CSI 5180. Topics in Artificial Intelligence: Machine Learning for Bioinformatics

Presentation of a Scientific Paper

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🎯 Learning Outcomes

- **Develop** and **apply** effective reading habits for peer-reviewed scientific literature.
- **Distill** and **summarize** key ideas from a targeted research paper into a coherent, concise format.
- **Strengthen** oral communication skills through structured, time-bound presentations.
- **Employ** multimedia resources and visual aids to enhance scientific discourse.
- **Critically analyze** and **contextualize** research findings, offering personal insights and critiques.
- **Demonstrate** poise in engaging with audience questions and peer evaluations.

Papers in (refereed) journals and conference proceedings are the main vehicles for communicating scientific information. In order to stay current with the literature, one must develop good reading habits. The academic journal *PLOS Computational Biology* has an engaging series of articles entitled "Ten simple rules for…". This series touches subjects such as writing, starting a company, obtaining funding, etc. In 2018, the journal has published an article specifically about developing good reading habits:

- Méndez, M. Ten simple rules for developing good reading habits during graduate school and beyond. *PLoS Comput Biol* **14**, e1006467 (2018).

In both academia and industry, communication skills have emerged as a critical competency. Consequently, this assignment is designed to further develop your ability to convey scientific ideas effectively.

📤 Submission Requirements & Deadlines

What?

- Deliver a **15-minute presentation**, incorporating time for audience questions.
- Prepare a concise **summary of the scientific paper**, of one to two pages.
- Develop a **multimedia presentation** to support your talk.

When?

(Additional details regarding the submission process will be provided soon.)

- **February 7, 2025:** Submit your selected paper as a PDF with a brief justification for your choice.
- **February 14, 2025:** Schedule of the presentations published on the course website.
- **April 7, 2025:** Deadline for the submission of all multimedia presentations.

Evaluation Criteria

The evaluation criteria are structured as follows: 80% is based on my assessment of your presentation, 10% derives from peer evaluations of the presentation, and the remaining 10% is allocated to the summary of the scientific paper, for a total of 100%.

- **Structure (Weight = 2):**
  - Objectives clearly stated?
  - Was the problem well presented and motivated?
  - Was the background information sufficient and appropriate?
  - Was the organization logical and easy to follow?
  - Did the presentation progress smoothly with clear transitions?
  - Was the presentation completed within the allotted time?
- **Ideas and Logic, Quality of Content (Weight = 3):**
  - Were the concepts clearly presented?
  - Was the level of complexity appropriate for the audience?
  - Were sufficient evidence or examples provided?
  - Did the presenter demonstrate mastery of the subject?
  - Did the presenter critically analyze the work, offering personal insights or critiques?
  - Did the conclusions logically follow from the presented facts?
- **Delivery (Weight = 2):**
  - Did the presenter consider and engage the audience effectively?
  - Did the presenter maintain eye contact and speak with conviction?
  - Were the spoken words clear and easy to understand?
  - Did the presenter speak at a reasonable pace?
  - Did the presenter avoid reading slides aloud?
  - Was the delivery original and engaging?
  - Did the presenter handle audience questions effectively?
- **Support, Visual Aids (Weight = 1):**
  - Was the support, including multimedia elements, adequate?
  - Were diagrams and other visual aids well chosen?
  - Were the slides or written descriptions clear and concise?
  - Did the slides contain an appropriate amount of information?
  - Were there any spelling, grammatical, or conceptual errors on the slides?

Consider reviewing the following concise paper for additional insights:

- Bourne, P. E. Ten Simple Rules for Making Good Oral Presentations. *PLoS Computational Biology* 3, e77 (2007).

Practicing your presentation is crucial to ensure a seamless delivery and adherence to the allotted time.

Schedule

We intend to release the presentation schedule on February 14, 2025. In the preceding week, we will endeavor to synchronize the presentations with the core lecture topics.

Week	Date	Presentation
7	Feb. 25	-
	Feb. 28	-
8	Mar. 4	-
	Mar. 7	-
9	Mar. 11	-
	Mar. 14	-
10	Mar. 18	-
	Mar. 21	-
11	Mar. 25	-
	Mar. 28	-
12	Apr. 1	-
	Apr. 4	-

Paper Selection

You may choose a paper that either aligns with your project or diverges from it, depending on your preferences. To make an informed selection, it is recommended that you review the project's specific requirements, which can be found here. Key factors to consider include the accessibility of data, the complexity of the topic, and the feasibility of implementation. It should be noted that reproducing studies resulting from extensive collaborative efforts may pose greater challenges.

Avoid choosing a scientific review article, as these tend to be overly broad and lack depth. Given the brevity of your presentation, it is unnecessary to cover every detail of the paper. Instead, focus on a specific subset of the content that allows you to deliver a concise and coherent message to your audience.

Prioritize well-established, highly ranked, peer-reviewed journals and conferences for sourcing information. Although excellent research is increasingly available on preprint servers such as bioRxiv and arXiv, these papers have not undergone peer review, making it difficult to assess their scientific validity. Consequently, it is advisable to refrain from relying on preprint papers.

Scientific Journals

This section enumerates the scientific journals that predominantly publish research in the field of bioinformatics. The impact factors of these journals, indicative of their influence and prestige within the academic community, are provided in parentheses. Please note that the impact factors listed here have not been

updated since their initial compilation in 2019. It is important to recognize that these values are subject to change over time.

Bioinformatics Research

The following journals are dedicated to bioinformatics research.

- Bioinformatics (5.481)
- Briefings in Bioinformatics (5.134)
- Computational and Structural Biotechnology Journal (4.148)
- BioData Mining (4.0)
- PLOS Computational Biology (3.995)
- Database (3.978)
- BMC Bioinformatics (2.213)
- Bioinformatics Advance (2.4)
- IEEE/ACM Transactions on Computational Biology and Bioinformatics (1.955)
- Bulletin of Mathematical Biology (1.484)
- Computers in Biology and Medicine (2.115)
- Journal of Theoretical Biology (2.049)
- Evolutionary Bioinformatics (1.877)
- Journal of Mathematical Biology (1.846)
- Statistical Applications in Genetics and Molecular Biology (1.77)
- Journal of Proteomics & Bioinformatics (1.57)
- Algorithms for Molecular Biology (1.536)
- Computational Biology and Chemistry (1.331)
- Journal of Data Mining in Genomics & Proteomics (1.16)
- Journal of Computational Biology (1.032)
- Journal of Bioinformatics and Computational Biology (0.931)
- Current Bioinformatics (0.770)

See also: List of bioinformatics journals on Wikipedia, as well as this list of top publications from Google Scholar.

Life Science Journals

The following life science journals are known to publish bioinformatics research on a regular basis.

- Nature Reviews Genetics (40.282)
- Cell (31.398)
- Genome Biology (11.908)
- Nucleic Acids Research (11.561)
- Molecular Biology and Evolution (10.217)
- Molecular Systems Biology (8.447)
- GigaScience (7.463)
- Genome Research (6.2)

High Impact and Interdisciplinary Journals

Major contributions and/or interdisciplinary research are published in journals such as the following.

- Nature (40.137)
- Science (37.205)
- Nature Machine Intelligence (18.8)
- Nature Communications (12.353)
- Proceedings of the National Academy of Sciences of the United States of America (PNAS) (9.661)
- PLOS One (2.766)

Conferences

Bioinformatics Conferences

- Intelligent Systems for Molecular Biology (ISMB), 2024
- European Conference on Computational Biology (ECCB) 2024
- Research in Computational Molecular Biology (RECOMB), 2024
- ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB)
- IEEE International Conference on Bioinformatics and Biomedicine (IEEE BIBM), 2024
- Pacific Symposium on Biocomputing (PSB), 2025
- International Conference on Bioscience, Biochemistry and Bioinformatics (ICBBB), 2024
- Machine Learning in Computational Biology, 2024 (formerly a workshop of NeurIPS)
- Bioinformatics and Biomedical Engineering 2024 Part 1, 2024 Part 2
- Advanced Intelligent Computing in Bioinformatics 2024
- International Conference on Bioinformatics Research and Applications, 2024, past event
- International Conference on Bioinformatics and Computational Biology (ICBCB), 2023, past events
- International Conference on Biomedical and Bioinformatics Engineering (ICBBE), 2023. past events
- Several conference proceedings are featured as special issues in BMC Bioinformatics. The provided link grants access to an extensive collection of these proceedings.

For conferences that lack a permanent website, I have included only the most recent event for which the proceedings are accessible. In certain instances, there are considerable delays in the publication of conference proceedings. For additional venues, you may also consult WikiCFP.

Machine Learning Conferences

High-quality bioinformatics research is frequently presented at top-tier machine learning conferences. Nevertheless, the broad scope of these conferences can make it difficult to locate papers specifically focused on bioinformatics.

- Annual Conference on Neural Information Processing Systems (NeurIPS)
- International Conference on Machine Learning (ICML)
- International Conference on Learning Representations (ICLR)
- ACM SIGKDD Conference on Knowledge Discovery and Data Mining
- AAAI Conference on Artificial Intelligence

Lists

- Awesome-LLMs-meet-genomes, a resource suggested by Kaixi Xu.

Resources

If you do use AI assistance, thoroughly document your interactions. Include the tools and their versions in your report, along with a transcript of all interactions. Most AI assistants keep a record of your conversations. The recommended practice is to create a new conversation specifically for the presentation and consistently reuse this conversation throughout your work on the presentation. Ensure that this conversation is solely dedicated to the presentation. Submit this conversation transcript in the reference section of your summary.

Your summary, of one to two pages, should be derived from your personal reading notes rather than relying on a large language model to generate the content.

Questions

- You may ask your questions in the Assignment topic of the discussion forum on Brightspace.
- Alternatively, you can email the teaching assistant. However, using the forum is strongly preferred, as it allows your fellow students to benefit from the questions and the corresponding answers provided by the teaching assistants.

References

Bourne, Philip E. 2007. "Ten simple rules for making good oral presentations." *PLoS Computational Biology* 3 (4): e77. https://doi.org/10.1371/journal.pcbi.0030077.

Méndez, Marcos. 2018. "Ten simple rules for developing good reading habits during graduate school and beyond." Edited by Fran Lewitter. *PLoS Computational Biology* 14 (10): e1006467. https://doi.org/10.1371/journal.pcbi.1006467.