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AdaptiveResonance.jl: A Julia implementation of Adaptive Resonance Theory (ART) algorithms

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Software

- Review
- Repository
- Archive

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Summary

AdaptiveResonance.jl is a Julia package for machine learning with Adaptive Resonance Theory (ART) algorithms, written in the numerical computing language Julia. ART is a neurocognitive theory of how competitive cellular networks can learn distributed patterns without supervision through recurrent field connections, eliciting the mechanisms of perception, expectation, and recognition (Grossberg, 1980, 2013).

Statement of need

There exist many variations of algorithms built upon ART (Brito da Silva et al., 2019). Each variation is related by utilizing recurrent connections of fields, driven by learning through match and mismatch of distributed patterns, and though they all differ in the details of their implementations, their algorithmic and programmatic requirements are often very similar. Despite the relevance and successes of this class of algorithms in the literature, there does not exist to date a unified repository of their implementations in Julia. The purpose of this package is to create a unified framework and repository of ART algorithms in Julia.

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References

Brito da Silva, L. E., Elnabarawy, I., & Wunsch, D. C. (2019). A Survey of Adaptive Resonance Theory Neural Network Models for Engineering Applications. *Neural Networks*, *120*(xxxx), 167–203. https://doi.org/10.1016/j.neunet.2019.09.012

Grossberg, S. (1980). How Does a Brain Build a Cognitive Code ? *Psychological Review*, *87*(1), 1–51. https://doi.org/10.1037/0033-295X.87.1.1

Grossberg, S. (2013). Adaptive Resonance Theory: How a brain learns to consciously attend, learn, and recognize a changing world. *Neural Networks*, *37*, 1–47. https://doi.org/10.1016/j.neunet.2012.09.017