# Classical speed limit and finite-time Landauer's bound

**Hyunggyu Park**, Jae Sung Lee, Sangyun Lee, Hyukjoon Kwon
*Korea Institute For Advanced Study, Seoul, South Korea*

Landauer's bound is the minimum thermodynamic cost for erasing one bit of information. As this bound is achievable only for quasistatic processes, finite-time operation incurs additional energetic costs. We find a tight finite-time Landauer's bound by establishing a general form of the classical speed limit. This tight bound well captures the divergent behavior associated with the additional cost of a highly irreversible process, which scales differently from a nearly irreversible process. We also find an optimal dynamics which saturates the equality of the bound. We demonstrate the validity of this bound via discrete one-bit and coarse-grained bit systems. Our work implies that more heat dissipation than expected occurs during high-speed irreversible computation.

References

[1] J.S. Lee, S. Lee, H. Kwon, H. Park, Phys Rev. Lett. 129, 120603 (2022).