GT06

Categorical and Homotopical Methods

Métodos Categóricos y Homotópicos

Organizers **Organizadores** **Antolatzaileak**

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Alba Sendón Blanco
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(Inst. of Science and Technology Austria)

Description **Descripción** **Deskribapena**

Homotopy theory is the study of mathematical contexts where there exists a notion of morphisms and deformations between them. Throughout last decades, categorical and homotopical methods have stopped being a subfield of Topology to become an independent discipline.
Nowadays, these techniques are applied in several problems within algebraic geometry (motivic homotopy theory), computation theory (homotopy type theory), functional analysis or mathematical physics (quantum field theory).
The objective of this session is to gather mathematicians that, even coming from different areas, have in common the use of these methods.

La teoría de homotopía es el estudio de contextos matemáticos en donde hay una noción de morfismos y de deformaciones entre los mismos. Durante las últimas décadas, los métodos categóricos y homotópicos han dejado de ser un subcampo de la Topología para convertirse en una disciplina independiente.
En la actualidad, estas técnicas se aplican en numerosos problemas de geometría algebraica (teoría de homotopía motívica), teoría de la computación (teoría homotópica de tipos), análisis funcional o física matemática (teoría cuántica de campos).
El objetivo de esta sesión es reunir a matemáticos y matemáticas que, aún proveniendo de distintas áreas, tienen en común el uso de estos métodos.

MSC Codes **Códigos MSC** **MSC Kodeak**

18-XX

(primary)

55PXX; 46MXX; 16D90

(secondary)

Slots **Bloques** **Blokeak**

2.A (Aula 0.20); 2.B (Aula 0.20); 2.C (Aula 0.20)

QR Code **Código QR** **QR Kodea**

Session Schedule **Horario de la Sesión** **Saioaren Ordutegia**

J16 | 11:00-11:20 | 0.20
Stable homotopy type of classifying spaces
Antonio Ceres Sánchez (Universidad de Málaga)

J16 | 11:30-11:50 | 0.20
Abstract representation theory via stable homotopy theory
Álvaro Sánchez (Universidad de Murcia & Charles University of Prague)

J16 | 12:00-12:20 | 0.20
Introduction to global algebraic K-theory
Gabriel Martínez de Cestafe Pumares (Universitat Autònoma de Barcelona)

J16 | 12:30-12:50 | 0.20
(Co)homology for data bases
Isaac Carcacía Campos (Universidade de Santiago de Compostela)

J16 | 16:30-16:50 | 0.20
Real Models of Configuration Categories
João Candeias (Universitat de Barcelona)

J16 | 17:00-17:20 | 0.20
The motivation behind higher sketches
David Martínez-Carpena (Universitat de Barcelona)

J16 | 17:30-17:50 | 0.20
Hopf braces and Hopf bracoids
Brais Ramos Pérez (Universidade de Santiago de Compostela)

V17 | 10:00-10:20 | 0.20
Homotopical operadic calculus in positive characteristic
Víctor Roca i Lucio (Université Paris Cité)

V17 | 10:30-10:50 | 0.20
bbA_∞*-algebras*
Anna Sopena-Gilboy (Universitat de Barcelona)

Thursday 16 | **Jueves 16** | **Osteguna 16**
11:00-11:20 | **11:00-11:20** | **11:00-11:20**
[Room 0.20] | **[Aula 0.20]** | **[Gela 0.20]**

Stable homotopy type of classifying spaces

Antonio Ceres Sánchez
(Universidad de Málaga)

Martino and Priddy proved various results relating p-local properties of certain groups with the homotopy type of their classifying spaces (after p-completion). In particular, in this talk we shall see how to classify the stable homotopy type of classifying spaces of compact Lie groups. The ideas and techniques used by the authors will be explained as well as possible generalizations of their result.

Joint work with Antonio Viruel.

Thursday 16 | **Jueves 16** | **Osteguna 16**
11:30-11:50 | **11:30-11:50** | **11:30-11:50**
[Room 0.20] | **[Aula 0.20]** | **[Gela 0.20]**

Abstract representation theory via stable homotopy theory

Álvaro Sánchez
(Universidad de Murcia & Charles University of Prague)

Certain tilting results for quivers which are independent of the ground field often have a rather deep explanation; namely, they arise as formal consequences of stability, and so hold for representations over any stable homotopy theory (e.g. arbitrary rings, schemes, dg algebras, or ring spectra). I will present here a systematic study of representations of quivers over arbitrary stable infinity categories, including vast generalisations of such results.

Joint work with Jan Stovicek.

Thursday 16
12:00-12:20
[Room 0.20]

Jueves 16
12:00-12:20
[Aula 0.20]

Osteguna 16
12:00-12:20
[Gela 0.20]

Introduction to global algebraic K-theory

Gabriel Martínez de Cestafe Pumares
(Universitat Autònoma de Barcelona)

Global algebraic K-theory is a refinement of algebraic K-theory due to Stefan Schwede, where the adjective "global" refers to actions of all finite groups. His construction turns a certain kind of categorical input data into a symmetric ring spectrum. One can then look at the equivariant homotopy groups of this spectrum to recover precise information about the input data. I will explain these ideas in the talk, taking as example the global algebraic K-theory of a commutative ring.

arXiv:1912.08872

Thursday 16
12:30-12:50
[Room 0.20]

Jueves 16
12:30-12:50
[Aula 0.20]

Osteguna 16
12:30-12:50
[Gela 0.20]

(Co)homology for data bases

Isaac Carcacía Campos
(Universidade de Santiago de Compostela)

The application of category theory to the study of computation has recently been a very interesting field. In this talk we will use David Spivak's ideas about databases, i.e. a functor from a small category to the category of sets. This work can be enriched when we use the free vector spaces associated to a database. In that case we can apply some (co)homological notions in order to study algebraic obstructions to the solution of some problems.

Joint work with David Mosquera Lois and Enrique Macías Virgós.

Thursday 16
16:30-16:50
[Room 0.20]

Jueves 16
16:30-16:50
[Aula 0.20]

Osteguna 16
16:30-16:50
[Gela 0.20]

Real Models of Configuration Categories

João Candeias
(Universitat de Barcelona)

We start this presentation by introducing configuration spaces and categories, as well as their Fulton-MacPherson compactifications. We go over the proof of the homotopy equivalence between the category of configurations of a manifold and its Fulton-MacPherson compactification. We review the recent results of Idrissi, providing a real model for the configuration spaces of compact, simply-connected manifolds. We then generalize these results to closed simply-connected parallelizable manifolds.

Joint work with Pedro Boavida.

Thursday 16
17:00-17:20
[Room 0.20]

Jueves 16
17:00-17:20
[Aula 0.20]

Osteguna 16
17:00-17:20
[Gela 0.20]

The motivation behind higher sketches

David Martínez-Carpena
(Universitat de Barcelona)

Sketches can be considered as one of the many formalizations of the concept of theory, by describing certain logical operations through limits and colimits. In this talk, we explore a homotopy-coherent generalization of sketches in the setting of ∞-categories. We show that numerous ∞-categories can be constructed as ∞-categories of models of limit sketches, including complete Segal spaces, ∞-operads, E_∞-algebras, spectra, and infinite loop spaces.

Joint work with Carles Casacuberta and Javier J. Gutiérrez.

Thursday 16	**Jueves 16**	**Osteguna 16**
17:30-17:50	**17:30-17:50**	**17:30-17:50**
[Room 0.20]	**[Aula 0.20]**	**[Gela 0.20]**

Hopf braces and Hopf bracoids

Brais Ramos Pérez
(Universidade de Santiago de Compostela)

In this talk we will introduce the notion of Hopf bracoid as the quantum version of skew bracoids in a braided monoidal framework. Taking into account that Hopf braces are examples of Hopf bracoids, many properties that Hopf braces satisfy will be extended for Hopf bracoids. Moreover, it is well known that there exists a categorical equivalence between Hopf braces and invertible 1-cocycles. So, we will also prove that certain subcategories of Hopf bracoids and 1-cocycles are isomorphic.

Joint work with José Manuel Fernández Vilaboa and Ramón González Rodríguez.

arXiv:2401.02925

Friday 17	**Viernes 17**	**Ostirala 17**
10:00-10:20	**10:00-10:20**	**10:00-10:20**
[Room 0.20]	**[Aula 0.20]**	**[Gela 0.20]**

Homotopical operadic calculus in positive characteristic

Víctor Roca i Lucio
(Université Paris Cité)

Algebraic operads provide a powerful tool to understand the homotopy theory of the types of (co)algebras they encode. So far, the principal results and methods that this theory provides were only available in characteristic zero. The main reason is that operads carry an action of all the symmetric groups, whose representation theory is involved in positive characteristic. The goal of this talk will be to explain how one can extend these results and methods over a positive characteristic field.

Joint work with Brice Le Grignou.

arXiv:2310.13095

Friday 17
10:30-10:50
[Room 0.20]

Viernes 17
10:30-10:50
[Aula 0.20]

Ostirala 17
10:30-10:50
[Gela 0.20]

bbA_∞*-algebras*

Anna Sopena-Gilboy
(Universitat de Barcelona)

In complex manifolds, the algebra of differential forms is equipped with a bigrading, with the differential decomposing as $d = \partial + \overline{\partial}$. This structure defines weak equivalences related to ∂ and $\overline{\partial}$, sensitive to the complex structure, leading to a stronger notion of formality. This talk introduces tools to understand this homotopical framework, specifically bbA_∞-algebras, which act as an analog of A_∞-algebras in the bidifferential context.

Joint work with Joana Cirici and Jonas Stelzig.