



Contribution ID: 8

Type: **Contributed talk**

The Fate of Articulation Points and Bredges in Percolation

Monday, 27 September 2021 12:50 (20 minutes)

Articulation points (APs) are *nodes* in complex networks whose removal would break the network component on which they are located into two or more disconnected components, while bredges (bridge-edges) are *edges* whose removal would break the network component on which they are located into two components. APs and bredges are thus crucial for the integrity and functionality of complex networks. In this talk we investigate the statistics of articulation points and bredges in complex networks in which bonds are randomly removed in a percolation process. Because of the heterogeneous nature of complex networks, the probability of a node to be an articulation point, or of an edge to be a bredge will not be homogeneous across the network. We therefore analyze full distributions of articulation point probabilities as well as bredge probabilities, using a message-passing approach to the problem, both for large single instances, and for networks in the configuration model class in the thermodynamic limit. We reveal, and are able to rationalize, a significant amount of structure in the evolution of articulation point and bredge probabilities in response to random bond removal. We argue that our results could be exploited in a variety of applications, including approaches to network dismantling or to vaccination and islanding strategies to prevent the spread of epidemics or of blackouts in process networks. Further details in Phys.Rev. E **103**, 042302 (2021).

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Session Classification: S2