

Diffusion approximations via Stein's method and time changes

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We extend the ideas of (Barbour, 1990) and use Stein's method to obtain a bound on the distance between a scaled time-changed random walk and a time-changed Brownian Motion. We then apply this result to bound the distance between a time-changed compensated scaled Poisson process and a time-changed Brownian Motion. This allows us to bound the distance between the Moran model with mutation and Wright-Fisher diffusion with mutation upon noting that the former may be expressed as a difference of two time-changed Poisson processes and the diffusive part of the latter may be expressed as a time-changed Brownian Motion. The method is applicable to a much wider class of examples satisfying the Stroock-Varadhan theory of diffusion approximation.