
BIOE 488 - Applied High-Performance Computing for Imaging Science - Fall 2025

Professor:	Matias Carrasco Kind
Contact Information:	Office: 3052 BIF; mcarras2@illinois.edu
Class Time:	Mondays and Wednesdays from 2:00pm-3:20pm
Class Location:	3117 Everitt Laboratory
Office Hours & Location:	Wednesdays 9:30 – 10:30am (3052 BIF / zoom) By request
Course Website:	https://canvas.illinois.edu/
Teaching Assistant:	None
TA Office Hours:	None

Course Description:

Will introduce students to basic principles and practical applications of scientific computing as they relate to problems in machine learning and computed imaging. In this self-contained course, students will be introduced to a variety of important topics that underlie real-world machine learning and biomedical image computing tasks that are not typically comprised in a single course.

The material will be presented in a practical way that will be accessible to engineering students who have a moderate level of experience in scientific computing but lack specific training in computer science.

The emphasis will be on immediate applicability of scientific computing techniques as opposed to theoretical knowledge. The course will begin with an overview of good scientific coding practices in Python and introductions to canonical computing architectures.

Subsequently, parallel computing concepts will be surveyed that address multi-core CPU and GPU-enabled systems. Distributed GPU computing on a cluster will also be covered. The salient aspects of TensorFlow and/or other relevant machine learning programming environments will be introduced and utilized in applications of machine learning.

Course Materials:

- We will use **Python** programming language
- Textbooks (All Available Online)
 - High Performance Python, Gorelick & Ozsvald
 - Computer Organization and Design, Patterson & Hennessy
 - Programming Massively Parallel Processors – A Hands-on Approach, Kirk & Hwu

Course Evaluation:

Participation	10%
Assignments (MP)	45%
Labs	15%
Midterm	15%
Final	15%

Reading and Assignment Submission:

All readings and assignments are due at the beginning of class.

Grading Rubric:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

DISCLOSURES

- **Building Emergency Procedures** - In the event of a tornado warning, please seek shelter in the Wohlers Hall basement or the Armory, or in the BIF basement between 8 am and 4:30 pm weekdays (the nearest designated University tornado shelters). If a tornado is imminent, the BIF basement stairwells also can be used on an emergency basis. In the event of a fire in BIF, exit BIF and proceed to 141 Wohlers Hall. In the event of threat from a shooter on campus, lock down the classroom and move to a place of safety within the classroom. If you encounter a suspicious package, do not touch the package; alert campus security, and refrain from cell phone usage until the situation is resolved. More detailed information and action instructions are available in the Building Emergency Action Plan.
- **Campus Emergency Statement** - Emergencies can happen anywhere and at any time, so it's important that we take a minute to prepare for a situation in which our safety could depend on our ability to react quickly. Take a moment to learn the different ways to leave this building. If there's ever a fire alarm or something like that, you'll know how to get out and you'll be able to help others get out. Next, figure out the best place to go in case of severe weather – we'll need to go to a low-level in the middle of the building, away from windows. And finally, if there's ever someone trying to hurt us, our best option is to run out of the building. If we cannot do that safely, we'll want to hide somewhere we can't be seen, and we'll have to lock or barricade the door if possible and be as quiet as we can. We will not leave that safe area until we get an Illini-Alert confirming that it's safe to do so. If we can't run or hide, we'll fight back with whatever we can get our hands on. If you want to better prepare yourself for any of these situations, visit police.illinois.edu/safe. Remember you can sign up for emergency text messages at <http://emergency.illinois.edu/>.
- **Sexual Misconduct Policy and Reporting** - The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options. A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and

can maintain confidentiality, can be found here:

<http://wecare.illinois.edu/resources/students/#confidential>. Other information about resources and reporting is available here: <http://wecare.illinois.edu>.

- **Food/Housing Insecurity Statement** - “Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support and alert the course [professor/instructor].”
- **Disability Resource Statement** - “To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 217-333-4603, email disability@illinois.edu or go to the DRES website: www.disability.illinois.edu.”
- **Mental Health Information** – Diminished mental health, including significant stress, mood changes, excessive worry, substance/alcohol abuse, or problems with eating and/or sleeping can interfere with optimal academic performance, social development, and emotional wellbeing. The University of Illinois offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services, skill-building workshops, and specialized screenings at no additional cost. If you or someone you know experiences any of the above mental health concerns, it is strongly encouraged to contact or visit any of the University’s resources provided below. Getting help is a smart and courageous thing to do – for yourself and for those who care about you.

Counseling Center: 217-333-3704, 610 East John Street, Champaign, IL

Jennifer House is the Gies Embedded Clinical Counselor from the Counseling Center. Jennifer provides individual counseling as well as consultation hours to Gies students. Contact Jennifer directly via email at jhouse@illinois.edu to schedule an appointment or for additional information. You can also visit the counseling center website site at: <http://counselingcenter.illinois.edu/about-us/embedded-counselors>

McKinley Health Center: 217-333-2700, 1109 South Lincoln Avenue, Urbana, IL

Disability Resources & Educational Services (DRES): (217) 333-1970, 1207 S Oak St, Champaign, IL

Kognito

Kognito teaches skills to recognize distress in others, talk to them about it, and connect them to resources that can help. Kognito offers modules specific

to concerns of LGBTQ individuals and student veterans. Having conversations about suicide can be difficult, but it is important to have them. If you are unsure where to begin, practice at <http://ui.kognito.com>