

Abstract Submitted  
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**Percolation transitions on multiplex lattices following the cascades of activations and deactivations** JEEHYE CHOI, KWANG-IL GOH, Korea Univ — We introduce the percolation transitions of the multiplex viability model [B. Min and K.-I. Goh, *Phys. Rev. E* 89, 040802(R) (2014)] on two-layer square lattices. This model is a generalized percolation model on multiplex systems comprised of two distinct processes establishing the viability, the cascade of activations (CA) and the cascade of deactivations (CD), depending upon which different transition points and thereby hysteresis are observed. To address the universality issue of this model, here we perform extensive Monte Carlo simulations and show that in two-layer square lattices the two processes not only have different percolation transition points but also exhibit different critical behaviors with distinct sets of critical exponents. For CA, the transition is found to be in the same universality class as the ordinary percolation in 2D. For CD, the transition belongs to different universality class from OP but shows critical behaviors consistent with those of 2D mutual percolation model. To achieve a self-contained and self-consistent scaling picture of the transitions we introduce a novel definition of the cluster that properly addresses the critical properties. The obtained results are verified for consistency through scaling relations such as  $d\nu = 2\beta + \gamma$ .

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