This lecture aims at an introduction to modern adaptive finite element methods for conforming and nonstandard versions in theory and practice following the seminal papers of Dörfler (1994) and Stevenson (2007) followed by many others. Although the lecture does not assume particular knowledge on finite element methods at the beginning, the goal is to guide the students towards the level of international research in this strikingly relevant area of cognitive algorithms in computational sciences.

**Theorem:** The convergence of AFEM is optimal with respect to approximation classes.