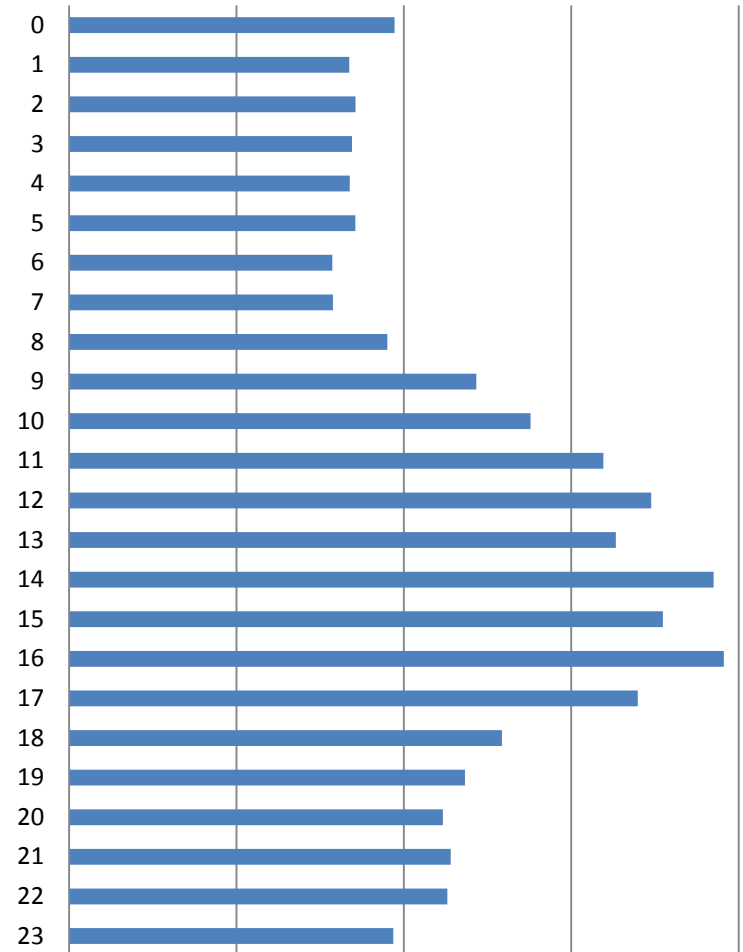


# Usage Statistics

**Traffic**  
**(using Google Analytics)**



**Submissions by Hour of Day**  
**(EST)**



# Usage Statistics, Per Day

- 3000 page views
- 10000 code submissions
- 40 new users
- 1000 code visualizations
- 5 “Help me!” messages asked
- about half of traffic is logged in

# Unsolicited Feedback

Rather than being disappointed before step 1, now I'm actually learning the language and have something to build upon. I'm addicted to how the frustration of getting the function or program wrong at first transitions into excitement as I finally figure it out, and it all makes perfect sense laid out in front of me. And on top of all that, if I don't understand something and need help, there's actually someone there to assist me. For the first time, programming is what I knew it could be the whole time: Fun.

# Writer/Teacher Tour

**Writers:** WordPress in-browser editor

**Teachers:** automated feedback is not perfect

- No style advice, “wrong” solutions can pass
- We don’t try to check for plagiarism

Students can specify teacher as their “guru”

- Guru can check progress of all their students
- Students can directly ask questions to guru

# What's Next?

- Scalability, using Amazon “cloud” for grading
  - Visualization already runs in the cloud
- Caching to reduce server load
- Adding French
- Releasing any tools as open-source that people would find useful
  - The sandbox is already available on github

# Hands-on Component

SSID: **cscircles**    pwd: **pythonic**

- Log on and create an account

**<http://cscircles.ca>**

- Test out the system
  - Jump forward/back as you see fit
- Ask questions about anything
- Feel free to try to hack the system
  - but please tell me if you succeed
  - don't disturb the local hotel network

# Thanks!

