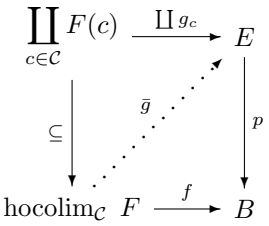
SUBJECTS FOR MASTER THESIS

(1) *Lifting maps from homotopy colimits.* Let $\mathcal{C}$ be a small category, $F : \mathcal{C} \to$ **Top** a diagram of spaces, and $p : E \to B$ a fibration. Consider a commutative diagram:



Develop an obstruction theory for existence and uniqueness of a lifting extension $\bar{g}$.

(2) *Directed paths on spheres.* We say that a path α in n-cube I^n is *directed* if all its coordinates are non-decreasing. A path in $S^n = I^n/\partial I^n$ is directed if it is a concatenation of images of directed paths in I^n. Let $\vec{P}(S^n)$ be the space of directed paths. Check if the inclusion $\vec{P}(S^n) \subseteq P(S^n)$ is a homotopy equivalence. Hint: use James construction.

(3) *Components of directed simplicial complexes* Calculate the category of components of a given directed simplicial set. References:
K.Ziemiański, *A cubical model for path spaces in d-simplicial complexes.* Topology Appl. 159, No. 8, 2127-2145 (2012). MSC2000: *55U10 68Q99
L. Fajstrup, E. Goubault, E. Haucourt, M. Raussen, *Components of the fundamental category*, Appl. Categ. Structures 12 (2004) 81108.