Modern scalar-tensor theories of gravity

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The unknown nature of dark energy and dark matter question the validity of General Relativity at very large distance scales. As a result, modified gravity theories have attracted a lot of attention recently and an important effort is made by the community to understand different facets of these theories, their stability, their cosmological implications, the existence and nature of compact objects etc. An important category amongst alternative gravity theories are scalar-tensor theories, as they are the simplest of modified theories, and additionally, present a lot of characteristics one finds in more complicated theories. I will review modern scalar-tensor theories, including Horndeski theory and its extensions, as well as their applications and recent observational constraints from GW170817.