# UNIVERSALITY CLASS OF TRAFFIC JAMS

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On a single-lane road, traffic jams emerge due to vehicles traveling at different preferred speeds. If $N$ cars start from distinct positions, each aiming to reach a distant destination and overtaking is not allowed, one can determine the number and size of the resulting jams. With randomly assigned speeds, the probability $P(\tilde{X}_N = k)$ that $k$ jams form can be computed. The expected number of jams of size $s$, $\langle n_s \rangle = 1/s$, reveals a power-law decay—an indication of criticality. This behavior also appears in the size and formation time of the last jam. We ask which other models share these properties or how new ones can be built within the same universality class—a question still open for both equilibrium and nonequilibrium systems. We pose this challenge through a traffic jam model, defining its universality class as that of partition models. A key result [1] shows alternative ways to partition a sequence while preserving criticality, yielding infinitely many equivalent models. Figure 1 informally illustrates three of these models.

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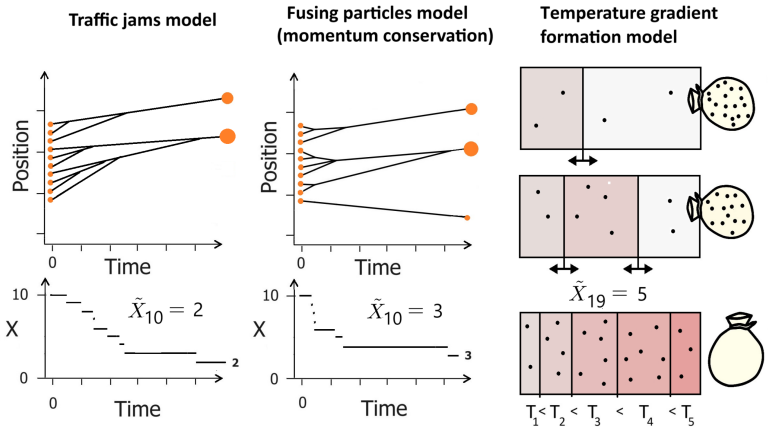


FIG. 1. Three models in the same universality class.

[1] Fraiman, D. (2024). Universality classes in out-of-equilibrium systems: An encompassing theorem for a one-dimensional fusing particles model. *Physical Review Research*, 6(3), 033288.

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