COURSE DESCRIPTION
The goal of this course is to provide an introduction to the data management and data processing applications available for large scale data, with a focus on biomedical data. Utilizing samples from the 1000 Genomes Project, this course will provide hands-on experience managing and processing large scale biomedical data. Topics covered include SQL, NoSQL, distributed file systems and parallel computing.

CREDIT HOURS
3

PREREQUISITES OR CONCURRENT ENROLLMENT REQUIREMENTS
BMI 565/656, BMI 550/650, familiarity with Linux

TERM, YEAR, AND CAMPUS
Winter, 2018, OHSU Marquam Hill Campus

FACULTY INFORMATION
- Name: Michael Mooney
  Email: mooneymi@ohsu.edu
  Phone: 503-418-9668
  Address & Office Number: HRC14D69E
  Office Hours: By appointment
  Preferred Method of Contact: Email
  Expected Response Time: 24hrs

- Name: Christina Zheng
  Email: zheng@ohsu.edu
  Phone: 503-494-8462
  Address & Office Number: HRC14D56
  Office Hours: By appointment
  Preferred Method of Contact: Email
  Expected Response Time: 24hrs

GENERAL COURSE MEETING LOCATION, DAY, AND TIME
Tuesdays and Fridays 1-2:30pm
BICC 124

COURSE OBJECTIVES, COMPETENCIES, OR OUTCOMES

BMI 535/635 Learning Objectives
1. Students should be able to create, normalize, load, and query relational databases
2. Students should be familiar with different platforms/use cases of NoSQL databases
3. Students should be familiar with alternative data storage and data structures
4. Students should be able to create and run jobs on Exacloud and Amazon Web Services
5. Students should be familiar with map-reduce and distributed file systems
6. Students should be able to reproduce, implement, debug, and document an established biomedical data analysis workflow

**BMI 635 Additional Learning Objective**

7. Students should be able to design and evaluate the efficiency of parallelized analysis workflows

**REQUIRED TEXTS OR READINGS**

Readings from primary literature will be assigned

**ATTENDANCE REQUIREMENTS**

On campus attendance is required.

**GRADING POLICY**

Grades will be based the following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Assignments</td>
<td>40%</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>20%</td>
</tr>
<tr>
<td>Final Project</td>
<td>40%</td>
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</tbody>
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Graduate Studies in the OHSU School of Medicine is committed to providing grades to students in a timely manner. Course instructors will provide students with information in writing at the beginning of each course that describes the grading policies and procedures including but not limited to evaluation criteria, expected time needed to grade individual student examinations and type of feedback they will provide.

Class grades are due to the Registrar by the Friday following the week of finals. However, on those occasions when a grade has not been submitted by the deadline, the following procedure shall be followed:

1) The Department¹ /Program Coordinator² will immediately contact the Instructor requesting the missing grade, with a copy to the Program Director and Registrar.
2) If the grade is still overdue by the end of next week, the Department¹ /Program Coordinator² will email the Department Chair directly, with a copy to the Instructor and Program Director requesting resolution of the missing grade.
3) If, after an additional week the grade is still outstanding, the student or Department¹ /Program Coordinator² may petition the Office of Graduate students for final resolution.

¹ For courses that are run by a specific department.
² For the conjoined courses (course number is preceded by CON_ that are run by Graduate Studies.

**COPYRIGHT INFORMATION**

Every reasonable effort has been made to protect the copyright requirements of materials used in this course. Class participants are warned not to copy, audio, or videotape in violation of copyright laws. Journal articles will be kept on reserve at the library or online for student access. Copyright law does allow for making one personal copy of each article from the original article. This limit also applies to electronic sources.
To comply with the fair use doctrine of the US copyright law, Sakai course sites close three weeks after grades are posted with the Registrar. Please be sure to download all course material you wish to keep before this time as you will have no further access to your courses.

DMICE COMMUNICATION POLICY
1. If the syllabus directs the student to contact the TA before contacting the instructor, the student should do so. Otherwise, the student should contact the instructor and allow 2 business days (not including weekends) for a response.
2. If the student does not receive a response from the instructor within 2 business days, s/he should contact the TA (if there is one). When contacting the TA s/he should cc the instructor and Diane Doctor at doctord@ohsu.edu.
3. If a student does not receive a response from the TA within 1 business day (not including weekends), s/he should contact Diane Doctor at doctord@ohsu.edu and cc the instructor and the TA.
4. If Diane does not reply within 1 business day (not including weekends), the student should contact Andrea Ilg at ilgan@ohsu.edu.
5. Students having difficulties with Sakai should contact the Sakai Help Desk at sakai@ohsu.edu or at (877) 972-5249. Sakai help is available M-F from 8am to 9 pm and weekends from Noon to 5pm. Do not contact the instructor.
6. Please use professional etiquette when communicating with peers and the instructor. This means avoiding aggressive or offensive language, showing respect for others’ opinions and positions, and conducting yourself as if you were face to face with them. Please pay special attention to etiquette in class forums and when using email. If you notice someone violating this policy, please make the instructor and TA aware of the problem.

SYLLABUS CHANGES AND RETENTION
This syllabus is not to be considered a contract between the student and the School of Medicine. It is recognized that changes may be made as the need arises. Students are responsible for keeping a copy of the course syllabus for their records.

SYLLABUS STATEMENT REGARDING DISABILITY SERVICES
OHSU is committed to providing equal access to qualified students who experience a disability in compliance with Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990, and the ADA Amendments Act (ADA-AA) of 2008. If you have a disability or think you may have a disability (physical, sensory, chronic health, psychological or learning) please contact the Office for Student Access at (503) 494-0082 or studentaccess@ohsu.edu to discuss eligibility for academic accommodations. Information is also available at www.ohsu.edu/student-access. Because accommodations may take time to implement and cannot be applied retroactively, it is important to have this discussion as soon as possible. All information regarding a student’s disability is kept in accordance with relevant state and federal laws.

COMMITMENT TO EQUITY AND INCLUSION
Oregon Health & Science University is committed to creating and fostering a learning and working environment based on open communication and mutual respect. If you encounter sexual harassment, sexual misconduct, sexual assault, or discrimination based on race, color,
religion, age, national origin or ancestry, veteran or military status, sex, marital status, pregnancy or parenting status, sexual orientation, gender identity, disability or any other protected status please contact the Affirmative Action and Equal Opportunity Department at 503-494-5148 or aaeo@ohsu.edu. Inquiries about Title IX compliance or sex/gender discrimination and harassment may be directed to the OHSU Title IX Coordinator at 503-494-0258 or titleix@ohsu.edu

ACADEMIC HONESTY
Course participants are expected to maintain academic honesty in their course work. Participants should refrain from seeking past published solutions to any assignments. Literature and resources (including Internet resources) employed in fulfilling assignments must be cited. See http://www.ohsu.edu/xd/education/library/research-assistance/plagiarism.cfm?WT_rank=1# for information on code of conduct for OHSU and http://www.ohsu.edu/xd/education/teaching-and-learning-center/f or-students/index.cfm for more information on citing sources and recognizing plagiarism.

In an effort to uphold the principles and practice of academic honesty, faculty members at OHSU may use originality checking systems such as Turnitin to compare a student’s submitted work against multiple sources.

To protect student privacy in this process, it will be necessary to remove all personal information, i.e. student name, email address, student u-number, or any other personal information, from documents BEFORE submission.

USE OF SAKAI
This course will have an online component, which can be accessed through Sakai, OHSU’s online course management system. For any technical questions or if you need help logging in, please contact the Sakai Help Desk.

Hours: Sakai Help Desk is available Mon – Fri, 8 am – 9 pm and weekends 12 pm – 5 pm, Pacific Time.
Contact Information:
(Toll-free) 877-972-5249
(Web) http://atech.ohsu.edu/help
(Email) sakai@ohsu.edu

OHSU Proctoring Policy
It is OHSU policy that any exam offered online and worth more than 10% of the final course grade must be virtually proctored. In this course, we will be using the services of Examity, a remote proctoring service. You will be required to schedule your exam three (3) weeks ahead of time. There is no cost to the student. More information will be provided to you regarding setup, scheduling, and requirements in the Course Materials.


INCLEMENT WEATHER POLICY
When the weather forecaster is calling for ice or snow, call the **OHSU Alert Line, 503 494-9021**, for information regarding weather conditions that may affect operations at OHSU. This hot line will offer specific recorded messages for road conditions on OHSU's Marquam Hill and West campuses (option 1), and for patients (option 2), students (option 3) and employees (option 4).

If extreme weather conditions present potentially unsafe situations, the provost of the university may choose to delay or cancel classes, or alter office and research activities. If classes are canceled or delayed, residents and students who have patient care responsibilities must meet those obligations.

For more information, please view the website [http://www.ohsu.edu/xd/about/visiting/weather/index.cfm](http://www.ohsu.edu/xd/about/visiting/weather/index.cfm) or call the above hotline.