This file contains pictures and illustrations used during the mini-course on numerics for SDEs at Central South University (Changsha).

Three realisations of a Brownian motion (or Wiener process) on the interval $[0, 1]$
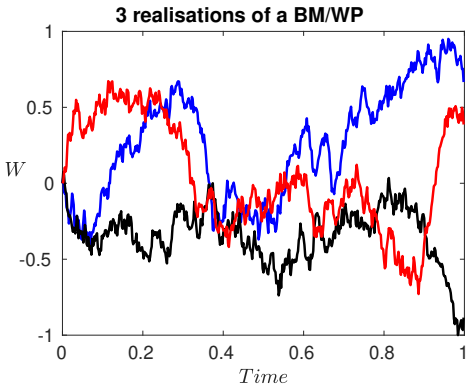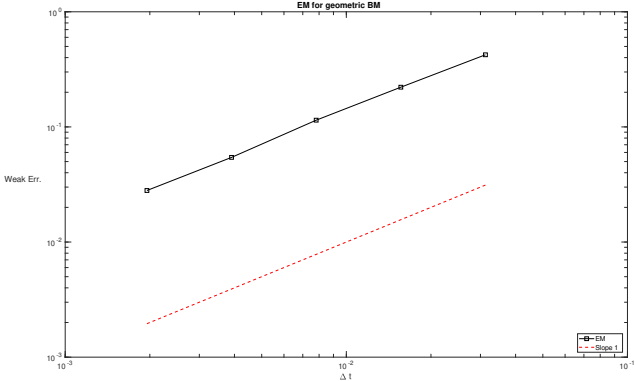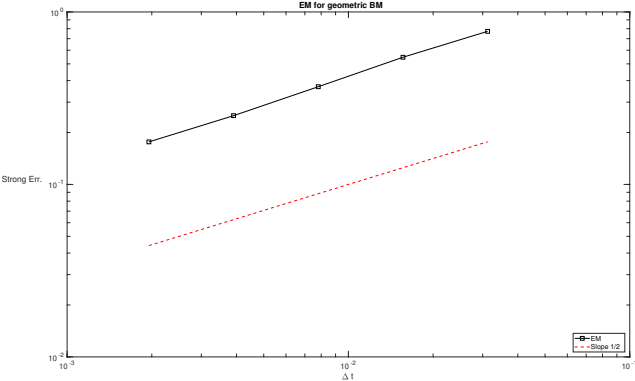

3 realisations of a BM/WP

Illustration of Brownian motions in $2d$. If the animation is not working with your pdf-viewer, just follow this link

Illustration of the weak error of Euler-Maruyama's scheme for the geometric Brownian motion

Illustration of the strong error of Euler-Maruyama's scheme for the geometric Brownian motion

Johann Carl Friedrich Gauss 1777 − 1855 (Brunswick, now Germany).

With 7: could sum the integers from 1 to 100! Phd: Fundamental theorem of algebra (complex roots). In 1801: Predicted the position of Ceres (dwarf planet). Worked on everything from number theory to optics, via statistics and mechanics.

Robert Brown 1773 − 1858 (Montrose, Scotland).

Studied medicin and botanic at the Univ. of Edinburgh. One of the first to use a microscope. In 1827: Discover Brownian motion (pollen in water) Explanation provided by Einstein and Smoluchowski.
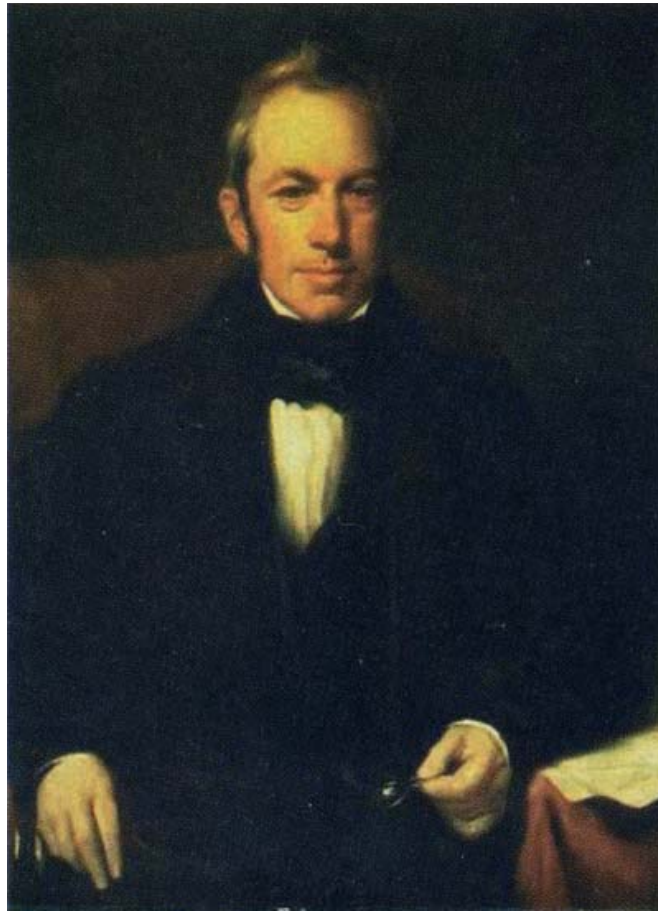
Norbert Wiener 1894 − 1964 (Columbia, Missouri, USA).

Had problems at school. His father decided to teach him. Start to study zoology at Harward, then mathematics and philosophy. Professor at MIT. Work: Brownian motion, stochastic processes, cybernetics (founder), quantum theory, etc.

Kiyosi Ito 1915 − 2008 (Hokusei-cho, Japan).
"Ever since I was a student, I have been attracted to the fact that statistical laws reside in seemingly random phenomena. Although I knew that probability theory was a means of describing such phenomena, I was not satisfied with contemporary papers or works on probability theory, since they did not clearly define the random variable, the basic element of probability theory." First worked at the Cabinet Statistics Bureau, then at Nagoya Imperial University (also at Aarhus University from 1966 to 1969). Creator of the modern theory of stochastic analysis.

Leonhard Euler 1707 − 1783 (Basel, Switzerland).

Entered the University at the age of 14. Had Johann Bernoulli as mentor. Worked in almost all areas of mathematics. If all his work would have been printed, this would represent ca. 50 books.
Best mathematician in the world.

Gisiro Maruyama $1916 - 1986$ (Nagano, Japan). B.S. at Tohoku Imperial University in 1937. Worked on stochastic processes. Know for the Euler-Maruyama scheme.