Research Statement

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The following text is a brief summary of both my past research experience and my research interests.

Higher Category, Higher Algebra, and Their Equivariant Variants

These are essential topics directly involved in my master thesis[1]. I am interested in application of (parametrised/equivariant) higher category and higher algebra. Moreover I focus on their development as well. For example, equivariant higher algebra is far from being complete now, especially the establishment of a counterpart theory of the classical nonequivariant nonsymmetric ∞-operad developed by [GH15][2] and of the module theory in [Lur17].

THH, THR, Algebraic K-theory and Hermitian K-Theory

THH and THR were two other essential topics in my master's thesis, largely inspired by Horev's work [Hor19]. I am also very interested in (real) algebraic K-theory, partly due to its connections with THH and THR. Additionally, inspired by talks from Yonatan Harpaz and Markus Land and from Emanuele Dotto, I have been studying quadratic forms within the context of Hermitian/Poincaré ∞-categories and exploring Hermitian K-theory (L-theory) and Grothendieck–Witt spectrum/space. It is noteworthy that they are closely related to real algebraic K-theory and THR.

Equivariant or Nonequivariant Stable Homotopy Theory

I have long been interested in stable homotopy theory, and later developed an interest in equivariant stable homotopy theory, sparked by the effort I paid on THR during my master's thesis. I later also spent some time on a more systematic learning, thanks to some notes and online lectures by Stefan Schwede and Andrew Blumberg. Currently, I am more inclined to explore the intersection of these areas with K-theory, especially using ∞-categories as a foundational framework. However, I am also open to exploring other directions; for example, recently I touched a little the topic of computing stable stems, i.e. the techniques of AdSS (Adams spectral sequence) and its various variants.

Homotopical Algebra

This is one of my earliest ressearch interests. I predicted during my undergraduate year the existence of an abstract homotopy theory, and later, thanks to Geoffroy Horel, I was lucky enough to study model category, and soon realised its close connection with ∞-category.

[1] Available upon request. It was conducted under the supervision of Gabriel Angelini-Knoll and Geoffroy Horel; it was essentially a recording of my trial on applying equivariant higher algebra to generalise current nonequivariant results written in the language of ∞-category.

[2] I am not quite convinced about this fact. Someone said that it should be owing to Ayala and/or Francis.

Complement

Generally speaking I am also willing to explore topics in homotopy theory related to the above themes. For example, some programs might involve HoTT, some algebro-geometric stuffs when it comes to K-theory, motivic homotopy theory or topos-related themes, etc. But I have to admit, for example, for algebraic geometry, I haven't yet had a systematic but instead somewhat fragmentary knowledge.

References

[GH15] David Gepner and Rune Haugseng. Enriched ∞-categories via non-symmetric ∞-operads. *Advances in Mathematics*, 279:575–716, July 2015.

[Hor19] Asaf Horev. Genuine equivariant factorization homology, 2019.

[Lur17] J. Lurie. Higher Algebra. *available on the author's webpage*, 2017.