MINICOURSE ON ∞-CATEGORIES:

Lecture 1:

Speaker: Aslı Güçlükan İlhan

Title : Simplicial sets and model categories

Abstract : In this talk we introduce model categories and give some examples. Then we discuss the category of simplicial sets which carries a nice model structure.

Lecture 2:

Speaker: David Blanc

Title : Simplicially enriched categories

Abstract: Quillen had originally proposed model categories as a framework for abstract homotopy theory, but Dwyer and Kan later showed that having a simplicial, cubical, or topological function complex between any two objects is enough. We how these can be used to define homotopy coherence, and discuss its relation to rectification.

Lecture 3:

Speaker: Samik Basu

Title : Quasicategories

Abstract : This talk will be an introduction to quasicategories as a model for homotopy theory.

Lecture 4:

Speaker: David Blanc

Title : Higher homotopy operations

Abstract : Toda brackets and Massey products originally arose as a tool for computations, but they are both examples of the abstract notion of a *higher homotopy operation*, which is an obstruction to a suitable rectification problem. We shall survey a number of approaches to defining them, and some contexts where they arise.

Lecture 5:

Speaker: Debasis Sen

Title: Models of infinity category.

Abstract: In this talk we will give a survey of different models of infinity category and the Quillen equivalence between them.

Lecture 6:

Speaker: David Blanc

Title : Further directions

Abstract : The many different models for infinity categories suggest that one might want to extract their common "intrinsic skeleton": that is, find a complete set of higher homotopy

invariants for an infinity category. We shall discuss some possible methods of doing so, and their relations to other questions of infinity categories.

TALKS on EQUİVARİANT HOMOTOPY

Tverberg like theorems and equivariant cohomology

Samik Basu
Ramakrishna Mission Vivekananda University, INDIA

The Tverberg theorem proved in 1966 deals with intersecting convex hulls of points in Euclidean space. There is an interesting topological version which is a conjecture about intersecting disjoint faces of a continuous image of a simplex. Usual techniques used here are generalised Borsuk Ulam theorems and ideal valued obstructions. We use techniques from equivariant homotopy theory to obtain similar results.

Monoid Actions, (Co)homology theories and (Co)homotopy theories

Mehmet Akif Erdal
Bilkent University, TURKEY

We will first discuss studying monoid actions on sets via monoid biactions on sets. Using this view point, we will associate a new action to a given monoid action on a set, so that when the monoid is a group, this action will be isomorphic to the action obtained by applying the inverses of group elements. We will also be able to see equivariant functions, between two sets with monoid actions, as the fixed points of an induced action on the set of functions between these two sets. We will also study actions of monoidal categories on categories again via biactions. As an application, we will define (co)homology and (co)homotopy theories graded over a monoidal category. We will also show that these definitions agree with the usual definitions of (co)homology and (co)homotopy theories for particular choices of monoidal categories and their actions. Moreover we will define Ω-spectra and suspension spectra as fixed points of certain monoidal actions and show how these fixed points can represent (co)homology and (co)homotopy theories. This talk is based on a joint work with Özgün Ünlü.

Higher Toda brackets and Massey products

Shilpa Gondhali
University of Haifa, ISRAEL

We provide a uniform definition of higher order Toda brackets in a general setting, covering the known cases of long Toda brackets for topological spaces and Massey products for differential graded algebras, among others.

Filtrations of classifying spaces

Cihan Okay
Universtiy of Western Ontario, CANADA

The classifying space BG of a group G classifies principal G-bundles up to isomorphism. Using the descending central series BG can be filtered by subspaces B(q,G). It turns out that these subspaces are classifying spaces for certain principal G-bundles. I will discuss homotopy theoretic properties of B(q,G), and give a computation of its complex K-theory modulo torsion.

Bredon Cohomology with local coefficients and Crossed complexes

Debasis Sen
Indian Institute of Technology Kanpur, INDIA

In this talk we will represent Bredon Cohomology with local coefficients in the category of Crossed complexes and construct a parametized spectra representing the cohomology. (Joint work with Samik)

Twisted Classifying Space Functor

Özgün Ünlü
Bilkent University, TURKEY

Let D be a diagram in the category of topological spaces. More precisely, we take D as a functor from a small category C to the category of topological spaces. Then one can see the geometric realization of the simplicial replacement of the functor D as a space over the classifying space of the small category C. Here we consider the classifying space functor from the category of small categories to the category of topological spaces as the composition of the geometric realization functor with the nerve functor. One can make a similar construction when a homotopy commutative diagram in the category of topological spaces is given. However the classifying space functor must be replaced by another functor. To understand this functor, in this talk we will introduce the notion of a twisted natural transformation, construct a twisted version of the classifying space functor, and show that one obtains a space over this twisted classifying space when a homotopy commutative diagram is given. This is joint work with Aslı Güçlükan İlhan.

Rank three p-group actions on products of spheres

Ergün Yalçın
Bilkent University, TURKEY

Abstract: We recently proved that every rank three p-group, where p is an odd prime, acts freely and smoothly on a product of three spheres. To construct this action, we first prove a

generalization of a theorem of Lueck and Oliver on equivariant vector bundles. In the proof we use homotopy colimits and perform some Bredon cohomology calculations to show that the obstructions for these constructions are possible to kill. I will present the main ideas of the proof and mention some of the open problems related to this result.