Meta: Enabling Programming Languages to Learn from the Crowd

Ethan Fast, Michael S. Bernstein
UIST 2016

Summary by Prof. Thomas LaToza
SWE 795, Spring 2017
Software Engineering Environments
Motivation

• Increase expertise sharing
  • In code reuse, capturing input / output examples
  • In performance optimization, suggesting alternative implementations
• In testing, warning when function fails with others
Count the vowels in a string

```python
import re

@meta(parent="5700375c2f6a2f000330436a")
def count_vowels(s):
    return len(re.findall('[aeiou]', s, flags=re.I))
```

Warning: Meta has found a possible alternative that is 1.3 times faster.

Example inputs:

```python
count_vowels("UIST")  #=> 2

count_vowels("CHI")   #=> 1
```

Known errors:

```python
count_vowels(["CHI", "UIST"])  #=> expected string
```

You can load this snippet with:

```python
count_vowels = meta.load("http://www.meta-lang.org/5700a")
```

https://www.youtube.com/watch?v=wQIPnnGuVxM
Using Meta

- Annotations indicate a function should be instrumented with meta

```python
@meta("Current temperature in a city, in Celsius")
def get_temp_of_location(city, country, apikey: private):
    response = urlopen("api.openweathermap.org/...")
    return json.loads(response)["main"]["temp"]

get_temp_of_location("Tokyo", "JP", my_api_key) #=> 15.83
```
Evaluation

- Had 7 developers complete ML task with Meta
- Participants
  - wrote 748 lines of code,
  - 26% of all code was covered by Meta functions
  - created 17 Meta functions
  - loaded 6 unique Meta functions
  - executed Meta functions 15,077 times
  - completed task in 5 hours
- Challenges with security, privacy, starting community
Questions for discussion

• Overall reaction to the paper

• Would you use such a system for your everyday programming?
  • Why or why not?

• Is a function the right place to start?

• Are there solutions to the privacy and security issues?