An approach to asymptotic error distributions of rough differential equations

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Asymptotic error distributions of solutions to stochastic differential equations driven by fractional Brownian motion (fBm) has been studied in several situations, which are classified by dimension and roughness of the driving fBm ([6, 3, 5, 1, 4]). In this talk we will show results of the problem in the case that fBm is multi-dimensional and rough. One of difficulties of this problem is expression of the error term. We introduce certain interpolation process between the solution and the approximation to overcome this difficulty. This talk is based on the joint work with Shigeki Aida ([2])

References

- S. Aida and N. Naganuma. Error analysis for approximations to one-dimensional SDEs via the perturbation method. Osaka J. Math., 57(2):381–424, 2020.
- [2] S. Aida and N. Naganuma. An approach to asymptotic error distributions of rough differential equations. arXiv:2302.03912, 2023.
- [3] Y. Hu, Y. Liu, and D. Nualart. Rate of convergence and asymptotic error distribution of Euler approximation schemes for fractional diffusions. *Ann. Appl. Probab.*, 26(2):1147–1207, 2016.
- [4] Y. Hu, Y. Liu, and D. Nualart. Crank-Nicolson scheme for stochastic differential equations driven by fractional Brownian motions. Ann. Appl. Probab., 31(1):39–83, 2021.
- [5] Y. Liu and S. Tindel. First-order Euler scheme for SDEs driven by fractional Brownian motions: the rough case. Ann. Appl. Probab., 29(2):758– 826, 2019.
- [6] N. Naganuma. Asymptotic error distributions of the Crank–Nicholson scheme for SDEs driven by fractional Brownian motion. J. Theoret. Probab., 28(3):1082–1124, 2015.