Review of: "Self-Driving Development of Perfusion Processes for Monoclonal Antibody Production"

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Potential competing interests: No potential competing interests to declare.

As a reviewer, I would like to commend the authors for their comprehensive and innovative approach to developing an autonomous framework for perfusion processes in monoclonal antibody production. The integration of machine learning, particularly the use of a hybrid Gaussian process model, with advanced bioreactor systems represents a significant advancement in bioprocess development. Here are some specific comments and suggestions:

1. While the results are promising, further validation with a broader range of cell lines and conditions would strengthen the claims. It would be beneficial to see how the system performs with different types of bioprocesses beyond monoclonal antibody production.
2. The paper could benefit from a discussion on the scalability of the proposed framework. How well does the system scale from laboratory to industrial-scale bioreactors? Are there any limitations or challenges anticipated in scaling up?
3. While the paper describes the user interface, more information on user feedback and usability testing would be valuable. How intuitive is the system for operators, and what training is required to use it effectively?
4. An economic analysis comparing the cost savings and efficiency gains of using this autonomous system versus traditional methods would provide additional insight into its industrial viability.
5. As a reviewer, I would like to suggest that Figure 1 in the manuscript could benefit from a more scientific presentation. Include detailed annotations that highlight key components of the ambr®250 perfusion system. This could involve labeling specific parts of the system, such as the bioreactor vessels, control units, and any sensors or monitoring equipment.