



## Departmental PhD Thesis Exam

Monday, May 5th, 2025 at 10:00 a.m. (sharp)  
via Zoom / BA6183

PhD Candidate : Xincheng Zhang

Supervisor : Jeremy Quastel

Thesis title : TASEP and the KPZ Fixed Point in the Half-space



### Abstract

In this thesis, we present the multi-point probability distribution of the totally asymmetric exclusion process (TASEP) in the half-space, starting from a general deterministic initial condition. More precisely, let  $h(t, x)$  denote the height function of the TASEP at position  $x$  and time  $t$ . We provide an explicit formula for

$$\mathbb{P}(h(t, x_1) \leq r_1, \dots, h(t, x_m) \leq r_m).$$

This formula is well-suited for scaling limit analysis. By applying a 1:2:3 scaling, we derive the probability distribution for the half-space KPZ fixed point, which is conjectured to represent the universal process for KPZ universality models restricted to a half-space.

Additionally, we introduce a new formula for the full-space TASEP, starting from a general initial condition. This formula differs from the one derived by Matetski et al.