

## Topics for Student Seminars 2022

In 2022, our seminars will be held in two themes:

1. Improve proficiency with the basic results in geometrical measure theory.
2. Become skilled in calculating dimensions of concrete interesting examples.

Professor Feng has suggested the following topics:

1. Discuss and solve some interesting Exercises in Chap 1-4 of the book by Bishop and Peres “Fractals in Probability and Analysis”.
2. Jarnik Theorem (cf. Theorem 8.16 in [3]), Dimensions of homogeneous Moran sets [6] and their applications in the multifractal analysis of Birkhoff averages (see Proofs of Theorem 4 in [4] and Theorem A in [5]).
3. Dimension of the overlapping self-similar set on  $\mathbb{R}$  generated by the IFS

$$\{x/3, (x+2)/3, (x+\tau)/3\},$$

where  $\tau$  is a rational (cf. [7]); Falconer’s distance set theorem (cf. [2]) etc.

## References

- [1] Christopher J. Bishop and Yuval Peres, *Fractals in probability and analysis*. Cambridge Studies in Advanced Mathematics, 162. Cambridge University Press, Cambridge, 2017.
- [2] K. J. Falconer, On the Hausdorff dimensions of distance sets. *Mathematika* 32 (1985), no. 2, 206–212.
- [3] K. J. Falconer, *The geometry of fractal sets*. Cambridge Tracts in Mathematics, 85. Cambridge University Press, Cambridge, 1986.
- [4] Ai-Hua Fan and De-Jun Feng, On the distribution of long-term time averages on symbolic space. *J. Statist. Phys.* 99 (2000), no. 3-4, 813–856.
- [5] Ai-Hua Fan, De-Jun Feng and Jun Wu, Recurrence, dimension and entropy. *J. London Math. Soc. (2)* 64 (2001), no. 1, 229–244.
- [6] De-Jun Feng, Zhi-Ying and Jun Wu, Some dimensional results for homogeneous Moran sets. *Sci. China Ser. A* 40 (1997), no. 5, 475–482.
- [7] Richard Kenyon,, Projecting the one-dimensional Sierpinski gasket. *Israel J. Math.* 97 (1997), 221–238.