Project title: Long-time dynamics in toy models of disordered systems

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Date project is proposed: 8 March 2024

General area: Disordered systems, Statistical Mechanics

Description:
Glasses and spin glasses are challenging systems with a very slow dynamics. We want to understand their dynamics in a simple setting, which would then allow us to have some understanding to guide us in future study of more complicated situations.
We address the long-time dynamics of simple models of glasses and spin glasses, with a particular emphasis on the Random Energy Model (REM) [1]. Tasks may include characterizing a phase transition between two off-equilibrium phases, numerical simulations to assess the long-time behavior of the model, and the study of entropic effects in the spherical p-spin model [2] and Correlated REM [3]. References: [4, 5].

Requirements:
Statistical mechanics, programming and scripting, a laptop.

Starting date, ending date:
Flexible. There is a possibility that some time periods are in conflict with my time availability.

Estimated hours per week:
Flexible, the ambition of the project can be adapted to the time investment.

Application deadline: Flexible.

References:
[1] B. Derrida. Random-energy model: Limit of a family of disordered models. Phys. Rev. Lett., 45:79–82, Jul 1980.
[2] Andrea Crisanti and H-J Sommers. The spherical p-spin interaction spin glass model: the statics. Zeitschrift für Physik B Condensed Matter, 87(3):341–354, 1992.
[3] M. Baity-Jesi, A. Achard-deLustrac, and G. Biroli. Activated dynamics: an intermediate model between REM and p-spin. Phys. Rev. E, 98:012133, 2018.
[4] Matthew R. Carbone, Valerio Astuti, and Marco Baity-Jesi. Effective traplike activated dynamics in a continuous landscape. Phys. Rev. E, 101:052304, May 2020.
[5] Matthew R Carbone and Marco Baity-Jesi. Competition between energy-and entropy-driven activation in glasses. Physical Review E, 106(2):024603, 2022.
Python coding, classical statistical physics