May 27th, 2021

Dear Prof. Ouellette,

We are writing to submit our manuscript entitled "Ten Quick Tips for Deep Learning in Biology" for consideration in *PLOS Computational Biology*'s education section.

Deep learning provides new opportunities for outcome prediction and pattern recognition in biological data. While deep learning is a relatively young field within the broader field of machine learning, many general-purpose algorithms and methods shared by the broader deep learning community can be readily repurposed and applied to biological data. Though we encourage the use of deep learning to solve existing and novel problems in biology, we want to share essential tips from practitioners to help readers beginning work in this area avoid common pitfalls.

Ultimately, we have decided on the following ten tips as being critical for engaging in principled and effective research based on deep learning:

1. Decide whether deep learning is appropriate for your problem
2. Use traditional methods to establish performance baselines
3. Understand the complexities of training deep neural networks
4. Know your data and your question
5. Choose an appropriate data representation and neural network architecture
6. Tune your hyperparameters extensively and systematically
7. Address deep neural networks' increased tendency to overfit the dataset
8. Deep learning models can be made more transparent
9. Don't over-interpret predictions
10. Actively consider the ethical implications of your work

It is our hope that, by applying these tips, deep learning novices and experienced machine learning practitioners new to biology will be able to generate correct, actionable, and robust biological insights through deep learning.

Sincerely,
Benjamin Lee, on behalf of all authors