Ideas for projects

Last updated on March 11, 2026.

(1) Ranga Rao's work on orbital integrals [RR72]; Theorem 4.10 in the lecture note.
(2) Casselman's formula for characters on non-compact elements and Jacquet modules [Cas77].
(3) DeBacker machinery, [DeB02a] or [DeB02b]. [CC: This topic only makes sense if you are following Professor Masao Oi's course on Bruhat-Tits theory. Even so, either of the two papers will be long to read; we should discuss how to cut out a subset of it, or share (a subset of) it among by multiple people.]
(4) Huntsinger's short proof for local constancy of $\Theta_\pi|_{G^{rs}}$. [AD04, Appendix A].
(5) Examples of orbital integrals, following e.g. Kottwitz' article [Kot05, §5].
(6) The geometry of orbital integrals, following e.g. Zhiwei Yun's article [Yun16, §2]. [CC: This is a bit long; we could discuss how to cut it down, or presented by a group of two.]

Also, there are quite some topics in https://swc-math.github.io/aws/2025/index.html that could lead to very good projects.

References

[AD04] Jeffrey D. Adler and Stephen DeBacker, *Murnaghan-Kirillov theory for supercuspidal representations of tame general linear groups*, J. Reine Angew. Math. **575** (2004), 1–35. MR 2097545

[Cas77] W. Casselman, *Characters and Jacquet modules*, Math. Ann. **230** (1977), no. 2, 101–105. MR 492083

[DeB02a] Stephen DeBacker, *Homogeneity results for invariant distributions of a reductive p-adic group*, Ann. Sci. École Norm. Sup. (4) **35** (2002), no. 3, 391–422. MR 1914003 (2003i:22019)

[DeB02b] ———, *Parametrizing nilpotent orbits via Bruhat-Tits theory*, Ann. of Math. (2) **156** (2002), no. 1, 295–332. MR 1935848 (2003i:20086)

[Kot05] Robert E. Kottwitz, *Harmonic analysis on reductive p-adic groups and Lie algebras*, Harmonic analysis, the trace formula, and Shimura varieties, Clay Math. Proc., vol. 4, Amer. Math. Soc., Providence, RI, 2005, pp. 393–522. MR 2192014

[RR72] R. Ranga Rao, *Orbital integrals in reductive groups*, Ann. of Math. (2) **96** (1972), 505–510. MR 0320232 (47 #8771)

[Yun16] Z. Yun, *Lectures on Springer theories and orbital integrals*, ArXiv e-prints (2016), https://arxiv.org/abs/1602.01451v1.