

CS 162 Programming languages

Lecture 1: Hello World!

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Winter 2020

Introducing the cast

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Course website: <https://github.com/fredfeng/CS162>

Research areas: programming languages, program analysis,
program synthesis, and security

Introducing the cast

TAs: Yimeng Liu and Yanju Chen

Discussion session: Phelp 3526 Fri 9:00 am

Why study PL?

- “A different language is a different vision of life” — Fellini
- Hypothesis: Programming language shapes programming thought
- Characteristics of a language affect how ideas can be expressed in the language

Course Goal



“Free your mind”
- Morpheus

You will learn several new

- languages and constructs
- ways to describe and organize computation



What does PL buy me?

Enable you to create software that is

- Readable
- Correct
- Extensible
- Reusable
- ...

Readability matters!

```
void sort(int arr[], int beg, int end){
    if (end > beg + 1){
        int piv = arr[beg];
        int l = beg + 1;
        int r = end;
        while (l != r-1){
            if(arr[l] <= piv)
                l++;
            else
                swap(&arr[l], &arr[r--]);
        }
        if(arr[l]<=piv && arr[r]<=piv)
            l=r+1;
        else if(arr[l]<=piv && arr[r]>piv)
            {l++; r--;}
        else if (arr[l]>piv && arr[r]<=piv)
            swap(&arr[l++], &arr[r--]);
        else
            r=l-1;
        swap(&arr[r--], &arr[beg]);
        sort(arr, beg, r);
        sort(arr, l, end);
    }
}
```

}

Quicksort in C

```
let rec sort l =
  match l with [] -> []
  | (h::t) ->
      let(l,r)= List.partition ((<=) h) t in
      (sort l)@h::(sort r)
```

Quicksort in Ocaml

What does PL buy me?

Will help you learn new languages easily

- No Java (C#) 15 (10) years ago
- Learn the anatomy of PL
- Fundamental building blocks
- Re-visit the languages you already know

What does PL buy me?

Enable you to design new language



Companies develop general purpose PLs

- Google: MapReduce
- Mozilla: Rust
- Nvidia: CUDA
- ...

What does PL buy me?

Enable you to choose the right language



Isn't that decided by

- libraries
- standards
- and my boss?

Goal: Educate tomorrow's TL and bosses!

What does PL buy me?

- Make you look at problems in a different way
- Knowing language paradigms other than traditional ones will give you new ways to approach problems, even if you are already a good programmer in Java/Python

Dimension: type model

- Statically typed: Java, C, C++, C#
- Dynamically typed: Lisp, Scheme, Perl
- Strongly typed (Java, OCaml) vs weakly typed (Javascript, C)

Dimension: computation model

- Functional: Lisp, OCaml, Haskell, Racket
- Imperative: Fortran, C, Pascal
- Object-oriented: Smalltalk, Java, C++, C#
- Logical: Prolog, Datalog

Dimension: execution model

- Compiled: C, C++
- Interpreted: Perl, Shell script
- Hybrid: Java

Course material

- Functional programming (OCaml)
- Solver-aided programming (Racket)
- Object-oriented (Python)
- Logical programming (Datalog)

Course mechanics

Website: <https://github.com/fredfeng/CS162>

Q&A: <https://piazza.com/ucsb/winter2020/cs162>

Grading

- Programming assignments: 50%
 - 6 programming assignments
- Midterm exam (closed book): 20%
- Final exam (closed book): 25%
- Class&Piazza Participation: 5%



No make-up exam

Programming assignments

- Please check the website regularly
- Deadline extension:
 - Four “late days”, used as “whole unite”
 - 5 mins late = 1 late day
 - Plan ahead, no other extensions

Programming assignments

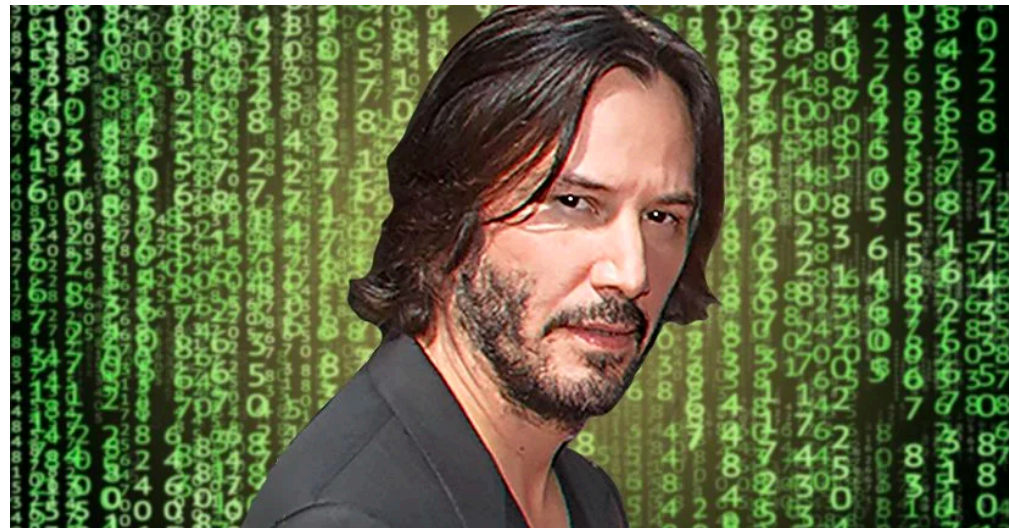
Unfamiliar languages

+ Unfamiliar environments

OCaml is hard

+ Racket is @!#@%

Start early!



Free your mind

Start early!

Academic integrity

- Programming assignments should be done ALONE
- We use MOSS to detect plagiarism
 - State-of-the-art
 - Have code from public repos
 - Make sure your repo private
 - I am an expert in this domain :-)
- “F” if you violate the honor code

TODOs by next lecture

- Join Piazza for CS162!
- Install OCaml on your laptop