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**Opponent Review for the Bachelor Thesis:**  
**“Effects of hyperparameters in multiple sequence alignment for**  
**Align-RUDDER using Clustal  $\Omega$ ” by Christian Samwald**

I enjoyed reading this thesis, as it combines methods from bioinformatics and reinforcement learning. The topic of this thesis is very interesting and has recently gained a lot of attention in the reinforcement learning community. Learning from delayed rewards and learning from very few demonstrations are hard problems in reinforcement learning. The method underlying this work, Align-RUDDER, deals with both of these problems, by using sequence analysis methods (which require only few examples) in combination with RUDDER, a method for dealing with delayed rewards. This method was only recently published, therefore studies on the effect of specific methods for sequence alignment and their hyperparameters are highly relevant. The topic of this thesis is to explore how hyperparameters of a well-known sequence analysis method (Clustal Omega) affect the performance of Align-RUDDER.

The overall presentation of this thesis is clear and easy to follow. The introduction clearly lays out the main goals of the work. The background work in both fields is covered well. While reading the thesis one can observe that Christian Samwald has a good understanding of the methods he used in this work. Experiments are well defined and performed and the discussions and conclusions very insightful.

All in all, I can confidently state that this thesis meets my criteria for an excellent bachelor thesis and I am pleased to recommend it for acceptance with the highest possible degree.



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