Abstract: The Tannaka-Krein duality principle roughly says that a "group" can be reconstructed from its linear representations. A version due to Woronowicz captures this correspondence for the compact quantum groups formulated in the language of C^*-algebras. Building on this paradigm, this lecture series presents an analogous duality for "group actions", which correspond to the actions of tensor categories (Ostrik, Pinzari-Roberts, De Commer-Yamashita, Neshveyev). In recent years this viewpoint have led to various applications to concrete classification problems for compact quantum groups and their actions. The last part of the lecture will focus more on the recent development on analogy with the theory of subfactors and quantum symmetries. In particular, we will cover a dynamical characterization of the weak Morita equivalence, which generalizes work of Schauenburg and Bichon-De Rijdt-Vaes.