Live Lecture Chat Window Q&A
March 29, 2021

12:00:06 From Matsumoto, Nicholas to Everyone : For project 0, can we just edit the example code for what we need to do?

Yes. Anytime I give you code, either in the notes or in a project handout, I want you to use it. It's not cheating if you copy it from me.

12:00:19 From Ben Wichser to Everyone : Can the assignments all be completed on flip? Or are there local machine requirements we should be aware of?

flip has no GPUs on it, but we have other OSU machines that do. For the GPU projects, you can use your machine or one of these others.

12:00:38 From Fong, Jane to Everyone : Will the link to notes for week 1 be available?

Should be available now, both on Canvas and on the Resources page. There was a problem on the Canvas links, but it should be fixed now.

12:00:46 From Sun, Huayue to Everyone : Do we have a place to discuss the hw and some questions? Slack or something like that

Still setting up the Ed Discussions for this class.

12:01:21 From Zinn Morton to Everyone : Church of evan is a cool osu cs discord that's helped me before - https://discord.gg/sy3Edfys

12:05:20 From Hirsch, Ethan Maxwell to Everyone : Statistically many of us will have the same birthday
12:05:45 From Jacob Eckroth(He/him/his) to Everyone : what is it, it's like 20 people or something and you get a 50% chance of 2 people sharing a birthday?

It's 23 people. I once wrote a program that proves this.

12:05:49 From Kevin Z to Bailey, Mike(Direct Message) : Hi professor, I wasn't able to find this information on canvas, so sorry if it was there, but will these lectures be recorded and made available for us to review?

Yes, they will be linked to both Canvas and the Resources page.

12:08:16 From Alice Li to Everyone : Where would the most recent recorded videos be uploaded to? Canvas or ?

Lecture videos are all in one place on the Resources page. They will be grouped by weeks on the Canvas site. The Live Lectures will also be posted on both.

12:09:24 From Kuhn, Kurt Arthur J to Everyone : Sorry, but what is OpenMP?
12:09:28 From Hirsch, Ethan Maxwell to Everyone : Literally a single pragma makes your loops parallel lol
12:09:41 From Ricardo Wu to Everyone : Open Muiti-Processing

Not a language, but a "package" that is built-in to the compiler. We will still program it in C or C++.

12:14:45 From Kayla Hunter to Everyone : I'm part of the Python wave of students...has anyone transitioned to C yet? I'm a worried about the learning curve

The TAs and I will help you as much as you need. All the principles of programming still apply. It is just the syntax that is changing.

12:15:00 From Kevin Z to Everyone : will slides be available on canvas?

Yes, they are published under each Week.

12:15:16 From Trieu, Huy to Everyone : Am I able to use visual studio?

Yes.

12:15:18 From Jake G to Everyone : prepare to suffer.

Prepare to learn lots of fun new stuff.

12:16:03 From Child, April Santa Cordova to Everyone : if you use putty, u can make it so u can log in without DUO, and access the files easily
https://it.engineering.oregonstate.edu/ssh-keygen

12:16:23 From Jacob Eckroth(He/him/his) to Everyone : I think in an announcement you said we were doing lectures on Mondays and Fridays, is it still Mondays and Wednesdays?

My mistake. It is really Mondays and Wednesdays.

12:16:37 From Kao, Wei-Chen to Everyone : When will the office hours be published?

Tuesday or Wednesday. Also, note that every Monday and Wednesday, the time between when Live Lecture ends and 2:00 is automatically my Office Hours too.

12:17:06 From Jordan to Everyone : Do the recorded lectures have captioning?

DAS tells me that they are in the process of captioning the Lecture Videos.

12:17:47 From Tran, John to Everyone : Will lectures differ from Monday compared to Wednesday?

Yes. And, I will post the topics ahead of time.

12:18:15 From Hershberger, Jacob to Everyone : So the main question is, is this class supported on the flip server?

Yes, except for the GPU and MPI projects. We have other servers for those.

12:20:24 From Nathanael Butler to Everyone : so tests are taken on our own time?

Yes. You will have 96 hours to take the 1-hour test in.

12:24:45 From Fleishman, Scott Cainelli to Everyone : not sure if you mentioned this, but on canvas the ppts link to page not found

I think it's been fixed – try again.

12:25:38 From Kuhn, Kurt Arthur J to Everyone : Maybe I missed it, is the write up for every project or for those in 575?

Only the project called *Paper Project* is for 575ers only. (475ers will get a free 100 points for that project.) All other projects are for *both* 475ers and 575ers.

12:26:02 From Tremper, Brayden Justin to Everyone : is there no video to be done for the assignments this term?

The only video you would need to make is if you chose Project 7A instead of 7B.

12:29:40 From Jordan to Everyone : What is a soft grade?

A "hard grade" would be where I also take off points for program style, lack of comments, etc. A "soft grade" is where I only care that you get reasonable results and can explain them.

12:34:47 From Jordan to Everyone : Are there set up guides for OpenMP and OpenCL?

Should be all in the notes.

12:35:35 From Jacob Eckroth(He/him/his) to Everyone : From previous experience with quizzes I suggest watching the recording because sometimes he emphasizes things in class that are on the quizzes

Good advice.

12:37:21 From Jordan to Everyone : Do the pre-recorded lectures have captioning?

DAS tells me that they are working on this.

12:37:33 From Nishant Tharani to Everyone : I'm also interested in hearing whether any projects can be shared publicly on GitHub after the course

I certainly can't stop you, but I would prefer that you show the world *snippets* of your code, not the whole thing. I dislike it when I catch people copying-and-pasting whole programs into their submission.

12:40:34 From Sullivan, Patrick to Everyone : Are the programs all ran on flip by the grader or is there another environment where they are ran?

We are not going to run them. We are going to look at your results and your explanation.

12:41:00 From Caroline to Everyone : More of an observation than a question: I noticed that Canvas doesn't have Project 3 listed for assignments. It looks like Project 4 got moved up into that due date. Just wanted to mention that in case anyone marked their calendar based on Canvas due dates.

No, Project 3 is due as listed. I just haven't completed the full handout yet.

12:42:34 From Trieu, Huy to Everyone : Are there any links to set up flip? I am not familiar with what flip is

It's a set of Linux servers for general student use. You get there by:
ssh flip.engr.oregonstate.edu

12:43:16 From Titsworth, Tyler to Everyone : https://it.engineering.oregonstate.edu/accessing-unix-server-using-putty-ssh
12:43:26 From Titsworth, Tyler to Everyone : Flip is a CentOS 7 Linux System
12:43:50 From Titsworth, Tyler to Everyone : It makes use of your Engineering File Space https://it.engineering.oregonstate.edu/accessing-engineering-file-space
12:44:55 From Child, April Santa Cordova to Everyone : there is also os1.engr.oregonstate.edu
12:45:07 From Titsworth, Tyler to Everyone : the os1 and os2 systems are far more unstable
12:45:11 From Draxler, Thomas to Everyone : Isn't os1 only for 344?

12:45:13 From Name Withheld to Everyone : Can we use the latest C++ with our own virtual Linux machine or do we still need to use the school's compiler?

Some people who took this class before had problems getting the code to work correctly under a VM. Not sure why. You are welcome to try. Let me know what happens

12:47:26 From White, Andrew Joseph to Everyone : are we using C or c++?

You can use either.

12:47:59 From Sullivan, Patrick to Everyone : Do we have to use -O3 when compiling? Would we still get the openMP threading without the optimization?

-O3 is not required to get the OpenMP-isms.

12:51:51 From Tony Fiore to Everyone : Have students successfully used libraries like matplotlib instead of excel/sheets?

Students in this class have used *everything* to make their plots. As long as it shows a good scientific presentation, use whatever works best for you.

12:52:45 From Ben Wichser to Everyone : This slide is perhaps the best demonstration of 2d slices in 3d surface plots that I have ever seen.

Thanks, 3D is my life…

12:52:59 From Jordan to Everyone : Can someone link the OpenCL set up info?

Look in the DGX and OpenCL notes.

12:54:42 From Michael Zimmerman to Bailey, Mike(Direct Message) : If our peak vs average execution times variances are consistently >100 seconds (unreliable in your slide). What do you suggest we do to resolve?

Try again later?

12:56:44 From Kuhn, Kurt Arthur J to Everyone : @Jordan, I got the printinfo.exe working. However, it printed out to a different file instead of outputting it to console. So perhaps you could look for that file

The output file is *printinfo.out*. If you want to print to standard out instead, delete these lines:

```
FILE *FP = fopen("printinfo.out", "w");
if( FP == NULL )
{
        fprintf( stderr, "Cannot create 'printinfo.out'\n" );
        return 1;
}
fprintf( stderr, "'printinfo.out' created.\n" );
```

and replace them with:

```
FILE *FP = stdout;
```

12:57:25 From Jordan to Everyone : no mine couldn't run I think it said missing libs

You have to run it on a system with a GPU (i.e., not flip). You also have to run it on a system where the libraries have been installed. And, you have to know where the libraries are. The paths I gave you are for how we install the OpenCL stuff on OSU machines. Your mileage may vary.

12:58:00 From Lisa Bettcher to Everyone : I see the .out file, but no text inside

If that file is empty, that is usually a sign that no OpenCL-compatible platforms were found.

12:58:12 From Jacob Eckroth(He/him/his) to Everyone : OSU gives Microsoft software for free for students

See the bullet about that in the *Stuff* part of the Resources page.

12:59:16 From Trieu, Huy to Everyone : Anyone have a discord study group?
12:59:32 From Abhi Balijepalli to Everyone : https://discord.gg/5eYVUsCf
12:59:40 From Abhi Balijepalli to Everyone : Choose the CS475 role

13:01:03 From Kuhn, Kurt Arthur J to Everyone : Could we get an example how to run a script from the start? I do not have much experience with that

Good idea! I will do it during the Wednesday Live Lecture.

13:02:14 From Tony Fiore to Everyone : Imo this is a really good scripting tutorial https://ryanstutorials.net/bash-scripting-tutorial/
13:02:38 From Tony Fiore to Everyone : If you're having trouble do the linux tutorial first https://ryanstutorials.net/linuxtutorial/

13:02:46 From Hawkins, Matthew R to Everyone : do you need to include stdlib.h for the atoi function?

That, or, <cstdlib>, I think.

13:05:52 From Jake G to Everyone : Are you planning to use rust at any point down the line?

Not for OpenMP. Because the compiler has to generate code based on your pragmas, it is more than porting the libraries. For now, OpenMP only works with C, C++, and Fortran [!] compilers.

13:09:19 From Taylor, James Edward to Everyone : Are we required to use OpenMP for multi threading code? Or can we write it ourselves?

Yes.

13:09:20 From Shultz, Caleb Ethan to Everyone : google sheets does a good job too if you don't have excel

13:09:32 From Fleishman, Scott Cainelli to Everyone : just noticed baby yoda :)

I will leave it up for you, but I always forget to take that down for "professional" Zoom calls. I've been called out on it more than once.

13:09:36 From Abhi Balijepalli to Bailey, Mike(Direct Message) : Just wanna make sure, openMP and everything required for this class is already on flip right?

The OpenMP and SIMD projects can all be done on flip. The GPU projects and the MPI project need to be done on a different set of servers.

13:10:43 From Liu, Susan to Everyone : Anyone using MobaXterm?

I am, until I find something better. *Ssh Secure Login* was discontinued. ☹ Anyone have a suggestion?

13:10:45 From Taylor, James Edward to Everyone : Are we required to use OpenMP for multi threading code?

Yes.

13:10:54 From Yamamoto, Satoru to Everyone : so we can execute our program on flip server

For the OpenMP projects, yes.

13:11:15 From Hirsch, Ethan Maxwell to Everyone : Pretty sure OpenMP is fine on mac

Since OpenMP is built into the g++ compiler, then g++ on a Mac should work fine.

13:15:06 From Sullivan, Patrick to Everyone : We are doing these tests with multiple cores but does that imply we need a machine with 8+ cores?

For Project #0, just use 1 core and 4 cores. For the others, at a minimum, you need to use 1, 2, and 4. But, your graphs will be more instructive if you can also use 8.

13:15:46 From Jacob Eckroth(He/him/his) to Everyone : you can do multithreading on one core

That is correct. OpenMP existed long before the emergence of multicore CPUs. (We talk about that in the Moore's Law noteset.) But, the real *performance gains* come from running the threads on separate cores.

13:15:49 From John Teeter to Everyone : Is it in the gcc compiler?

Yes.

13:23:13 From Zinn Morton to Everyone : How does OpenMP know that the implied barrier is there? Is there any way to dictate where it ends?

By default, OpenMP inserts a thread barrier at the end of the for-block. There is a directive you can use on the #pragma line that will eliminate that.

13:23:29 From Morello, Zachary D to Everyone : so this lib takes all that mutex and lock and thread stuff we learned 2 years ago and makes it magically easy?

I would call it *easier*, not easy. OpenMP itself makes no effort to prevent race conditions with mutexes and locks, but it does give you, the smart programmer, the mutex and lock capabilities so that you can use them where you know they are needed.

13:23:47 From Draxler, Thomas to Everyone : Yeah, that's a good question. How does this all compare to fork/exec or pthreads?

forks and execs are for entire programs, not program-sharing and memory-sharing threads within a program.
pthreads is more low-level that OpenMP. pthreads deals with thread-level programming. OpenMP deals with task-level programming, a higher abstraction. Some of the OpenMP implementations are actually written in terms of pthreads.

13:24:03 From Weiner, Christopher Charles to Everyone : is that implied barrier the closing bracket of the for-loop?

The implied barrier is at the *end* of the for-loop, wherever that is. Remember that one-line for-loop bodies don't need the curly braces.

13:24:11 From Matsumoto, Nicholas to Everyone : Can we use the project 0's example code and just modify it for our use?

Yes. It's not cheating if *I* give it to you.

13:24:41 From terencetang to Everyone : Will we go over the differences between threads and cores and pros and cons on which to use for what type of scenarios?

Yes. By the time we are done this quarter, you won't be able to remember a time when you didn't understand this.

13:24:43 From Jake G to Everyone : so we're going high level abstraction to avoid bugs.

Easier to get the program to work correctly. Part of that is avoiding bugs.

13:25:00 From Jacob Eckroth(He/him/his) to Everyone : I don't think it's even that high level which is nice
13:25:08 From Jacob Eckroth(He/him/his) to Everyone : although definitely higher than making the pthreads yourself

13:25:25 From Zinn Morton to Everyone : Also can you explain the syntax of the pragma omp line?

1. *#pragma* is a signal to the compiler that a hint is coming.
2. *omp* says that it will be an OpenMP hint.
3. *parallel* says that the code should create a team of threads.
4. *for* says that the code should use that team of threads to divvy-up the iterations for the for-loop that immediately follows.

13:26:26 From Jordan to Everyone : Where does NUMT get defined?

Look in the *Project Notes* about how to run all of your tests from a script. The notes show you two ways to set NUMT.

13:28:13 From Ricardo Wu to Everyone : I think you're supposed to edit project 0 example code, that's why it's there

Correct.

13:28:52 From Burke, Caden Thomas to Everyone : are we going to learn how the i's get divided into the threads

If you say nothing else, they get round-robinned among the threads, like a dealer dealing cards one-at-a-time to poker players. But, you can control it with additional directives on the #pragma line. We will cover that in the full OpenMP notes.

13:30:40 From Jamie Chaisson to Everyone : I am running the file and getting an error, then my file gets deleted.
/usr/bin/ld: /usr/lib/gcc/x86_64-linux-gnu/9/../../../x86_64-linux-gnu/Scrt1.o: in function `_start':
(.text+0x24): undefined reference to `main'
collect2: error: ld returned 1 exit status

This is *printinfo*, right? Email me more about where you are running it and how you are running it.

13:31:35 From Halaapiapi, Leni Tualau to Everyone : So, I assume that if the result of one iteration is dependent on the other, then parallelization is not applicable?

That's correct. It's known as an *inter-loop dependency*. However, OpenMP does not detect it. It will let you create code that does it. It's up to you, the smart programmer, to not do it.

13:31:37 From Wil Coiner to Everyone : How does openmp handle recursive value assignments where there is an accumulator?
13:33:11 From Wil Coiner to Everyone : Something like x = x + i

That's called a *reduction*. It is so common in application programming that OpenMP has a special directive for it that gets added to the #pragma line. It will be covered in the full *OpenMP* notes and in the noteset called *Trapezoid*.

13:33:14 From Jordan to Everyone : Sorry, what values should we be using for NUMT, NUMTRIES, and SIZE? NUMTRIES is 10-20?

NUMT is the number of threads/cores. For Project #0, use 1 and 4.
NUMTRIES is the number of attempts to get a reliable maximum performance. I usually use 10-20.
SIZE (in Project #0) is how many for-loop iterations to use. Use at least 1000. You might experiment with larger SIZE values too. 10,000? 100,000?

13:34:06 From Jake G to Everyone : what else do you have running?
13:45:19 From John Teeter to Everyone : Any suggestions on what to look at if our 1 thread times are faster than our 4 times?

Definitely kill *all* other applications you can, especially your browsers. That will free up as much CPU and memory as possible for your test runs so that you are testing your program and only your program.

13:41:23 From Lisa Bettcher to Everyone : period makes it a double rather than an int?

Correct.

13:47:59 From Lisa Bettcher to Everyone : Can we run the code in Visual Studio with F5, or do we need to use g++ in the terminal?

You can do it either way. The Simple OpenMP notes show you how to turn on OpenMP in both g++ and Visual Studio.

13:50:06 From Haj, Lucian to Everyone : I'm getting a page not found when clicking on the notes slides. Are the ppt links working for everyone?

There was a problem earlier – try again.

13:51:43 From Ferrari, Anthony to Everyone : based off John's situation, should we be using c++ compiler or c compiler? is this up to us?

Up to you.

13:52:48 From Kao, Wei-Chen to Everyone : For project 0, do we only need to submit the source code? Is there any file that we have to submit?

Submit your C or C++ file. Also submit your PDF file. Don't submit an executable.