**Genomics of Mixed-ancestry Individuals**

**Official title: Topics in Ecology and Evolutionary Biology (Fall 2015 Syllabus)**

**Banner ID: BIOL 2440 S02 / CRN: 25493**

**Course Instructor:** Professor Sohini Ramachandran

(sramachandran@brown.edu, office phone and voicemail: 863-9701)

**Class meetings:** Mon 3:00 - 5:30 p.m. (M hour), CIT 241 (Swig Board Room)

**Office hours:**

Ramachandran: Tuesdays 2-4 p.m. Watson CIT 247A, by appointment at <http://bit.ly/SRofficehours>. Students may sign up individually or in groups (in the latter case, take two consecutive time slots). If necessary I am also available by appointment – just email

[sramachandran@brown.edu](mailto:sramachandran@brown.edu) to set one up.

**Course description:** The goal of this 2000-level course is to critically review state-of-the-art statistical methods for analyzing genomic data from mixed-ancestry individuals. The second, equally important goal is to develop skills in scientific communication, both spoken and written. The papers we cover, and data analysis projects, will be chosen and updated by course participants as the course evolves, with instructor guidance. Initially we will focus on the human genomic literature, but welcome opportunities to expand our focus to other species and hybrid species. Mixed-ancestry individuals represent the result of natural experiments, and we will explore how current researchers: (1) model mixed-ancestry individuals and the recombination processes that shape their genomes, (2) infer the evolutionary history of mixed-ancestry individuals (and that of their ancestry sources), and (3) leverage the genomes of mixed-ancestry individuals for disease mapping.

**Prerequisites:** formal coursework, and a strong interest in, applied statistics and probability theory; some familiarity with programming in any language (Python would be ideal); the willingness to lead and actively participate in discussions of primary literature in genomics.

**Grading: This seminar is offered for satisfactory/no credit grading only.** A passing grade requires completing all assignments, and participating actively in class discussions, at a level satisfactory to the instructor.

**Git repository:** This syllabus and the papers covered in class, along with suggested papers, will be publicly available, and evolving in real-time over the semester, at <https://github.com/ramachandran-lab/MixedAncestryGenomics> (GitHub enables version control across all our machines). You can publicly download the repository, which contains suggested papers on mixed-ancestry individuals as well as the papers for the first two class discussion, and also push changes to it (e.g., papers for discussions you lead). I suggest using the app GitHub Desktop in order to sync your local copy of the repository, and to push any changes. For a detailed introduction to git (which you probably don’t need for this course), see <https://www.atlassian.com/git/tutorials>.

**Assignments:** There will be two types of assignments throughout the semester.

1. Leading discussion: Each course participant will co-lead *at least one* (depending on course size) course session during the semester. This can consist of giving an interactive chalk talk covering a relevant paper, or generating an applied project the class can work on for at least half a class meeting. Students are encouraged to discuss their proposed topics and papers when leading discussions with Professor Ramachandran.
2. Practicing scientific writing/communication: Course participants have two options for fulfilling this requirement, detailed below.

*Option 2a.:* write two abstracts (each ≤ 300 words) for papers discussed throughout the semesters. Papers will have abstracts masked; resist the urge to find the paper and read the abstract! Instead, you’ll write your own summary of the work. A good abstract generally contains: (1) a clear statement of the problem the researchers are focusing on, (2) why the problem is important, (3) the technical contribution of the new study, (4) what the evaluation is and what it indicates (e.g., a proof, experiments, data collection and analysis), and (5) what the consequences and interpretation of (3) and (4) are. A good abstract should balance both specific technical details and general interpretations such that the reader is motivated to read the paper.

These will reviewed by the class alongside the actual abstract, as part of the discussion of the paper of interest.

*Option 2b.:* producing a 3-minute animation illustrating some aspect of the genomics of mixed-ancestry individuals to a general audience. These will be presented to course participants on April 30, and shared with the broader public via the web. You can see examples made by undergraduates and graduate students who took Biol 1465 (Human Population Genomics) during Fall 2014 at <https://vimeo.com/ramachandranlab>. You will be given support and some resources regarding animation and sound recording.

Information on producing a video is available at <http://creaturecast.org/making-a-creaturecast-episode> (thanks to Professor Casey Dunn, formerly at Brown and now at Yale). Along with the animation, you submit a brief caption that includes links to music and other resources (see [http://creaturecast.org](http://creaturecast.org/) for example captions). In addition, you must provide citations to the scientific literature that back up each factual assertion that is part of your story.

You must submit a plan for your animation for preliminary evaluation early on in the semester: by email before 3 p.m. on March 26. The animation plan will consist of a 1-page single-spaced script, a storyboard outlining a series of images/transitions for your animation, and your citations to the scientific literature.

Any content that is included in an animation (be it music in an animation or a figure in a paper) must be original by you, or available under a license that allows its reuse, such as a [http://creativecommons.org](http://creativecommons.org/) license that allows derivative works. You must also attribute the work, i.e. by providing a link for music or specifying the source of a figure. It is fine to cite references, such as copyrighted journal articles, that are available under stricter licenses. The license covers the media itself (i.e., the text, sound, or images), not the ideas in the media.

Students are free to expand on any relevant topic *approved by Professor Ramachandran* for an animation project. **This assignment is meant to be fun and creative, and it will take a lot of effort so plan accordingly!**

**Textbook:** There will be no required textbook for this course. Several relevant reference books are available from the instructor.

**Policy regarding computers in class:** Unless we are actively working on a computational project, or adding to the course git repository, participants should plan to leave laptops down during class meetings.

**Policy regarding late work:** If there is an emergency that prevents you from turning in work on time or presenting your final project, please contact the Dean of the College’s office immediately; they will then contact me.

**Academic Honor Code:**

Although working together will be encouraged when leading discussions and producing animations, students are required to present their work independently and to cite the name of their partner(s) if work with a partner or partners was done. Violation of the Academic Honor Code is a serious issue, with serious consequences. The following are examples of violations:

* Unauthorized collaboration on technical assignments, such as computer science programs, laboratory reports, etc.;
* Submission of written work which is in whole or in part plagiarized from other sources, including papers or material copied from fellow students, from published sources such as articles, books, websites, or internet paper mills;
* Altering of exam or homework answers for resubmission and additional credit, and submission of the same written work to each of two different courses;
* Cheating from a fellow student or from prohibited materials on an in-class exam.

The consequences of these violations range from loss of credit to temporary (or permanent) separation from the University. Please review the Academic Code at:

<http://brown.edu/Administration/Dean_of_the_College/curriculum/academic_code.php>

**Course meeting dates**

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| **Date** | **Lecture/lab topic** |
| January 29 | History of analyses of mixed-ancestry individuals, admixture mapping and local ancestry deconvolution – led by Sohini |
| February 5 | Copying with recombination, Random forests and local ancestry deconvolution – led by Michael Turchin and Sahar Shahamatdar |
| February 12 |  |
| February 19 | *President’s Day Weekend – No Class* |
| February 26 | *Sohini is away – No Class* |
| March 5 |  |
| March 12 |  |
| March 19 |  |
| March 26 | *Spring Break* |
| April 2 |  |
| April 9 |  |
| April 16 |  |
| April 23 |  |
| April 30 | (Presentations of animations) |
| Week of May 7 | Final class meeting at Sohini’s house for dinner |