

Out-of-equilibrium machine learning: Dynamical loss functions and catastrophic forgetting

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Optimizing a loss function in high-dimensional space lies at the heart of machine learning and other constraint satisfaction problems. The structure of these landscapes and the optimization method used to find solutions can determine the final outcome in both scenarios. We are inspired by the tuning of physical systems which benefit from changes in the loss function landscape [1], to propose a dynamical loss function that helps training and generalization in machine learning [2]. In this talk, we will explore some similarities and differences between constraint satisfaction problems and supervised classification tasks, and show how analogies between the two fields can be exploited to propose new ideas within both realms. Time permitting we will discuss how the model architecture can be modified to transform catastrophic forgetting into positive transfer [3].

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- [1] Ruiz-García, M., Liu, A. J. and Katifori, E., *Tuning and jamming reduced to their minima*, Phys. Rev. E **100**, 052608 (2019)
 - [2] Ruiz-Garcia, M., Zhang, G., Schoenholz, S. S., and Liu, A. J., *Tilting the playing field: Dynamical loss functions for machine learning*, International Conference on Machine Learning, PMLR, 9157 (2021)
 - [3] Ruiz-Garcia, M., *Model architecture can transform catastrophic forgetting into positive transfer*, Scientific Reports **12**, 10736 (2022)

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