The quantum way of sensing

The precision of measurements is ultimately limited by quantum mechanics. However, achieving the quantum limit in practical measurement application like sensing proves to be a significant challenge. Indeed one may argue that environmental noise on the order of $k_B T$ dominates and hence the quantum limit is never reach unless sensing resorts to exotic realms like low temperature or high energy. Indeed for certain types of spin-based sensors this is not the case. Although relying on inherently low interaction energies spins can be efficiently decoupled from their environment and are used as highly specific probes for their close environment. The talk shall describe nanoscale sensing of electric, magnetic fields, temperature etc. utilizing spin quantum sensors. Applications even in a live cell environment will be discussed.