About indefinite Neumann problems with oscillating nonlinear potentials: multiplicity of positive solutions

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We discuss some recent results concerning the multiplicity of positive solutions of Neumann problems associated with a second order nonlinear differential equation of the form $u'' + a(t)g(u) = 0$, where the weight function $a(t)$ has indefinite sign. We assume that the weight has a "positive hump" followed by a "negative hump" and the primitive of the nonlinearity $G(u)$ presents some oscillations at infinity, expressed by the condition $\varliminf G(u)/u^2 = 0 < \varlimsup G(u)/u^2$. Our analysis is also extended to multiple radially symmetric solutions for Neumann problems associated with $\Delta u + a(x)g(u) = 0$. We deal with a careful analysis of the solutions in the phase-plane and we base our proof on shooting approach. This is a joint work with F. Zanolin (University of Udine, Italy).