An extraordinary transition in a minimal adaptive network of introverts and extroverts

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We introduce a simple model of adaptive networks, modeling a society in which an individual cuts/adds contacts based on whether he or she has more/less links than some "preferred number" (κ). For example, introverts/extroverts typically have small/large κ's. Evolving with detailed balance violating dynamics, the steady state distribution of this dynamic betwork is not known in general (despite displaying reasonably understandable properties). After a brief summary of our findings for systems with a single κ (i.e., a homogeneous population) or two κ's, I will present surprises discovered in an extreme two case, as the title indicates. In particular, we find a mapping to a 2-D Ising-like model, restoration of detailed balance, the exact steady state distribution, and an abrupt transition – in the total number of links, as the fraction of introverts crosses 1/2. Sharp contrasts between this phenomenon and typical phase transitions (e.g., Lenz-Ising-Onsager) will be noted. Beyond this theoretically interesting limit of our system, we outline some potentially important applications, such as modeling how a population endowed with adaptive behavior would respond to a spreading epidemic.