

# APPROXIMATE GROUPS AND ERDŐS GEOMETRY

E. BREUILLARD

For the general area of arithmetic combinatorics a good introductory book is [TV10] by Tao and Vu. For the connections with Model Theory, see Hrushovski's original paper [Hru12] and his survey [Hru13]. Tao's blog also contains precious and accessible information on most of the topics discussed in this mini-course.

Surveys and books : [Hru13], [Dvi10], [TV10], [Bre15], [Bre14], [Bre16], [BGT13].

Selected original papers: [Tao08], [Tao15], [Hru12], [BGT11], [BGT12], [Tao15], [ES12]

## REFERENCES

- [Bre14] Emmanuel Breuillard. A brief introduction to approximate groups. In *Thin groups and superstrong approximation*, volume 61 of *Math. Sci. Res. Inst. Publ.*, pages 23–50. Cambridge Univ. Press, Cambridge, 2014.
- [TV10] Terence Tao and Van H. Vu. *Additive combinatorics*, volume 105 of *Cambridge Studies in Advanced Mathematics*. Cambridge University Press, Cambridge, 2010. Paperback edition [of MR2289012].
- [Dvi10] Zeev Dvir. Incidence theorems and their applications. *Found. Trends Theor. Comput. Sci.*, 6(4):257–393 (2012), 2010.
- [Hru13] Ehud Hrushovski. On pseudo-finite dimensions. *Notre Dame J. Form. Log.*, 54(3-4):463–495, 2013.
- [BGT13] Emmanuel Breuillard, Ben Green and Terence Tao, Small doubling in groups. *Erdős centennial volume, 129–151, (2013)*.
- [Bre15] Emmanuel Breuillard. Approximate subgroups and super-strong approximation. In *Groups St Andrews 2013*, volume 422 of *London Math. Soc. Lecture Note Ser.*, pages 1–50. Cambridge Univ. Press, Cambridge, 2015.
- [Bre16] Emmanuel Breuillard. Lectures on approximate groups and Hilbert's 5th problem. In *Recent trends in combinatorics*, volume 159 of *IMA Vol. Math. Appl.*, pages 369–404. Springer, [Cham], 2016.

## REFERENCES

- [Tao08] Terence Tao. Product set estimates for non-commutative groups. *Combinatorica*, 28(5):547–594, 2008.
- [Hru12] Ehud Hrushovski. Stable group theory and approximate subgroups. *J. Amer. Math. Soc.*, 25(1):189–243, 2012.
- [BGT11] Emmanuel Breuillard, Ben Green, and Terence Tao. Approximate subgroups of linear groups. *Geom. Funct. Anal.*, 21(4):774–819, 2011.
- [BGT12] Emmanuel Breuillard, Ben Green, and Terence Tao. The structure of approximate groups. *Publ. Math. Inst. Hautes Études Sci.*, 116:115–221, 2012.
- [ES12] György Elekes and Endre Szabó. How to find groups? (and how to use them in Erdos geometry?). *Combinatorica*, 32(5):537–571, 2012.
- [Tao15] Terence Tao. Expanding polynomials over finite fields of large characteristic, and a regularity lemma for definable sets. *Contrib. Discrete Math.*, 10(1):22–98, 2015.

---

*Date:* Marseille Pre-School January 2018.

DPMMS, UNIVERSITY OF CAMBRIDGE, UK,  
*E-mail address:* `emmanuel.breuillard@maths.cam.ac.uk`