V prvi polovici tečaja bomo ponovili klasično homotopsko teorijo, kjer bomo iz konkretnih topoloških modelov prešli v abstrakten homotopski okvir Quillnovih modelskih kategorij. Ogledali si bomo nekatere standardne modelske kategorije, med drugim Kanove simplicialne množice.

V drugi polovici tečaja se bomo ukvarjali s homotopsko teorijo tipov. To je formalizem, ki omogoča homotopsko-teoretične konstrukcije in argumente na abstrakten in sintetičen način: vse, kar izrazimo v tem formalizmu, vključno z logiko, je homotopsko invariantno in osnovni pojmi, kot so "pot", "krožnica", "homotopija", so neposredno vgrajeni v temelje. S tem lahko razvijamo homotopsko teorijo brez predhodne konstrukcije topoloških prostorov in realnih števil. Obseg homotopske teorije tipov je precej večji od klasične homotopske teorije, ker jo lahko splošneje interpretiramo v (∞,1)-toposih. Računska različica homotopske teorije tipov ima aplikacije v teoretičnem računalništvu.

In the first half of the course we shall review classical homotopy theory, building from the concrete topological models towards the concept of an abstract homotopical setting, as represented by Quillen model categories. We shall then look at some standard model categories, such as Kan simplicial sets.

In the second half of the course we will study homotopy type theory, which is a formalism for carrying out homotopy-theoretic constructions and arguments in an abstract and synthetic way. That is, everything expressed in the formalism, including logic, is homotopy invariant, and basic notions such as "path", "circle", "homotopy", etc., are built into the foundations directly. Consequently, we can do homotopy theory without having to first construct topological spaces and real numbers. The scope of homotopy type theory is much wider than just classical homotopy theory, as it can be interpreted more generally in (∞,1)-toposes. A computational version of homotopy type theory has applications in theoretical computer science.