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Inversion techni ues are widely applied in the analysis of spectropolarimetric observations to infer the thermal and magnetic properties of the solar atmosphere. Over the past decades, these techni ues have become increasingly more sophisticated, building up in complexity and scope. In this talk, I will highlight some of these latest advances, with a particular focus on the exploitation of scattering polarization and the Hanle effect for magnetic field diagnostics. Since these effects are intrinsically sensitive to the geometry of the radiation field, their proper treatment re uires going beyond one-dimensional modeling. I will discuss development in both one-dimensional and three-dimensional approaches and the challenges they still present for uantitative inference.