

Title Diffusion processes and Stochastic differential equations.

Proposer Bob Griffiths

Brief Description This project is to learn about diffusion processes and stochastic differential equations, with an emphasis on those occurring in Mathematical Genetics. Simulation from stochastic differential equations will be used to study the properties of the diffusion processes.

Simulation/Theoretical project

Prerequisites Part B Applied Probability, Part C Mathematical Genetics, Computing ability to code programs.

References

Ewens, W. J. *Mathematical population genetics*. (2004) 2nd ed Springer.
Cyganowski, S., Kloeden, P. and Ombach, J. (2002) *From elementary probability to stochastic differential equations with Maple*. Springer
Karlin, S. and Taylor, H. (1981) *A second course in stochastic processes*. Academic Press.

Title The Lambda coalescent

Proposer Bob Griffiths

Brief Description The Lambda coalescent is a random tree process which begins with n leaves and is built by multiple edges coalescing to vertices according to a probability distribution until a single root vertex is reached. The project is to learn about these processes and study properties by simulation and theory.

Simulation/Theoretical project

Prerequisites Part B Applied Probability, Part C Mathematical Genetics, Computing ability to code programs

References

Bertoin, J. *Random fragmentation and coagulation processes*. (2006)
Pitman, J. Coalescents with multiple collisions. (1999). *Ann. Probab.* 27, 1870–1902.
Pitman, J. *Combinatorial Stochastic Processes* (2006). Lect. Notes in Maths 1875 Springer.
Sagitov, S. The general coalescent with asynchronous mergers of ancestral lines. (1999) *J. Appl. Prob.* 36, 1116–1125.