Stability Theorems and Degree Sequence Theorems in Graph Theory

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In their 1976 paper "A Method in Graph Theory", Bondy and Chvátal define that a graph property P is *k-stable* if whenever the graph $G+uv$ has property P and $\deg(u)+\deg(v) \geq k$, then G has property P. This definition was prompted by a well-known result of Ore which implies that hamiltonicity is n-stable, where n is the number of vertices. They proceed to demonstrate a process by which the k-stability of P can produce conditions on the degree sequence of G that guarantee G has property P. In the case of hamiltonicity, the resulting degree sequence conditions are equivalent to those of a classic theorem of Chvátal. This specific degree sequence theorem is best possible in a certain sense, which we define as *best monotone*. In this talk, we provide examples of stability values and best monotone degree theorems for a variety of properties (e.g., k-connected, t-tough, b-binding). Then, we demonstrate that some properties have stability values which provide the corresponding best monotone degree theorem and others do not.

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