3nd FGC-IPM Joint Workshop
"Around Langlands"

Feza Gürsey Center for Physics and Mathematics
Boğaziçi University-Kandilli Campus
Üsküdar 34684, İstanbul-TÜRKİYE

پژوهشگاه دانش‌های بنیادی (مرکز تحقیقات فیزیک نظری و ریاضیات)

INSTITUTE FOR RESEARCH IN FUNDAMENTAL SCIENCES

October 18, 2024

Venue: Feza Gürsey Center for Physics and Mathematics, Boğaziçi University-Kandilli Campus, Üsküdar 34684, Istanbul - Türkiye

Speakers:

- Esmail ARASTEH RAD, School of Mathematics, Institute for Research in Fundamental Sciences (IPM), P.O. Box: 19395-5746, Tehran, Iran;
- Somayeh HABIBI, School of Mathematics, Institute for Research in Fundamental Sciences (IPM), P.O. Box: 19395-5746, Tehran, Iran;
- Bahri F. BARBAROS, Boğaziçi University, Department of Mathematics, Bebek 34342, Istanbul - Türkiye;
- K. İlhan İKEDA, Feza Gürsey Center for Physics and Mathematics, Boğaziçi University-Kandilli Campus, Üsküdar 34684, Istanbul - Türkiye

Workshop Program:

Registration and welcome: 08:30-08:50

Opening remarks: 08:50-09:00

Speaker: Esmail Arasteh Rad (IPM-Tehran)
Title: Rapoport-Zink spaces for local G-shtukas.
Date: October 18, 2024, Friday 09:00-10:15.
Abstract:

In Langlands program discourse, the stacks for global *G*-shtukas appear as function field analogs of Shimura varieties. The Rapoport-Zink spaces for local *G*-shtukas are local counterparts to the stacks of global *G*-shtukas. In this talk, we provide a brief overview of the theory of local and global *G*-shtukas. We explore a local model theory for these spaces, which offers a local version of the local model theory for the stacks of global *G*-shtukas. Additionally, we discuss some results related to the question of local algebraizability of these spaces and highlight some applications related to the nearby-vanishing cycles sheaves on these spaces.

Reference List:

1. E. Arasteh Rad, *Local models for Rapoport-Zink spaces for local P-shtukas,* `arXiv:2010.05361 [math.NT]`.
2. E. Arasteh Rad and S. Habibi, *Local models for the moduli stacks of global G-shtukas*, Math. Res. Lett. **26** (2019), 323-364.
3. M. Rapoport and Th. Zink, *Period Spaces for p-divisible Groups*, Annals of Mathematics Studies **141**, Princeton Univ. Press, Princeton N.J. (2016).

Coffee and tea break: 10:15-10:30

Speaker: Somayeh Habibi (IPM-Tehran)
Title: Some finiteness results.
Date: October 18, 2024, Friday 10:30-11:45.
Abstract:

In this talk, we explore how some motivic tools can be employed to achieve finiteness results for the (higher) Chow groups of certain varieties. This includes, for example, certain Schubert varieties in the affine Grassmannian. To this end, we implement the theory of slice filtration by A. Huber and B. Kahn, along with the motivic decomposition theorem of Corti-Hanamura and Migliorini-de Cataldo.

Reference List:

1. E. Arasteh Rad and S. Habibi, *Local models for the moduli stacks of global G-shtukas*, Math. Res. Lett. **26** (2019), 323-364.
2. E. Arasteh Rad and S. Habibi, *Some motivic remarks on the moduli stacks of global G-shtukas and their local model*, `arXiv:1912.09968` [math.NT].
3. S. Habibi and F. Rahmati, *A remark on a result of Huber and Kahn*, `arXiv:2301.05477` [math.AG].
4. A. Huber and B. Kahn, *The slice filtration and mixed Tate motives*, Compositio Math. **142** (2006), 907–936.

Lunch break: 11:45-13:00

Speaker: Fatih Bahri BARBAROS (Bogaziçi University, Department of Mathematics, İstanbul)
*Title: An overview of the **FF**-curve*
Date: October 18, 2024, Friday 13:00-14:15.
Abstract:

The Fargues-Fontaine curve has a significant impact on the geometrization of the local Langlands correspondence [1,3]. In this talk we define the Fargues-Fontaine curve as an adic space, as a scheme, and as a diamond following [2,4,5].

Reference List:

1. L. Fargues, *From local class field theory to the curve and vice versa* in *Algebraic geometry: Salt Lake City 2015*, 181--198, Proc. Sympos. Pure Math., **97**.2, Amer. Math. Soc., Providence, R.I.
2. L. Fargues, *Tokyo Lectures on the Geometry of Diamonds*, 2022.
3. L. Fargues and P. Scholze, *Geometrization of the local Langlands correspondence*, `arXiv:2102.13459v3 [math.RT]` .
4. J. Lurie, Lecture Notes on the Fargues-Fontaine Curve, 2018.
5. P. Scholze and J. Weinstein, *Berkeley lectures on **p**-adic geometry*, Annals of Mathematics Studies, **207**, Princeton Univ. Press, Princeton, NJ, 2020.

Coffee and tea break: 14:15-14:30

Speaker: Kazım İlhan İKEDA (FGC-İstanbul)
Title: On the Langlands reciprocity and functoriality principles.
Date: October 18, 2024, Friday 14:30-15:45.
Abstract:

In the first part of the talk, for a number field K, following [3,4,5], we shall introduce an unconditional topological group WA_K which depends only on K endowed with a unique continuous homomorphism onto the hypothetical automorphic Langlands group of K compatible [7] with Arthur's construction in [1]. In the second part of the talk, we shall discuss certain morphisms from this topological group WA_K to the L-group ${}^L G(\mathbb{C})$ of a reductive group G over K and assuming the local Langlands reciprocity principle for reductive groups over K_v for finite and infinite places v of K, propose a possible approach to the global Langlands reciprocity and functoriality principles [2]

for *G* over *K* following [6].

Reference List:
1. J. Arthur, *A note on the automorphic Langlands group*, Canad. Math. Bull. **45** (2002), no. 4, 466–482.
2. J. Arthur, *The principle of functoriality*, Bull. Amer. Math. Soc. (N.S.) **40** (2003), no. 1, 39–53.
3. K. İ. İkeda, *On the non-abelian global class field theory*, Ann. Math. Qué. **37** (2013), no. 2, 129–172.
4. K. İ. İkeda, *Basic properties of the non-Abelian global reciprocity map*, in *Mathematics in the 21st century*, 45--92, Springer Proc. Math. Stat., **98**, Springer, Basel.
5. K. İ. İkeda, *On a group closely related with the automorphic Langlands group*, J. Korean Math. Soc. **57** (2020), no. 1, 21–59.
6. K. İ. İkeda, *On the Langlands reciprocity and functoriality principles*, preprint.
7. K. İ. İkeda, *A note on Arthur's construction of the automorphic Langlands group*, preprint.
8. K. İ. İkeda and E. Serbest, *Non-abelian local reciprocity law,* Manuscripta Math. **132** (2010), no. 1-2, 19–49.
9. K. İ. İkeda and E. Serbest, *Ramification theory in non-abelian local class field theory,* Acta Arith. **144** (2010), no. 4, 373–393.

Coffee and tea break: 15:45-16:00

Closing remarks: 16:00-16:15