Existence and Regularity theory for non-isotropic fully non-linear singular elliptic equations

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Abstract. I will survey our recent results on Lipschitz optimal regularity for viscosity solutions to fully nonlinear singular elliptic equations $F(x, u, Du, D^2u) = 0$. We deal with non-trivial Du dependence (non-isotropic equations) and F may be singular w.r.t the u dependence, for example $F \sim u^{-1}$. No sign restriction is imposed. Our estimates are then combined with fine regularizing techniques to establish existence and optimal regularity for two-phases non-isotropic limiting free boundaries. This is a joint work with Marcelo Montenegro.