BMETE92AK28:

Kvantum valószínűségszámítás és kvantum logika

Oktató a 2017/2018 -as őszi szemeszterben: Weiner Mihály.

Tantárgyleírás

The course is about the non-classical calculus of probability which is behind Quantum Physics. The emphasis will be on the mathematical, information-theoretical and philosophical aspects (but not directly on physics). In the first part of the course some necessary mathematical tools are introduced, while in the second part - through the study of a simple spin system - concepts like that of entanglement, "paradoxes" (such as the "EPR" paradox), some quantum coding protocols as well as quantum computers are discussed. TOPICS:

1st part (the mathematical tools):
finite dimensional Hilbert spaces, orthogonal projections, operator norms, normal operators, self-adjoint operators, unitary operators, spectral resolution, spectral calculus, positive operators, tensorial products, ortho-lattices and probability laws, distributive and non-distributive probability spaces, dispersion free and pure states, measurable quantites and the ortho-lattice of projections, Gleason's theory (without proof), operations between measurable quantites

2nd part (applications):
spin half particles, bipartite systems, entanglement, the "EPR" paradox, quantum cryptography (the protocol of Bennett and Brassard), physical operations and state changes, symmetries operations and Wigner's theorem, dense coding, no-cloning theorem, quantum bits and quantum computers, complexity and quantum complexity, an example of an algorithm for a quantum computer (either Grover's search algorithm or Shor's algorithm for factorizing numbers)

Számonkérés és osztályzás

Követelmények szorgalmi időszakban:

az órák elején megírt 5 perces tesztek ("short quizes"), mindig az előző óra anyagából + beadandó házifeladat

Követelmények vizsgaidőszakban:

Szóbeli vizsga. A vizsgajegy felerészben a szóbeli, felerészben a félévközi feladatok és beadandó házi feladatok alapján kerül megállapításra