Contribution ID: **58** Type: **Poster**

Critical time-dependent phenomena in diffusion generative models

Tuesday, 14 April 2026 16:40 (7 minutes)

In recent years, diffusion generative models have become state-of-the-art for tasks such as image, video, and audio generation, among others. More recently, there has been growing interest in studying the statistical mechanics of these models, driven by the observation of apparent phase transitions during the sampling process. More specifically, a symmetry breaking that resembles the one encountered in the Ising model. In this proposal, a theoretical description of the diffusion models is presented, explaining what diffusion models are, how they can be studied from perspective of equilibrium statistical mechanics, and how critical phenomena emerge in a simple case. Additionally, a simple simulation using a feed forward network and two delta functions as the initial distributions provides some insight into the model's behavior near the critical point. The main objectives include a deeper investigation of this critical phenomenon, with particular focus on questions concerning the relationship between data dimensionality and the number of spins in the Ising model, as well as the emergence of scaling-free properties. Furthermore, the development of new models is proposed to allow for a more detailed observation and analysis of these critical behaviors.

Primary author: MONTAÑO, William (Egresado)

Co-author: Dr TELLEZ, Gabriel (Professor)

Presenter: MONTAÑO, William (Egresado)

Session Classification: Poster session

Track Classification: Statistical Physics