Your TAs

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Sections format

• Presentations
• Interactive sessions
• Exercises and worksheets
• Q&A
Let’s C

- General purpose programming language
- Procedural
- Often used in low-level system programming
- Supports use of pointers
- Provides facilities for managing memory
- C passes all of its arguments by value
- Pass-by-reference is simulated by passing the address of a variable
Example

```c
#include <stdio.h>
void f(int *j) {
    (*j)++;  
}
int main() {
    int i = 20;
    int *p = &i;
    f(p);
    printf("i = %d\n", i);
    return 0;
}
```

- **Output**

```
$ gcc test.c
$ ./a.out
i = 21
```
Pointers and Addresses

• A data type that refers to a value stored in another location
• Can point to values, variables of different data types or functions
Arrays and pointers

- \( a[0] \iff *a \)
- \( a[3] \iff *(a + 3) \)
- How about \( a, a+3, \)
- \( *a+3 \) or \( *a++ \)?
const char *c = "hello";
const char **cp = &c;
const char ***cpp = &cp;
Function pointers

#include <math.h>
#include <stdio.h>

// Function taking a function pointer as an argument
double compute_sum(double (*funcp)(double), double lo, double hi) {
    double sum = 0.0;
    // Add values returned by the pointed-to function 'funcp'
    for (int i = 0; i <= 100; i++) {
        double x, y;
        // Use the function pointer 'funcp' to invoke the function
        x = i/100.0 * (hi - lo) + lo;
        y = (*funcp)(x);
        sum += y;
    }
    return sum / 100;
}
int main(void) {
  double (*fp)(double); // Function pointer
  double sum;
  // Use 'sin()' as the pointed-to function
  fp = sin;
  sum = compute_sum(fp, 0.0, 1.0);
  printf("sum(sin): %f\n", sum);
  // Use 'cos()' as the pointed-to function
  fp = cos;
  sum = compute_sum(fp, 0.0, 1.0);
  printf("sum(cos): %f\n", sum);
  return 0;
}
Section exercise

• Write a C program that:
• Accepts a string.
• Reverses the string
• Determines whether the string is a palindrome.

• A palindrome is a string which when reversed is same as the original string.
• Ex: abba, aba, mom, noon etc.
Debugging with gdb

- <demo factorial, show gdb features and C style script demo>
Valgrind

• <Valgrind slides>