

**Welcome back  
to CS429G!**

**Week 7**



Ed meme recap:

addw a0,a0,a1

The Girl You Like

add 3,3,4

Her First Love

addu \$2,\$4,\$5

Her Father

add w0,w1,w0

Her Ex

add %0,%01,%00

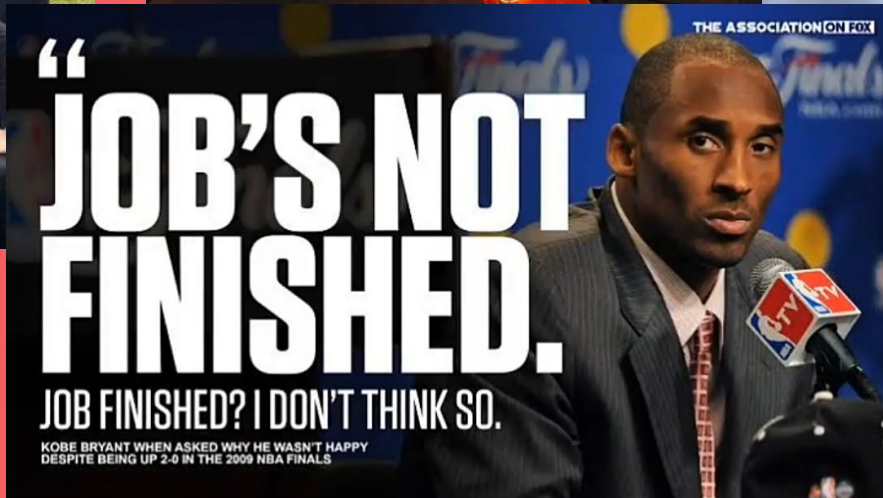
Her Brother

lea eax,[rdi+rsi]

You



MINNESOTA BE LIKE



Questions on lecture content?  
Or about cats?

# Stress



If you are feeling overwhelmed, be the frenchiest fry, and then come talk to one of us or Dr. Gheith.

[Mental health resources at UT](#)

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P6

# Poll

How's your status on P6?

- A. What's P6?
  - B. I've heard of it
  - C. I've cloned the starter code and/or looked through it
  - D. I've started planning/writing code
  - E. I'm mostly done but might still have bugs
  - F. P6 any% speedrun
-

# Program Execution

- What runs before main?
  - `_start`
- What does `_start` do?
  - Initializes a lot of stuff
  - Set up memory, caches, stack
  - **Initialize runtime**
  - Call main
- Initializing the runtime?
  - Load shared libraries
  - Initialize global memory
  - Construct global objects
    - GCC lets us manually insert code here with `__attribute__((constructor))`



# Interposition

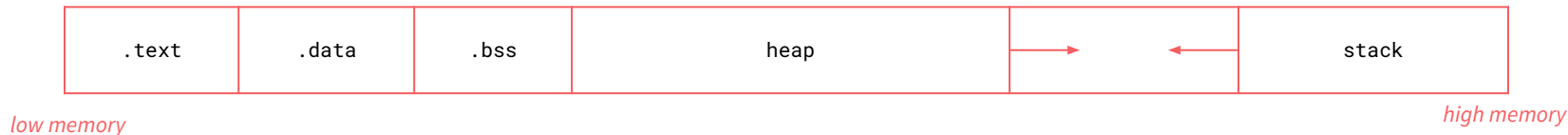
- Interposition is the process of inserting what you want to do where you weren't necessarily invited
  - You can think of this as analogous to adding a layer of indirection
- Can someone think of some ways you are already doing this in p6?
- Interesting example

# Interposition in Main

- So you can interpose on calls to func with a wrapper function (how?)
- How can you do this for main? is there a way for you to control how main is called?
- Why would you want to do this?
- *Again*, why would you want to do this?

```
// TODO: remove from slides  
#include <setjmp.h>
```

# Memory



There's only one stack in this memory diagram – is this okay?

*Discuss:*

1. How does each routine maintain its own stack in p6?
2. Where do these stacks come from?
3. The stack the operating system gives us will always live in high memory addresses. Is this true for the stacks we give each coroutine?
4. How do we change `%rsp`?
5. If we rewrote gcc, could we manually calculate the correct stack offsets and use only the stack the operating system gave us?

# Tool Setup

# Set Up X Forwarding

X Forwarding is how we can run software remotely on a lab machine while displaying the graphics to our local machine! Instructions for setting up X Forwarding posted on Ed!

Once you've set it up, you SSH into a lab machine like this:

```
ssh -X <csid>@<hostname>.cs.utexas.edu
```

And then you can run fun programs!

```
xeyes
```

```
~jocelyn/public/oneko
```

Questions?

