

Abstract Submitted
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Speed, Dissipation, and Accuracy in Early T-cell Recognition¹

WENPING CUI, Department of Physics, Boston College, PANKAJ MEHTA, Department of Physics, Boston University — In the immune system, T cells can perform self-foreign discrimination with great foreign ligand sensitivity, high decision speed and low energy cost. There is significant evidence T-cells achieve such great performance with a mechanism: kinetic proofreading(KPR). KPR-based mechanisms actively consume energy to increase the specificity of T-cell recognition. An important theoretical question arises: how to understand trade-offs and fundamental limits on accuracy, speed, and dissipation (energy consumption). Recent theoretical work suggests that it is always possible to reduce the the error of KPR-based mechanisms by waiting longer and/or consuming more energy. Surprisingly, we find that this is not the case and that there actually exists an optimal point in the speed-energy-accuracy plane for KPR and its generalizations.

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Wenping Cui
Boston College

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