

# CS2810: Tools

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# Outline

- Makefile
- Debug - gdb
- Measuring time
- Measuring memory
- Plotting - gnuplot/ Libre Calc/ MS excel
- Version control system - git / svn
- Hackerrank

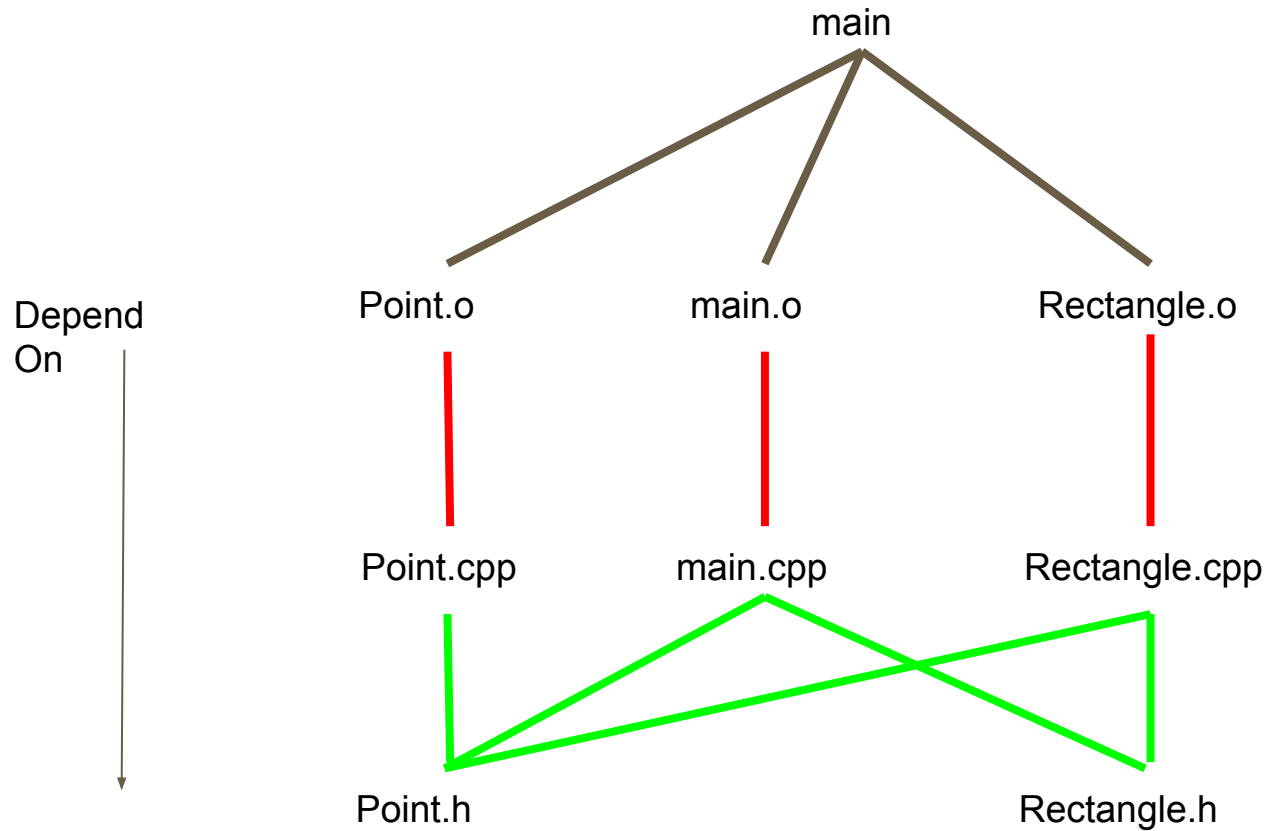
## At end of this presentation

- Know the uses of above tools
- Understand the basics of using it

# Makefile

- Why makefile?
  - Building large programs with multiple files
  - Intelligent compilation
- How to create makefile?
  - Know Dependencies
  - Commands
  - Macros
- How to auto build ?
  - make
- Demo
  - <https://www.cs.bu.edu/teaching/cpp/writing-makefiles/>

# Makefile



# GDB

- Why GDB ?
  - Debugging Code
  - Find Implementation loopholes
  - Helps in resolving runtime errors
  - Helps in fixing Segmentation faults
- Demo
- Usage:
  - `g++ -g hello.c -o hello`
  - `gdb ./hello`

# **`gdb` - commands**

- `break fun_name` - break at funtion\_name e.g `break main`
- `break linenumber` - break at <line num>
- `info break` - list of existing break points
- `info watch` - list of existing watch points
- `watch var_name` - watches the change for that variable
- `print var_name` - print cur value of var
- `display var_name` - displays the var at every step/breakpoint
- `continue` - continue till break/watch/error

# **gdb - commands**

- step - one line at a time
- next - one line at a time but function call is a step here
- run - run the program
- <ENTER> - repeat prev cmd
  
- Shortcut: you can use the first letter of the cmd
- E.g *b main* is same as *break main*

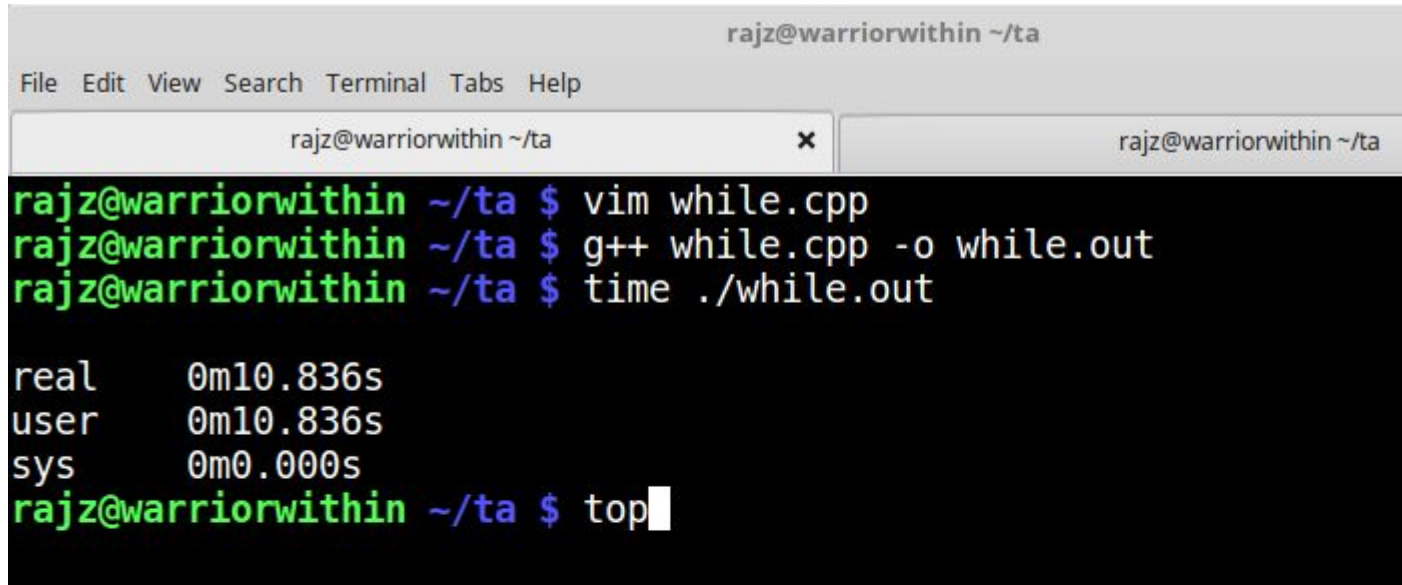
# Measuring time

- time - shell command
- top- shell command
- system\_clock



# Measuring time

- time - shell command



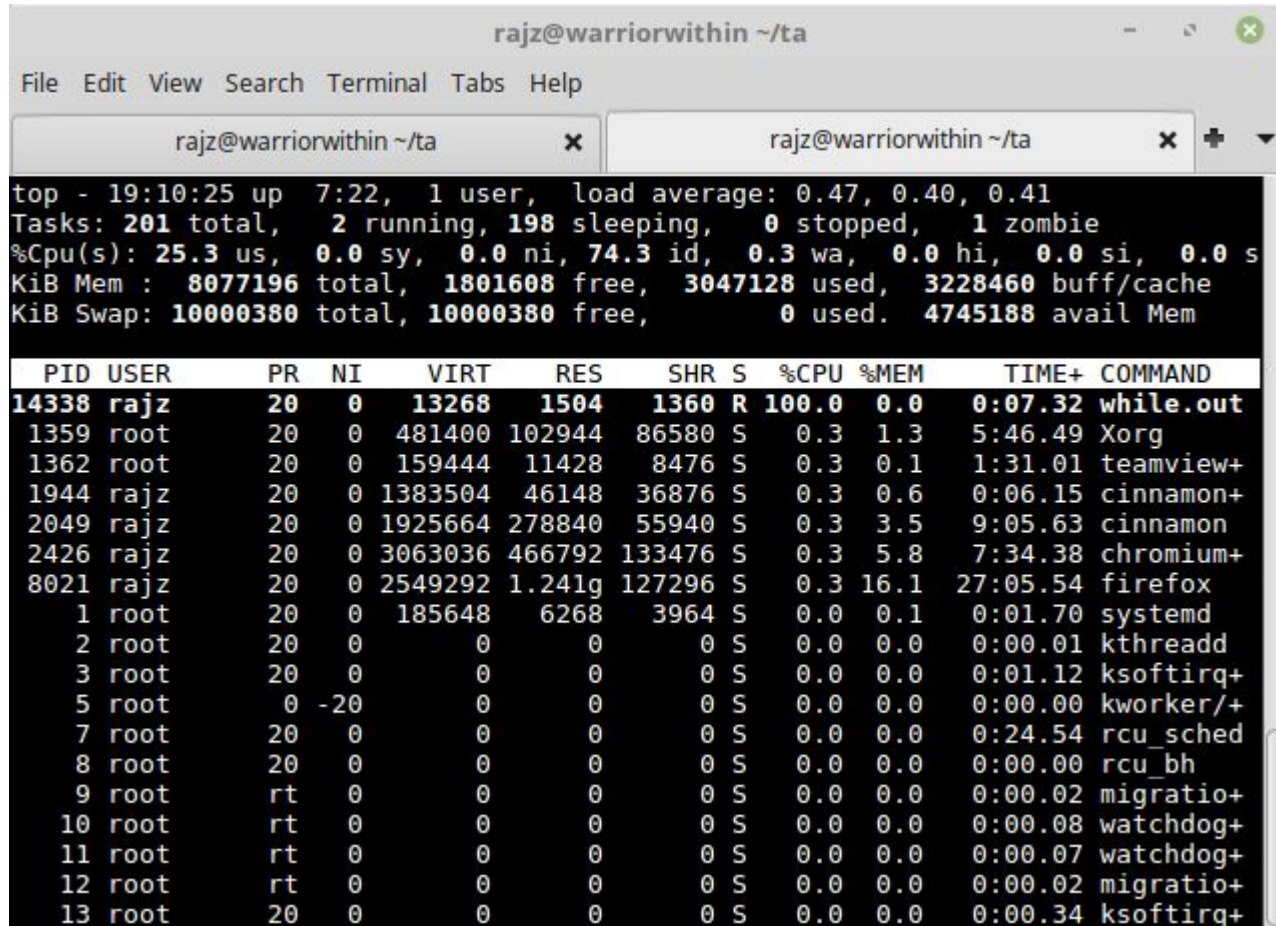
A terminal window titled 'rajz@warriorwithin ~/ta' with a menu bar (File, Edit, View, Search, Terminal, Tabs, Help). The terminal shows the following commands and output:

```
rajz@warriorwithin ~/ta $ vim while.cpp
rajz@warriorwithin ~/ta $ g++ while.cpp -o while.out
rajz@warriorwithin ~/ta $ time ./while.out

real    0m10.836s
user    0m10.836s
sys     0m0.000s
rajz@warriorwithin ~/ta $ top
```

# Measuring time

- top- shell command



```
rajz@warriorwithin ~/ta
File Edit View Search Terminal Tabs Help

rajz@warriorwithin ~/ta x rajz@warriorwithin ~/ta x + v

top - 19:10:25 up 7:22, 1 user, load average: 0.47, 0.40, 0.41
Tasks: 201 total, 2 running, 198 sleeping, 0 stopped, 1 zombie
%Cpu(s): 25.3 us, 0.0 sy, 0.0 ni, 74.3 id, 0.3 wa, 0.0 hi, 0.0 si, 0.0 st
KiB Mem : 8077196 total, 1801608 free, 3047128 used, 3228460 buff/cache
KiB Swap: 10000380 total, 10000380 free, 0 used. 4745188 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM    TIME+  COMMAND
14338 rajz       20   0   13268    1504    1360 R   100.0   0.0   0:07.32 while.out
 1359 root       20   0  481400  102944  86580 S    0.3   1.3   5:46.49 Xorg
 1362 root       20   0  159444   11428   8476 S    0.3   0.1   1:31.01 teamview+
 1944 rajz       20   0 1383504   46148  36876 S    0.3   0.6   0:06.15 cinnamon+
 2049 rajz       20   0 1925664  278840 55940 S    0.3   3.5   9:05.63 cinnamon
 2426 rajz       20   0 3063036  466792 133476 S    0.3   5.8   7:34.38 chromium+
 8021 rajz       20   0 2549292  1.241g 127296 S    0.3  16.1  27:05.54 firefox
    1 root       20   0  185648    6268   3964 S    0.0   0.1   0:01.70 systemd
    2 root       20   0         0         0        0 S    0.0   0.0   0:00.01 kthreadd
    3 root       20   0         0         0        0 S    0.0   0.0   0:01.12 ksoftirq+
    5 root        0 -20         0         0        0 S    0.0   0.0   0:00.00 kworker/+
    7 root       20   0         0         0        0 S    0.0   0.0   0:24.54 rcu_sched
    8 root       20   0         0         0        0 S    0.0   0.0   0:00.00 rcu_bh
    9 root       rt    0         0         0        0 S    0.0   0.0   0:00.02 migratio+
   10 root       rt    0         0         0        0 S    0.0   0.0   0:00.08 watchdog+
   11 root       rt    0         0         0        0 S    0.0   0.0   0:00.07 watchdog+
   12 root       rt    0         0         0        0 S    0.0   0.0   0:00.02 migratio+
   13 root       20   0         0         0        0 S    0.0   0.0   0:00.34 ksoftirq+
```

# Measuring time

- `system_clock::now()`

Note: c++11 std

```
21 #include <iostream>
20 #include <chrono>
19 using namespace std;
18 using namespace chrono;
17 long fibonacci(unsigned n) {
16     if (n < 2)
15         return n;
14     return fibonacci(n - 1) + fibonacci(n - 2);
13 }
12
11 int main() {
10     time_point<system_clock> start, end;
9     start = system_clock::now();
8
7     cout << "fib(40) = " << fibonacci(40) << endl;
6     end = system_clock::now();
5
4     duration<double> func_duration = end - start;
3
2     cout << "total time taken(in s): " << func_duration.count() << endl;
1     return 0;
22 }
```

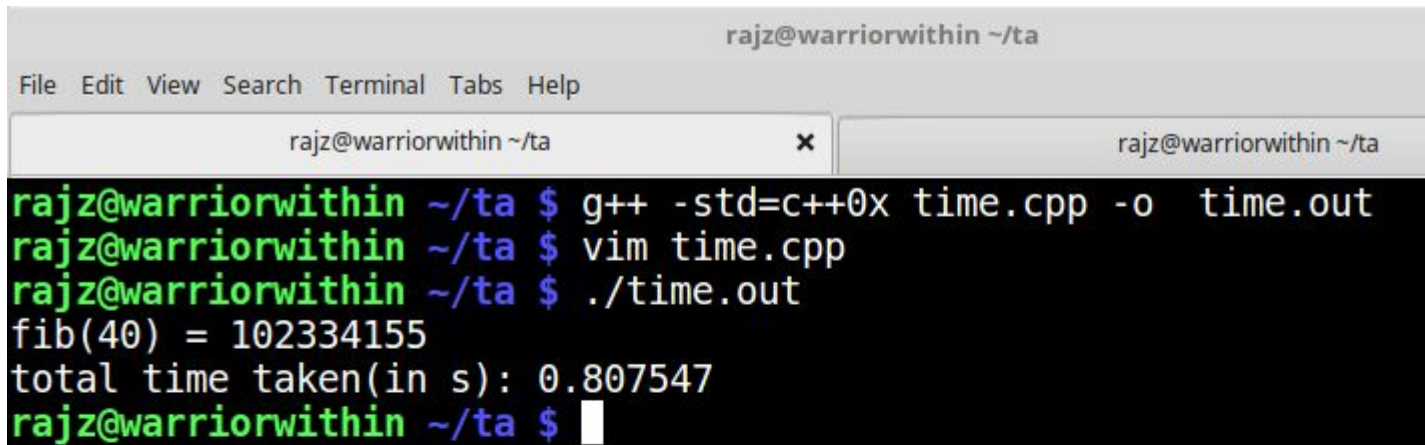
N... time.cpp

cpp 100% 22/22 : 1

# Measuring time

- `system_clock::now()`

Note: c++11 std



```
rajz@warriorwithin ~/ta
File Edit View Search Terminal Tabs Help
rajz@warriorwithin ~/ta x rajz@warriorwithin ~/ta
rajz@warriorwithin ~/ta $ g++ -std=c++0x time.cpp -o time.out
rajz@warriorwithin ~/ta $ vim time.cpp
rajz@warriorwithin ~/ta $ ./time.out
fib(40) = 102334155
total time taken(in s): 0.807547
rajz@warriorwithin ~/ta $
```

# Measuring memory

- `cat /proc/<pid>/status`

```
rajz@warriorwithin ~/ta $ cat /proc/14619/status
Name:   while.out
State:  R (running)
Tgid:   14619
Ngid:   0
Pid:    14619
PPid:   8200
TracerPid: 0
Uid:    1000    1000    1000    1000
Gid:    1000    1000    1000    1000
FDSize: 256
Groups: 4 24 27 30 46 113 130 1000
NStgid: 14619
NSpid:  14619
NSpgid: 14619
NSsid:  8200
VmPeak: 13268 kB
VmSize: 13268 kB
VmLck:  0 kB
VmPin:  0 kB
VmHWM:  1540 kB
VmRSS:  1540 kB
VmData: 280 kB
VmStk:  136 kB
VmExe:  4 kB
```

# Gnuplot

- Draw plots 2D , 3D
- Draw graphs, lines, curves
- Draw charts

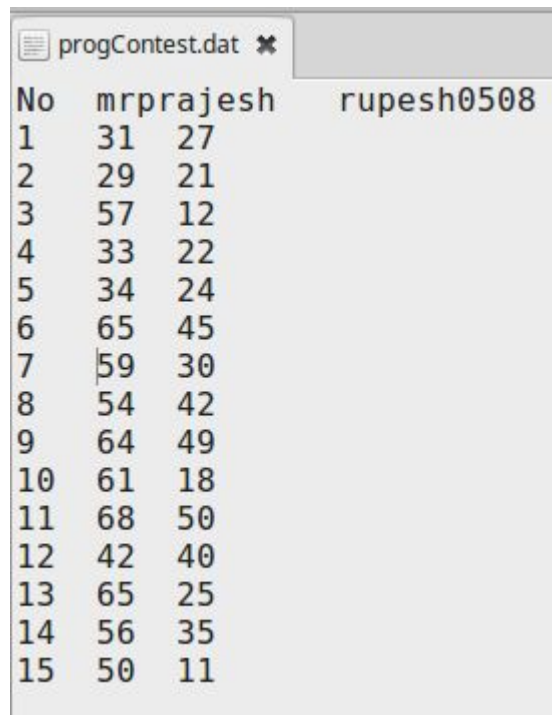
To draw

- Data file
- Plot file

Demo

# Gnuplot

Let's say in a content, two programmers and their running time on 15 testcases (in milli sec) in given



No	mrprajesh	rupesh0508
1	31	27
2	29	21
3	57	12
4	33	22
5	34	24
6	65	45
7	59	30
8	54	42
9	64	49
10	61	18
11	68	50
12	42	40
13	65	25
14	56	35
15	50	11



# Gnuplot

```
rajz@warriorwithin ~/ta/gnuplot
File Edit View Search Terminal Help
rajz@warriorwithin ~/ta/gnuplot $ gnuplot

G N U P L O T
Version 5.0 patchlevel 3    last modified 2016-02-21

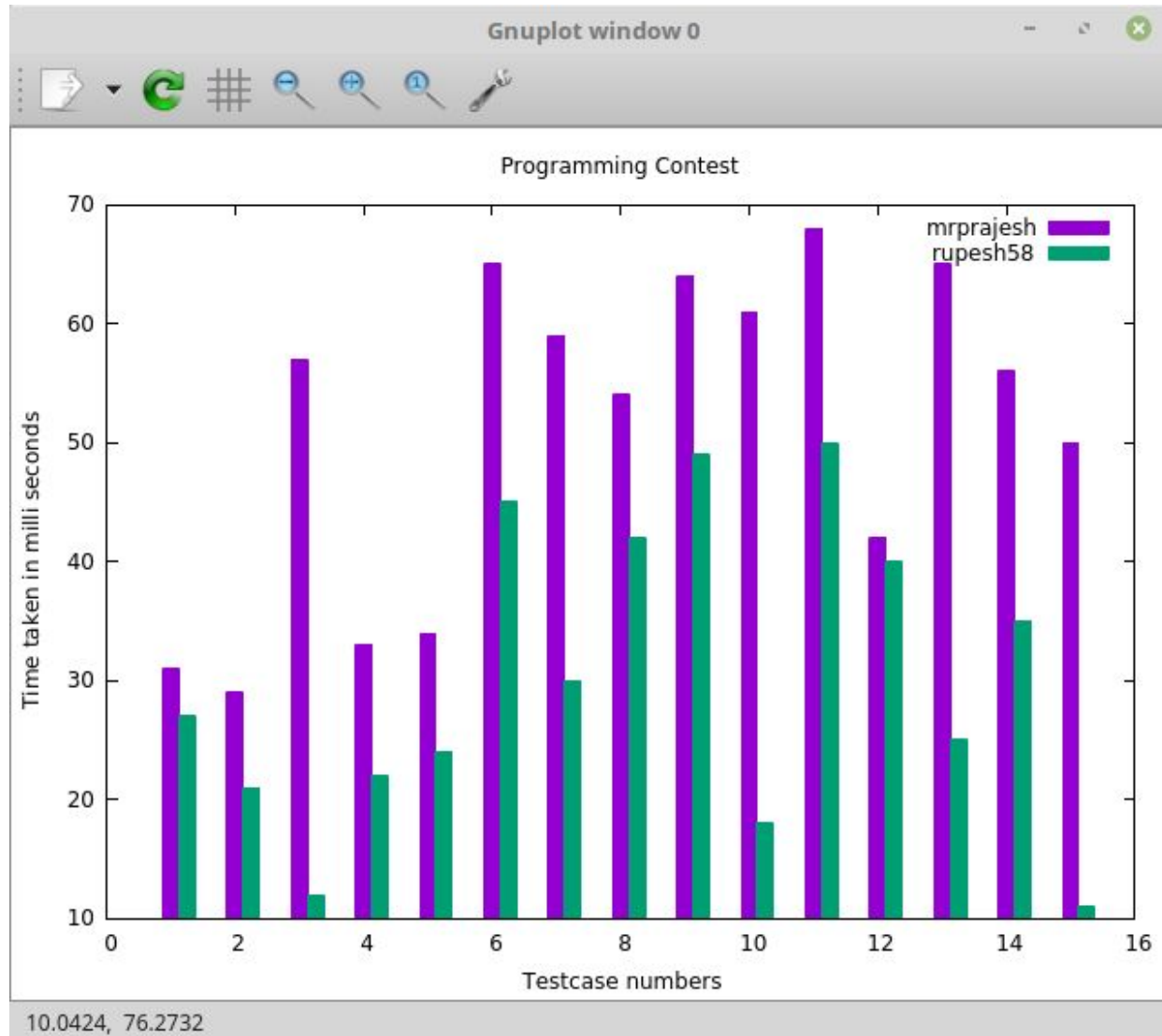
Copyright (C) 1986-1993, 1998, 2004, 2007-2016
Thomas Williams, Colin Kelley and many others

gnuplot home:      http://www.gnuplot.info
faq, bugs, etc:    type "help FAQ"
immediate help:    type "help" (plot window: hit 'h')

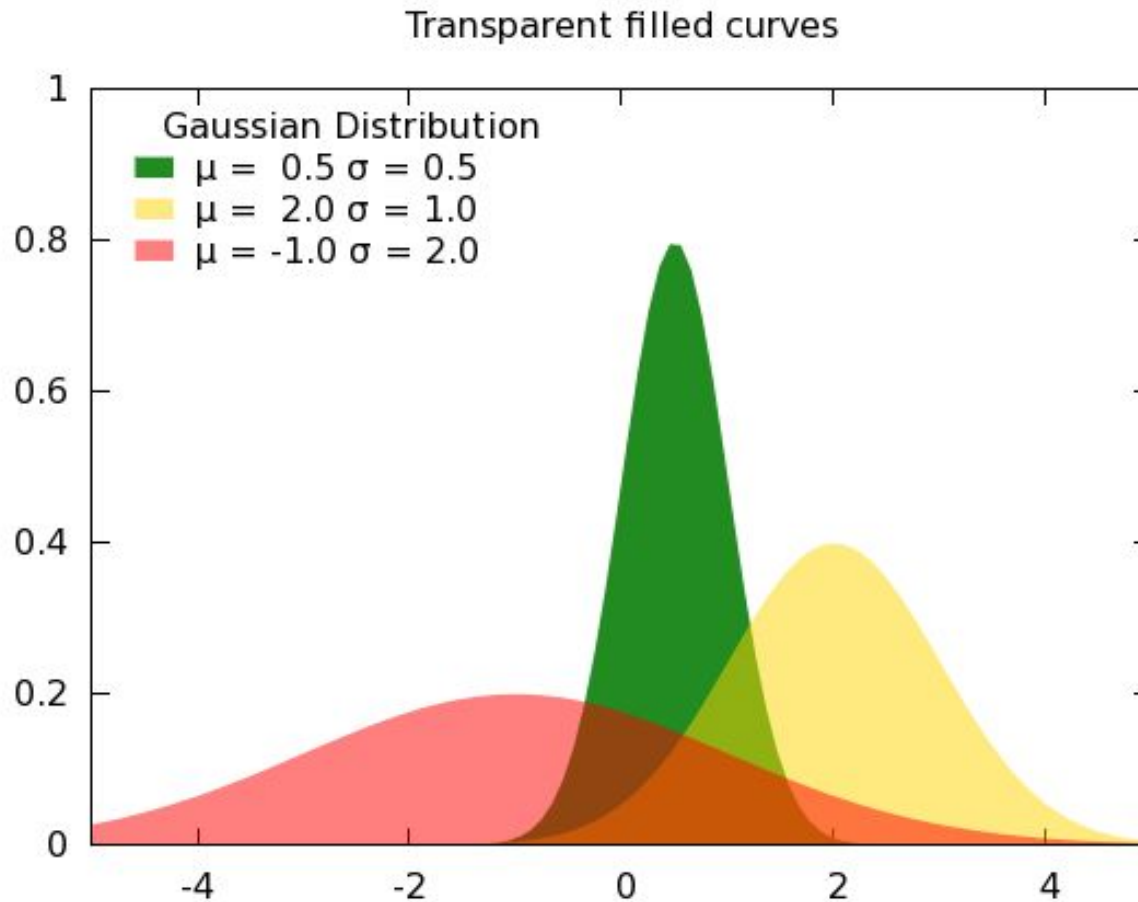
Terminal type set to 'qt'
gnuplot> set title "Programming Contest"
gnuplot> set xlabel "Testcase numbers"
gnuplot> set ylabel "Time taken in milli seconds"
gnuplot> set xrange [0:16]
gnuplot> red="#FF0000"
gnuplot> blue="#0000FF"
gnuplot> set style data histogram
gnuplot> set style fill solid
gnuplot> plot "progContest.dat" using 2 title "mrprajesh", "" using 3 title "rupesh58"
gnuplot> █
```



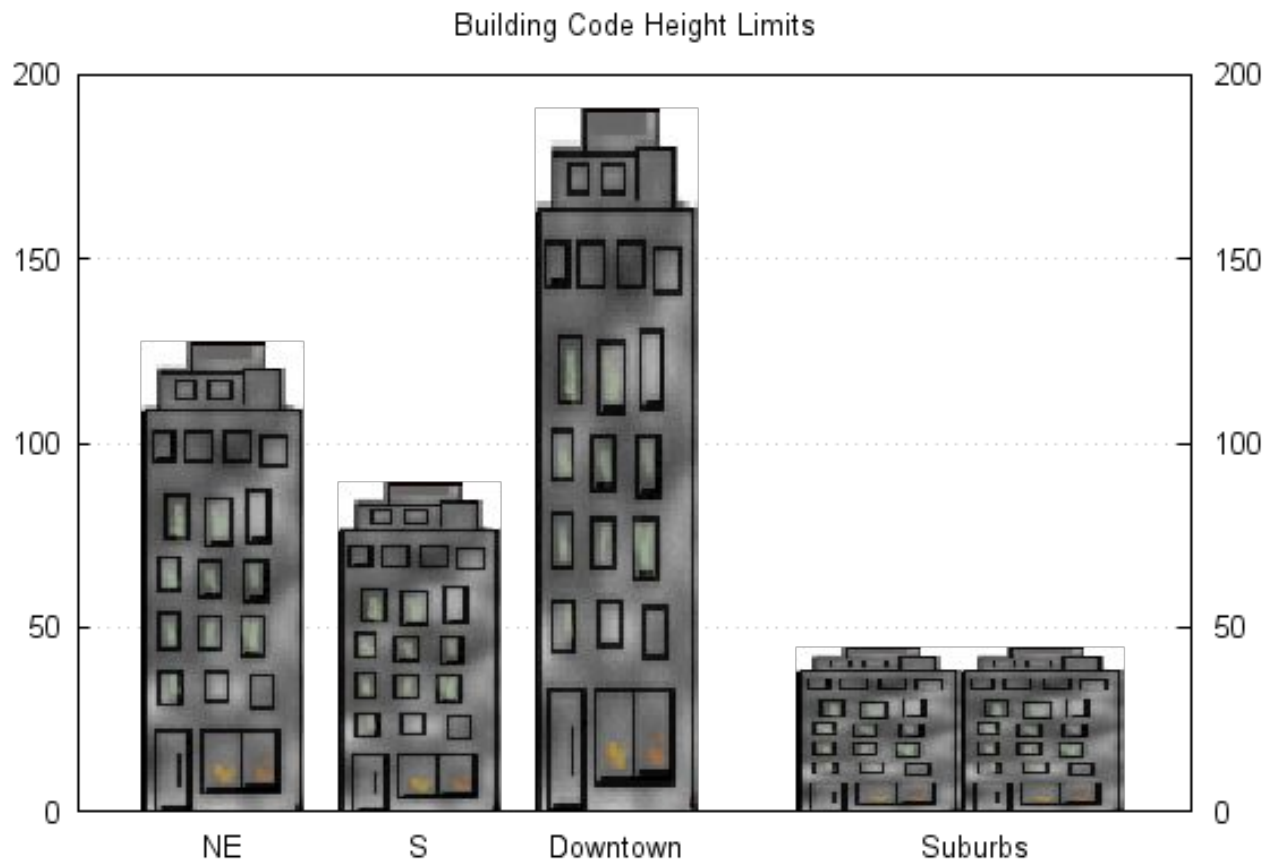
# Gnuplot - Histogram



# Gnuplot - curves



# Gnuplot - Drawings

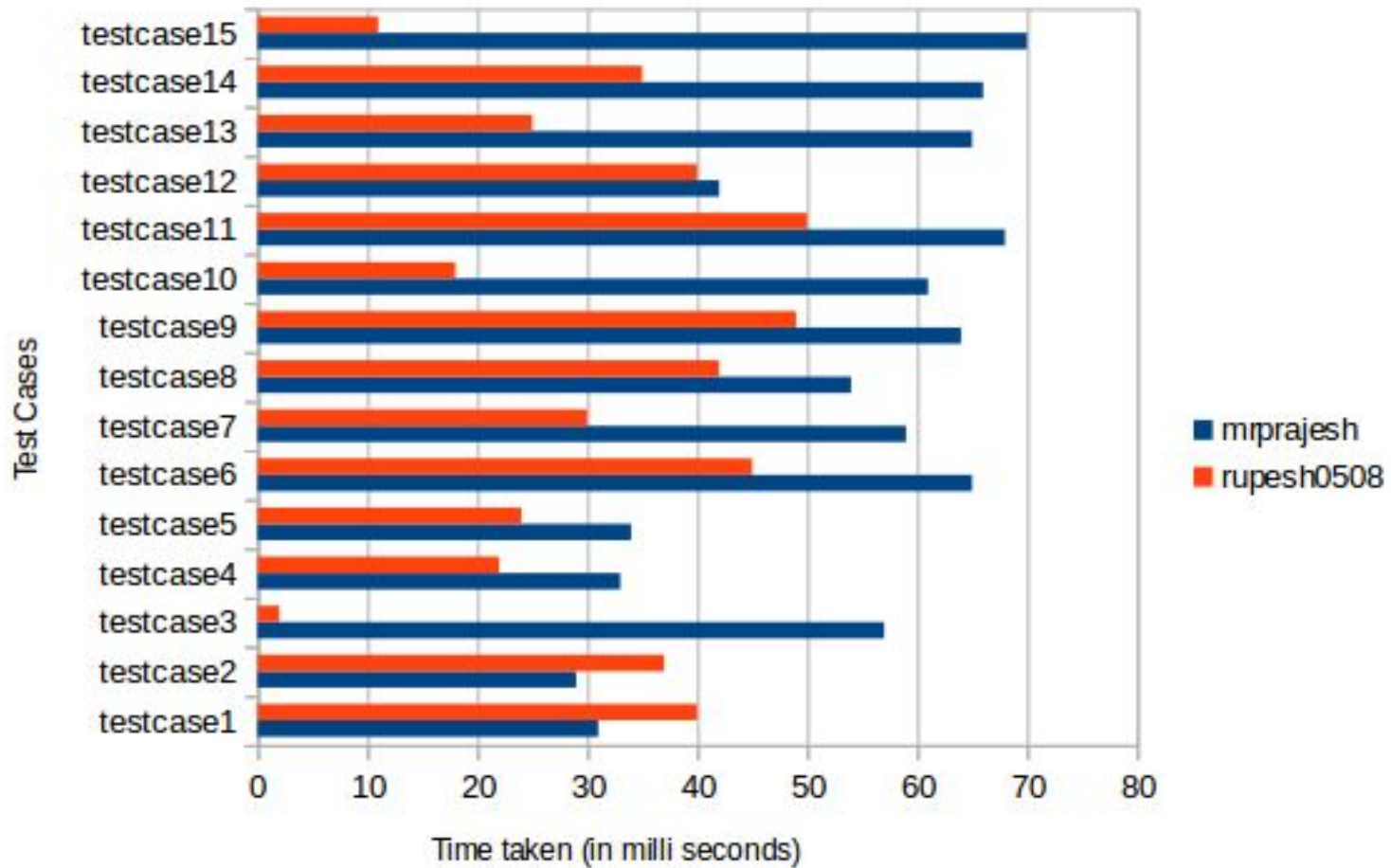


# Calc

	A	B	C
1	<b>Test Case No.</b>	<b>mrprajesh</b>	<b>rupesh0508</b>
2	testcase1	31	40
3	testcase2	29	37
4	testcase3	57	2
5	testcase4	33	22
6	testcase5	34	24
7	testcase6	65	45
8	testcase7	59	30
9	testcase8	54	42
10	testcase9	64	49
11	testcase10	61	18
12	testcase11	68	50
13	testcase12	42	40
14	testcase13	65	25
15	testcase14	66	35
16	testcase15	70	11
17			

Demo

# Calc



# VCS - Git

Why do we need a version control system

- Collaborating on a single software
  - Distributed development
  - Remember versions
  - Ability to move back and forth on versions
  - etc
  - etc
- 
- Demo

# Git - basics

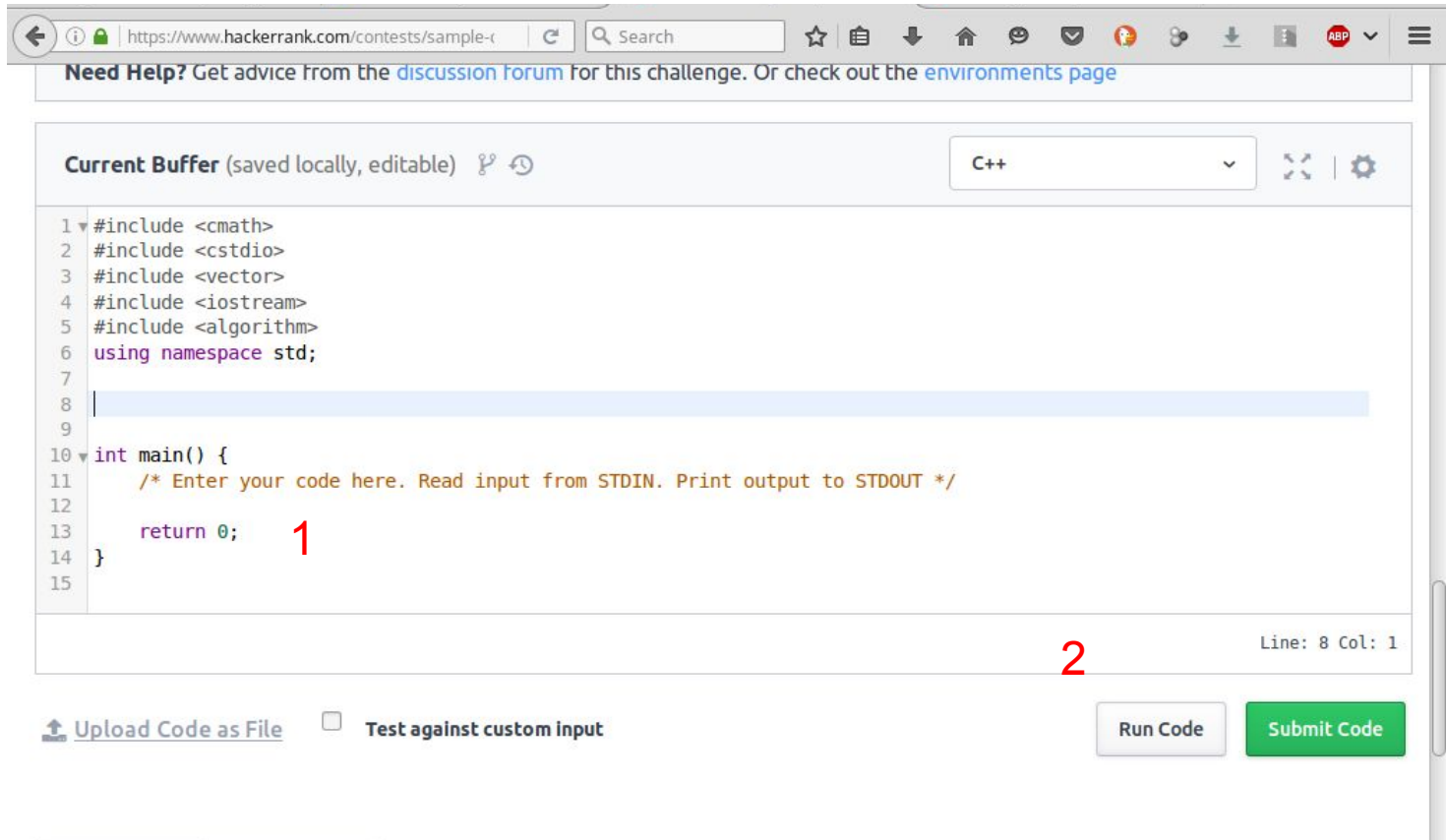
- `git init`
- `git add <files>`
- `git log`
- `git status`
- `git commit -m "commit message"`
- `git remote -v`
- `git remote add origin <url>`
- `git push origin master`
- `git config --global user.name "Your name"`
- `git config --global user.email "your_email@example.com"`

# Hackerrank

- Create an account
- Code offline or online
- Run code
- User Input
- Public testcase
- Private testcase
- Leaderboard



# Hackerrank - online editor



# Hackerrank - online editor

The screenshot displays the Hackerrank online editor interface. The main area contains a C++ program for calculating factorials. The code is as follows:

```
7
8 long long fact(int n){
9     if(n == 0 || n == 1)
10        return 1;
11    else
12        return fact(n-1)*n;
13 }
14
15 int main() {
16     /* Enter your code here. Read input from STDIN. Print output to STDOUT */
17     int t,n;
18     cin >> t;
19     while(t--){
20         cin >> n;
21         cout << n << "!=" << fact(n)<<endl;
22     }
23     return 0;
24 }
25
```

Below the code editor, there are several controls and status indicators:

- Line: 1 Col: 1** (position indicator)
- 1** (red number) pointing to the **Upload Code as File** button.
- 4** (red number) pointing to the **Test against custom input** checkbox.
- 2** (red number) pointing to the **Run Code** button.
- 5** (red number) pointing to the **Submit Code** button.
- 3** (red number) pointing to the **Testcase 1** status box.

The test results section shows:

- Testcase 0** with a green checkmark.
- Testcase 1** with a green checkmark.

At the bottom, a message states: **Congratulations, you passed the sample test case.**

# Hackerrank - Submit

Problem

Submissions

Leaderboard

Discussions

2

Submitted 2 hours ago • Score: 20.00

3

Status: **Accepted**

✓	Test Case #0	✓	Test Case #1	✓	Test Case #2
1 ✓	Test Case #3				

## Submitted Code

Language: C++[Open in editor](#)

```
1 #include <cmath>
2 #include <cstdio>
3 #include <vector>
4 #include <iostream>
5 #include <algorithm>
6 using namespace std;
7
8 long long fact(int n){
9     if(n ==0 || n==1)
10         return 1;
11     else
```

# Hackerrank - Submissions

by [mrprajesh](#)

Problem

Submissions

Leaderboard

Discussions

Problem

Language

Time

Result

Score

[Fast factorial](#)

C++

2 hours ago

Accepted ✓

20

View  
Results

[Fast factorial](#)

C++

2 hours ago

Wrong Answer ✗

0

View  
Results

[Fast factorial](#)

C++

3 days ago

Accepted ✓

20

View  
Results

Join us on IRC at [#hackerrank](#) on freenode for hugs or bugs.

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# Thank you

THE #1 PROGRAMMER EXCUSE  
FOR LEGITIMATELY SLACKING OFF:

"MY CODE'S COMPILING."

