Math 168, Networks, UCLA
Information Sheet (9/25/20)

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1. *About the Course*

   (a) Math 168 is a project-based course about networks, which can be used to study complex systems of interacting agents. The study of networks — in terms of theory, computation, and applications — is pervasive in physics, biology, sociology, information science, and myriad other fields. The study of networks is also a major part of data science.

   (b) **Some Motivating Questions:** How should one describe the structure of social networks? How do diseases and rumors spread along different types of networks, and how does network structure affect the speed and pervasiveness of information, memes, and diseases? Using network structure only, how can one determine which Web pages are the most important ones? How does 'physical distancing' affect the propagation of a disease?

   (c) **Learning Outcomes:** Students will develop a sound knowledge and appreciation of some of the tools, concepts, and computations used in the study of networks. The study of networks is predominantly a modern subject, so the students will also be expected to develop the ability to read and understand current research papers in the field. They will also have a chance to explore a topic in depth in a final project. Course topics include basic structural features of networks, generative models of networks, centrality, random graphs, clustering, and dynamical processes on networks.

   (d) **Online Course Description (from https://ww3.math.ucla.edu/courses/:** "Lecture, three hours; discussion, one hour. Requisites: courses 115A, 170A or Electrical and Computer Engineering 131A or Statistics 100A. Introduction to network science (including theory, computation, and applications), which can be used to study complex systems of interacting agents. Study of networks in technology, social, information, biological, and mathematics involving basic structural features of networks, generative models of networks, network summary statistics, centrality, random graphs, clustering, and dynamical processes on networks. Introduction to advance topics as time permits. P/NP or letter grading."

2. *Coordinates*

   (a) **Classes:** online, Zoom (Meeting ID: 986 9467 1903 , Passcode: 888777 , MWF 14:00–14:50

   (b) **Discussion Sections:** online, Zoom (https://ucla.zoom.us/my/abbyhickok), Thursday 14:00–14:50

3. *Primary Texts*

   - Mark Newman, *Networks*, 2nd edition, Oxford University Press, 2018 (**primary course text**; make sure that you have access to this book)
   - MAP and James P. Gleeson, *Dynamical Systems on Networks: A Tutorial* (available for free through UCLA)
   - Supplementary material from other sources (e.g., review articles, other papers, etc.)

4. *TA*

   (a) Abby Hickok (abigailhickok2@gmail.com)

5. *Office Hours*

   (a) **My office hours:** 2 weekly hours to be determined (upcoming online poll), or by appointment [location = class Zoom room]

   (b) **Abby's office hours:** to be determined [location = discussion Zoom room]

6. *Class Participation*: Class participation will take many forms and will also constitute 10% of the final grade in the class.

   (a) We will use our Math 168 CCLE course web page for various discussions, including scientific things about networks, homework questions and discussions, other discussions (hobbies and other interests), and so on. Especially in an online environment, support and community-building is crucial (and it will also help directly with learning the mathematical material).

   (b) In Table I, I show how to get Course Participation points (with a maximum of 100, so you will see that there are many ways to do this).

TABLE I: How to get class-participation points for Math 168 in fall 2020. (Note: A hyperlink to your new network-scientist Wikipedia entry should be posted to our CCLE page for discussion.)

Activity	Points per engagement	Maximum number of engagements	Possible points
Ask a question on CCLE	5	7	35
Answer a question on CCLE	5	7	35
Complete a project peer review	10	2	20
Write a Wikipedia entry about a network scientist	25	1	25
Introduction post on CCLE	15	1	15
Create a review sheet for the midterm and post it on CCLE	10	1	10
Attend project presentations	15	1	15
Attend an office hour (for at least 10 minutes)	10	2	20

7. *Grading*

   (a) **Class Participation (10%:** See the description above. The maximum possible score is $A = 100$.

   (b) **Homework (25%):** There will be some number (N) of homework assignments. (Roughly, $N = 6$ is likely, but I am not promising exactly this number.) The lowest homework score will be dropped. The maximum possible score is $B = 100$.

   (c) **Midterm (15%):** There will be one midterm. It is meant to take about 1.5–2 hours, but you will have a 24-hour period in which to do it. The tentative date for this exam is Monday 9 November (with posting at 8:45 am pacific time on 9 November and a due via CCLE by 9:45 am pacific time on 10 November), but we'll figure out the precise timing a bit later. The midterm will be open book (Newman's book only) and open notes, and it is to be taken individually. The maximum possible score is $C = 100$.

   (d) **Outreach Article (10%):** This will be a short (1500-word) article for teens and/or pre-teens about one idea in networks that is written in the form of an article for the journal *Frontiers for Young Minds*. I expect the submission date for this to be roughly 1 week after the midterm (specifically, roughly Thursday 19 November). The maximum possible score is $D = 100$.

   (e) **Final Group Projects (40%):** The capstone part of the course will be a project, in the form of a final written report and various other milestones (in written and/or oral format) leading up to it. As explained below, the intermediate milestones will be 10% of the course grade and the final project itself will be 30% of the course grade. Our final slot (Wednesday 16 December 3:00–6:00 pm pacific time) is reserved for group presentations of final projects. The final written report is due by Friday 18 December at 23:59 (i.e., 11:59 pm) pacific time. It should be submitted to me by e-mail and (in case of large file size) shared with me using Dropbox or something similar. All code (and other relevant supplementary files) must also be submitted. The maximum possible project score is $E = 100$.

   Here are the four graded components of the final group project:

      i. Four short essays (less than 1000 words) in and near the beginning of the course. These are guided writing prompts to help you prepare for the project. In total, this will constitute 8% of the course grade.

      ii. Two group meetings with me about the project. In total, this will constitute 2% of the course grade.

      iii. A final oral group presentation, which can either be done live via Zoom or prerecorded before our final slot. Other creative modes of presentation are welcome and encouraged as long as you get them approved by me in advance. In total, the final oral presentation will constitute 10% of the course grade.

iv. A final submission in the format of a paper for the scholarly journal *PNAS* (maximum 6 pages of main text + any amount of Supplementary Materials). All code must also be submitted. A LaTeX template will be provided for this submission. In total, the final written report will constitute 20% of the course grade.

(f) **Final Grades:** The final score is

$$S := \frac{A + B + C + D + E}{5} \tag{1}$$

Anybody with $S \geq 90$ will get at least an 'A-'; anybody with $S \geq 80$ will get at least a 'B-'; anybody with $S \geq 70$ will get at least a 'C' (without the minus); and anybody with $S \geq 60$ will get at least a 'D' (without the minus). I reserve the right to be more generous, but the above are guarantees.

A grade of 'F' will be assigned to any student who does not submit a final report (even if $S \geq 60$, in the unlikely event that this occurs in this situation). Incompletes are reserved for those who have completed all of the work for the class, including the final project, but who, for a legitimate, documented reason, miss the final presentation.

8. *Homework Format*

(a) Homework will be a mixture of many different formats (including computational exercises) and will be of varying difficulties.

Due dates and submission instructions will be indicated on each homework assignment, which will each be posted on CCLE at least one week before the due date. In most cases, homework solutions are to be uploaded to CCLE.

Due to the current extraordinary circumstances, for each assignment, there will be an automatic grace period for submission of 72 hours after the published due date. (If you get seriously ill or need to care for somebody who is ill or there is something else in your life for which you need accommodation, we will find a way to work with this on deadlines. Keep in touch with us.)

9. *Computing*

(a) Computations, simulations, and the use and analysis of data are important aspects of network science. No prior coding experience is required for this course. A few of the homework problems will include some computational or coding-based exercises, and you may wish to involve computation in your final project. You are welcome to use any coding language that is familiar to you. Examples include MATLAB, PYTHON, and R. All of these are either open-source or are available to you for free through UCLA. The TA will provide a tutorial on some of the popular networks packages to help you get started. It is very important that you be proactive about asking for assistance from your classmates, our TA, or me when you need help with computing.

10. *Other Notes*

(a) **Appeals**: As a rule of thumb, you should only appeal on correctness (not on the amount of partial credit that you received). Any such requests will only be considered within 7 days of when I return the assignment and no later than Monday 8 June.

(b) **Academic Accommodations:** Students needing academic accommodations based on a disability must contact the Center for Accessible Education (CAE) at 310-825-1501. As the professionals delegated authority from the camps to determine reasonable disability accommodations, CAE will assess all requested accommodations and communicate appropriately with faculty. In the event that a student has approval for proctoring arrangements during exams, please inform your respective professors and/or Teaching Assistant(s) before the date of exam(s). When possible, students should contact the CAE within the first two weeks of the term, as reasonable notice is needed to coordinate accommodations. For more information, visit `www.cae.ucla.edu`.

(c) **Academic Integrity:**

Quoting the office of the Dean of Students: *With its status as a world-class research institution, it is critical that the University uphold the highest standards of integrity both inside and out- side the classroom. As*

a student and member of the UCLA community, you are expected to demonstrate integrity in all of your academic endeavors. Accordingly, when accusations of academic dishonesty occur, The Office of the Dean of Students is charged with investigating and adjudicating suspected violations. Academic dishonesty includes, but is not limited to, cheating, fabrication, plagiarism, multiple submissions or facilitating academic misconduct.

Students are expected to be aware of the University policy on academic integrity in the UCLA Student Conduct Code: `http://www.deanofstudents.ucla.edu/Portals/16/Documents/UCLACodeOfConductRev030416.pdf`

Please note the sections on (1) cheating, (2) plagiarism, and (3) unauthorized study aids. Violation of course policy involving plagiarism, cheating, or possession of course materials during exams will be referred to the Dean of Students, who will be encouraged to take strong action. Do not cheat! The penalties can be very severe. Do not believe it if you hear that "everyone does it." You generally do not hear about the punishments because they are kept confidential. If you are found responsible by the Dean of Students for violating course policy, cheating on any course materials, or giving or receiving unauthorized help, a 0 will be assigned for the entire assignment. No exceptions will be made. Past examples of penalties also include loss of an entire term of credit and suspension for several terms. If you plan to apply to graduate or professional school, such a negative mark on your record may be a major obstacle to admission.

(d) **Title IX Resources:** UCLA prohibits gender discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking. If you have experienced sexual harassment or sexual violence, there are a variety of resources to assist you:

- CONFIDENTIAL RESOURCES: You can receive confidential support and advocacy at the CARE Advocacy Office for Sexual and Gender-Based Violence, 1st Floor Wooden Center West, `CAREadvocate@careprogram.ucla.edu`, (310) 206-2465. Counseling and Psychological Services (CAPS) also provides confidential counseling to all students and can be reached 24/7 at (310) 825-0768.
- NON-CONFIDENTIAL RESOURCES: You can also report sexual violence or sexual harassment directly to the Universitys Title IX Coordinator, 2241 Murphy Hall, `titleix@conet.ucla.edu`, (310) 206-3417. Reports to law enforcement can be made to UCPD at (310) 825-1491. These offices may be required to pursue an official investigation.

Faculty and TAs are required under the UC Policy on Sexual Violence and Sexual Harassment to inform the Title IX Coordinator — A NON-CONFIDENTIAL RESOURCE — should they become aware that you or any other student has experienced sexual violence or sexual harassment.

(e) **Psychological Health, Well-Being, and Resilience:** UCLA is renowned for academic excellence, yet we know that many students feel overwhelmed at times by demands to succeed academically, socially, and personally. Our campus community is committed to helping all students thrive, learn to cope with stress, and build resilience. Remember, self-care is a skill that is critical to your long-term success. Here are some of the many resources available at UCLA to support you:

- Counseling and Psychological Services (CAPS): `https://www.counseling.ucla.edu/`. Provides counseling and other psychological/mental health services to students. Walk-in hours are Monday–Thursday 8am–4:30pm and Friday 9am–4:30pm in John Wooden Center West. Crisis counseling is also available 24 hours/day at (310) 825-0768.
- Ashe Student Health and Wellness Center: `http://www.studenthealth.ucla.edu`. Provides high quality and accessible ambulatory healthcare and education by caring professionals to support the academic success and personal development of all UCLA students.
- Healthy Campus Initiative (HCI): `https://healthy.ucla.edu`. Provides links to a wide variety of resources for enhancing physical and psychological well-being, positive social interactions, healthy sleep, healthy eating, healthy physical activity and more.
- Campus and Student Resilience: `https://www.resilience.ucla.edu/`. Provides programs to promote resilience and trains students to help support their peers.
- UCLA Recreation: `https://www.recreation.ucla.edu/`. Offers a broad array of services and programs including fitness, yoga, dance, martial arts, meditation, sports, and much more.
- Equity, Diversity, and Inclusion: `https://equity.ucla.edu/`. Committed to providing an equal learning, working and living environment at UCLA and supports a range of programs to promote these goals campus-wide.

- UCLA GRIT Coaching Program: `https://www.grit.ucla.edu/`. GRIT stands for Guidance, Resilience, Integrity, and Transformation. In this program, UCLA students receive individualized support from trained peer coaches to manage stress, fostering positive social connections, set goals, and navigate campus resources.

(f) **Resources for Students Dealing with Financial Stress**

- Bruin Shelter: `http://www.bruinshelter.org/`. Provides a safe, supportive environment for fellow college students experiencing homelessness by fostering a collaborative effort between universities, community-based organizations, and service providers.
- The CPO Food Shelter: `http://www.cpo.ucla.edu/cpo/foodcloset/`. Provides free food for any UCLA student who may be experiencing hunger and/or struggling to attain food due to financial hardships.

11. **Important dates:**

- `First discussion session:` Thursday 10/01 (2:00 pm pacific time)
- `First lecture:` Friday 10/02 (2:00 pm pacific time)
- `Midterm (estimated):` Available Monday 9 November
- `Outreach article (estimated):` Due Thursday 19 November
- `Holidays (no class):` Wednesday 11 November (Veterans Day), Thursday–Friday 26–27 November (Thanksgiving)
- `Last lecture:` Friday 12/11
- `Oral project presentations:` Wednesday 16 December (our 'final slot' is 3:00–6:00 pm pacific time)
- `Written project reports due:` Friday 18 December at 23:59 (i.e., 11:59 pm) pacific time