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# Colloquium

# *Path Analysis Method for Linear and Nonlinear Partial Differential Equations*

## *Professor Shige PENG*
### *Shandong University*

**Abstract**

Many typical first order partial differential equations (PDE) have their own characteristic curves. They are often the solutions of the corresponding ODEs. Similarly, Brownian motion, viewed as the most simple and typical solution of SDEs, is the characteristic curve for the heat equation and the Laplace equation. Recently we have introduced a nonlinear Brownian motion which provides us the characteristic curves of many important second order quasi-linear or fully nonlinear PDEs of parabolic and elliptic type. A Solution of the corresponding PDE is the corresponding martingale in the language of stochastic analysis. In a higher point of view, a solution u(t,x) of such PDE is a solution of the corresponding differential equations of function u(t,$\omega$(t)) of the nonlinear Brownian paths $\omega$. Many important progresses in stochastic analysis can be understood with this new angle of view. We also discuss some nonlinear Monte-Carlo methods for numerical solutions of the corresponding PDEs.

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| Date: | 10 March 2017 (Friday) |
| Time: | 10:30am ~ 11:30am |
| Venue: | Rm. 404, William M.W. Mong Engineering Building, The Chinese University of Hong Kong, Shatin |

*All are Welcome*