LANGEVIN AND ADAPTIVE LANGEVIN ALGORITHMS FOR SAMPLING AND OPTIMISATION IN MACHINE LEARNING

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I will discuss the use of various dynamics models in machine learning (ML) applications. ML applicaitons are characterised by high dimensional parameter spaces, complicated potentials and gradient noise due to subsampling. I will discuss the convergence of Langevin [1,2] and adaptive Langevin [3] algorithms for sampling in both clean and noisy gradient settings. Morever, I will explore the zero-temperature limit of adaptive Langevin dynamics which provides a powerful new framework for optimisation [4].

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[3] B. Leimkuhler, M. Sachs and G. Stoltz, Hypocoercivity Properties of Adaptive Langevin Dynamics, SIAM J. Ap. Maths 80, 3: 1197-1222, 2020.
[4] A. Karoni, B. Leimkuhler, G. Stoltz, Friction-adaptive descent: a family of dynamics-based optimization methods, J. Comput. Dyn. 10, 4: 450-484, 2023.