



Pap Gyula

Valószínűségeloszlások konvergenciája

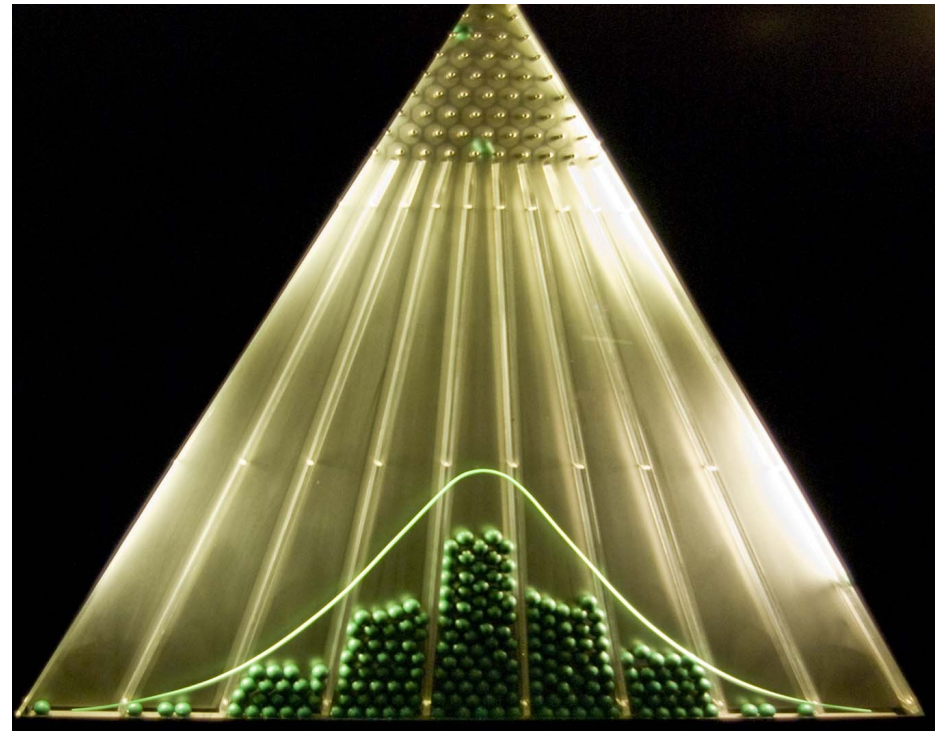
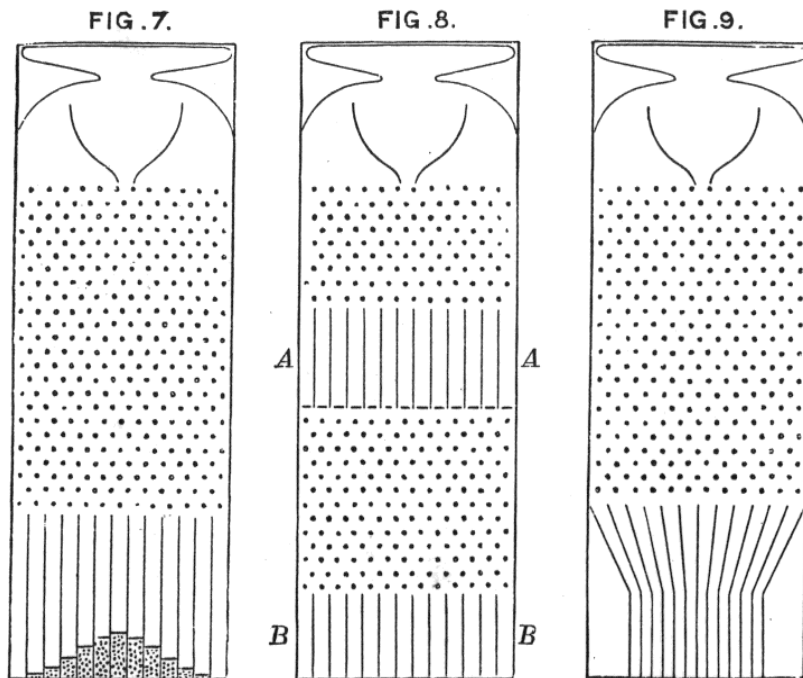
Deák Ferenc Gimnázium
Szeged, 2014. április 9.

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Konvergencia

- Konvergál ~ egyre közelebb kerül
- Galton-deszka <http://hu.wikipedia.org/wiki/Galton-deszka>

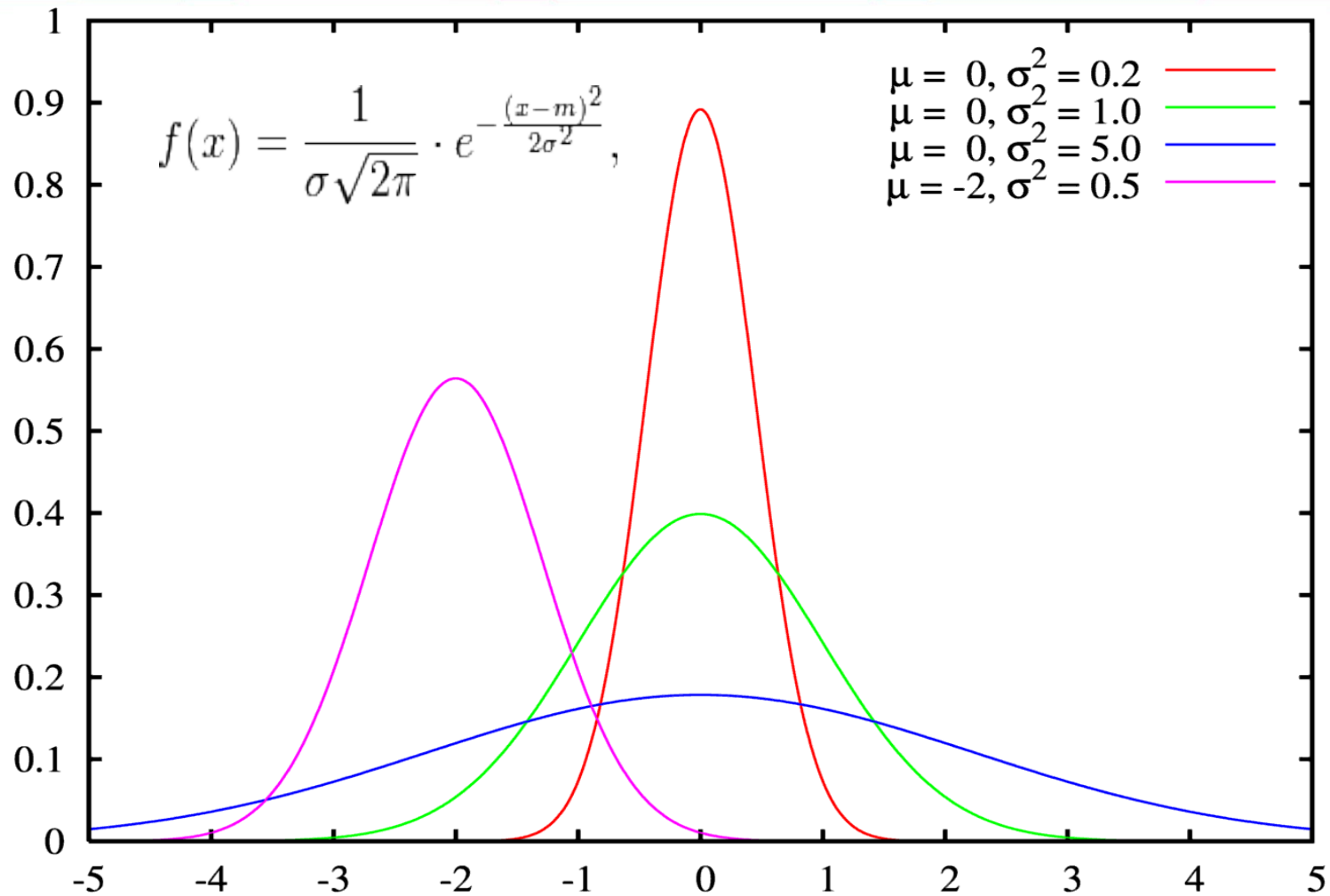


Gauss-eloszlás

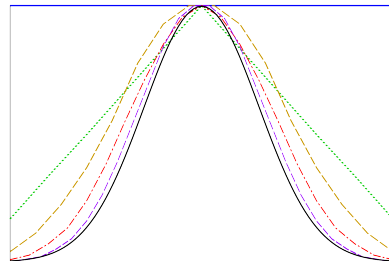
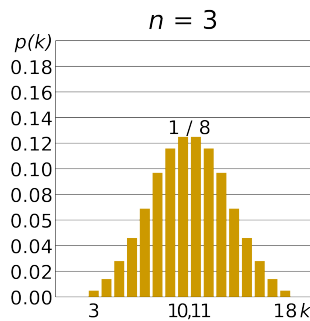
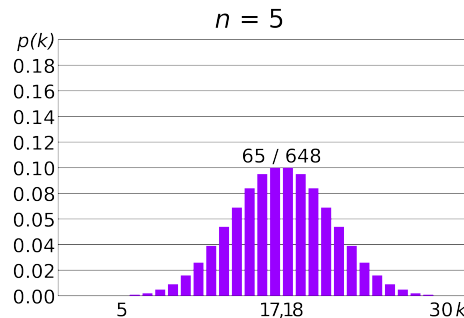
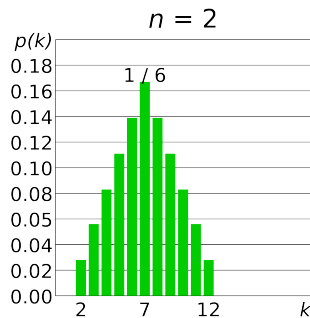
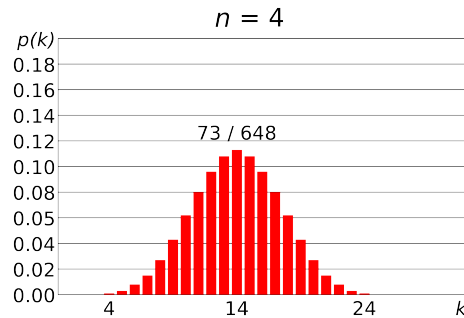
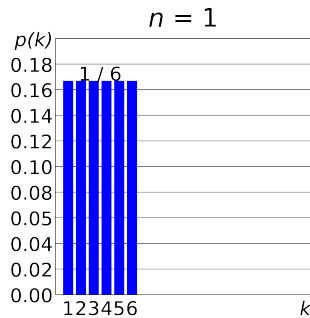


Carl Friedrich Gauss (1777-1855)

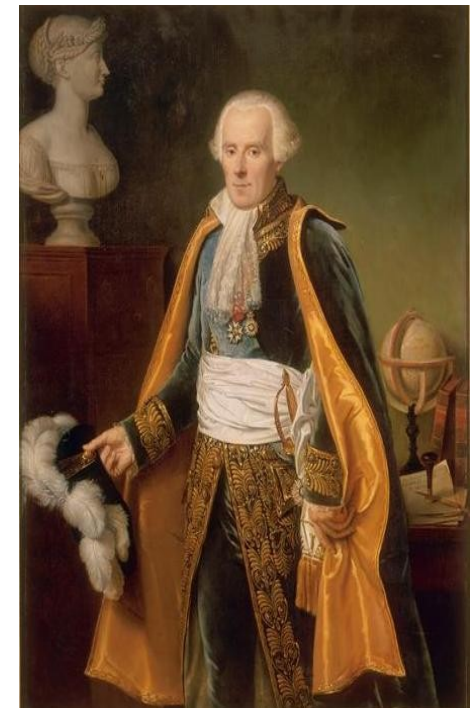
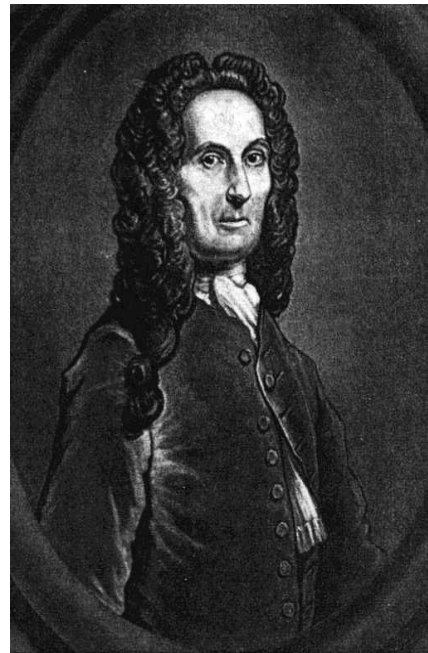
Gauss-eloszlás



Centrális határeloszlás-tétel

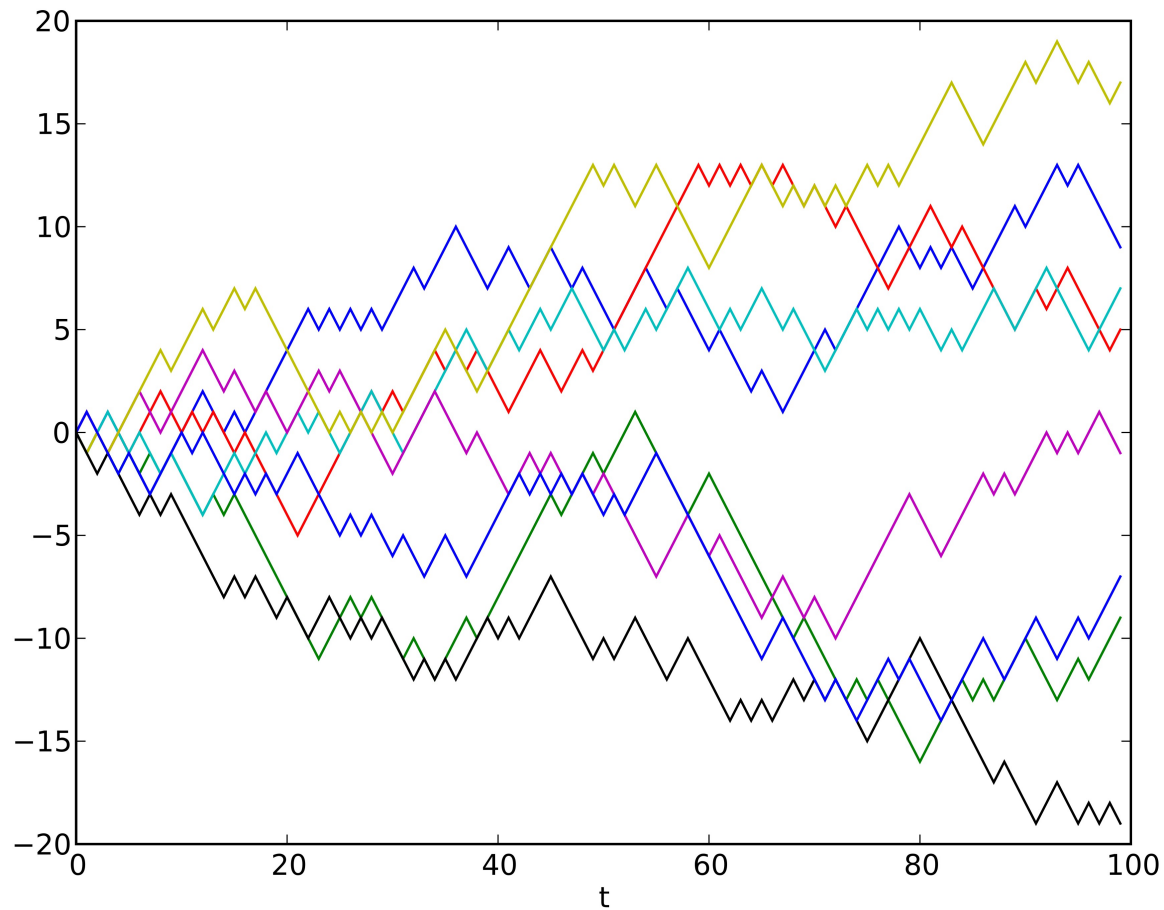


Abraham de Moivre, 1733

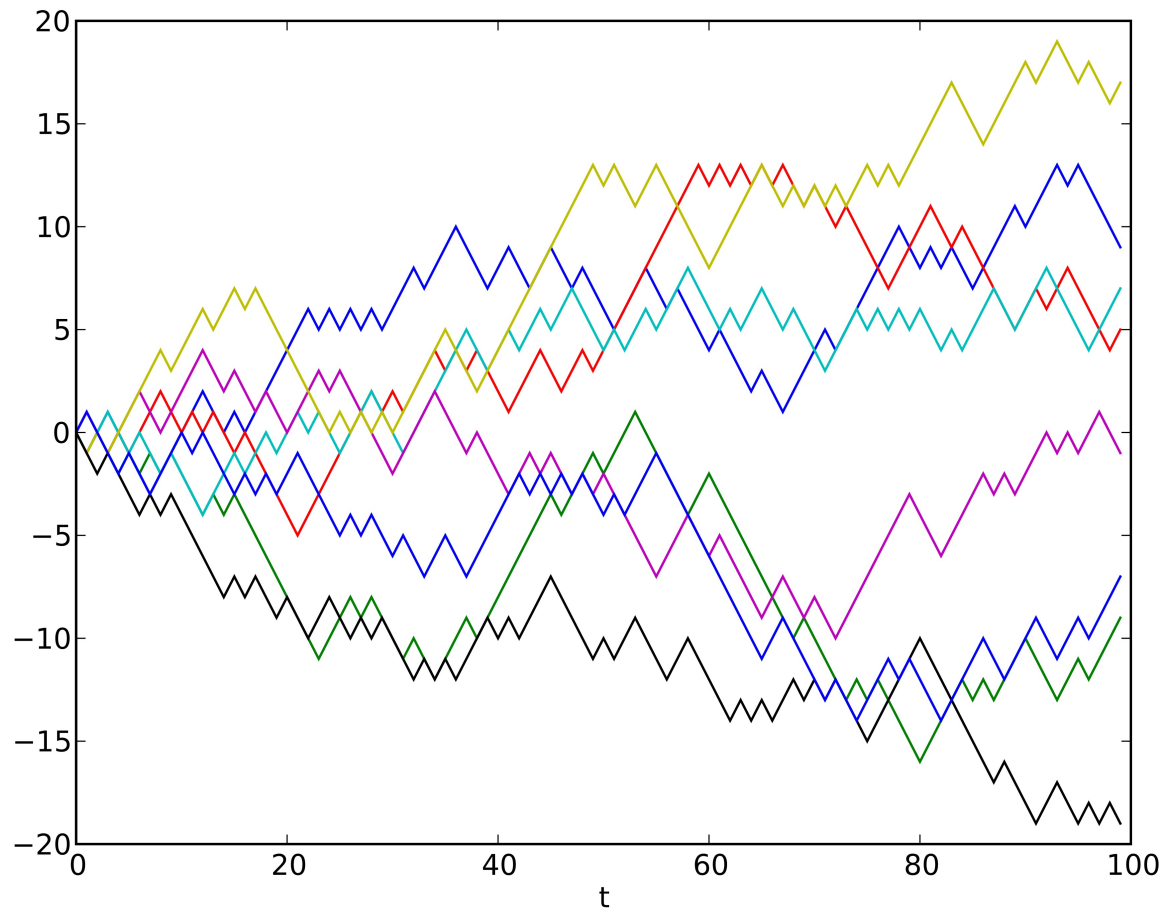


Pierre-Simon Laplace, 1812

Véletlen bolyongás

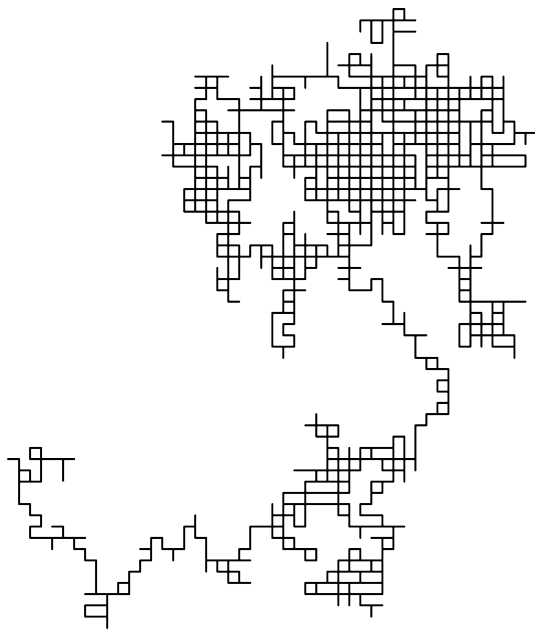


Véletlen bolyongás

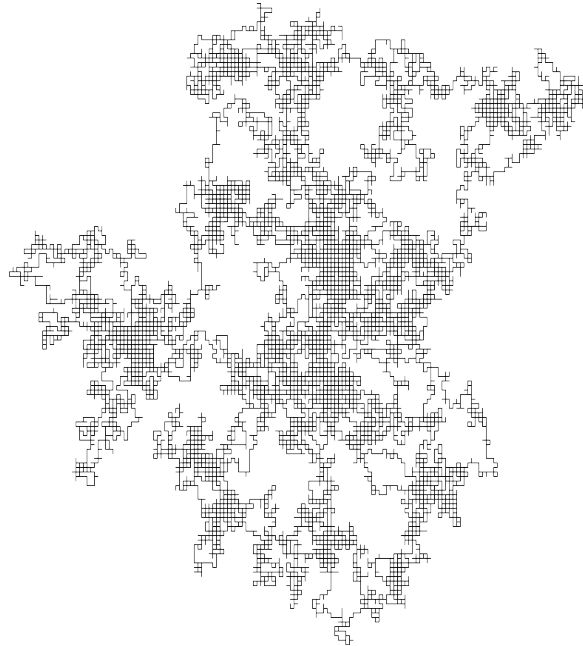


2-dimenziós véletlen bolyongás

<http://vlab.infotech.monash.edu.au/simulations/swarms/random-walk/>



2500 lépés

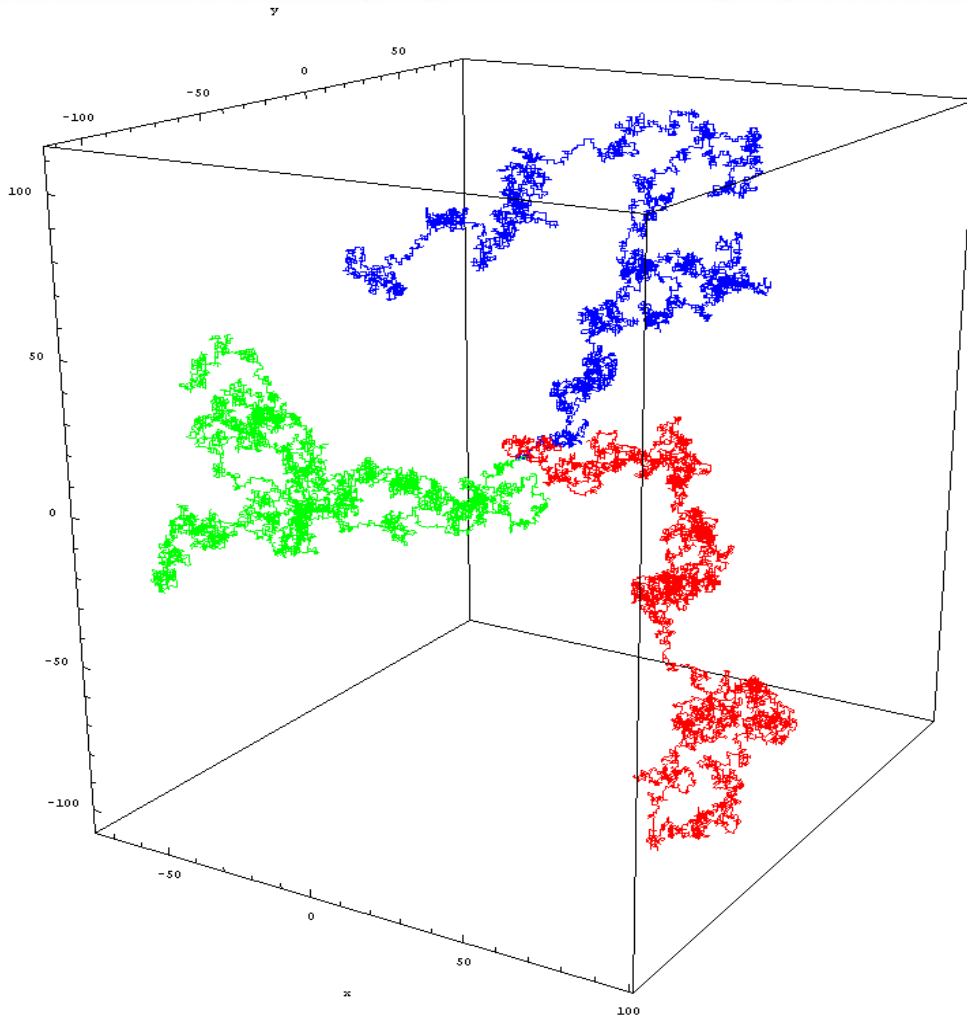


25000 lépés



200000 lépés

3-dimenziós bolyongás



Pólya György (1887-1985)

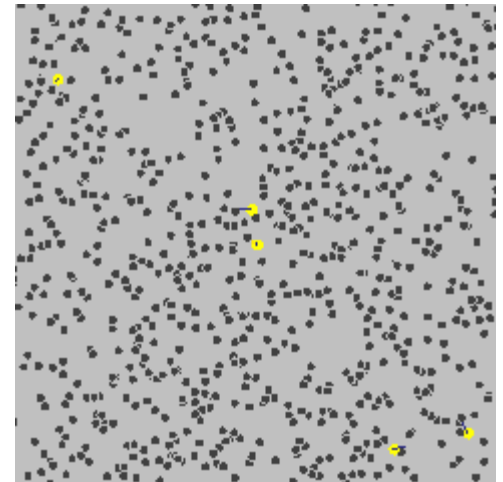
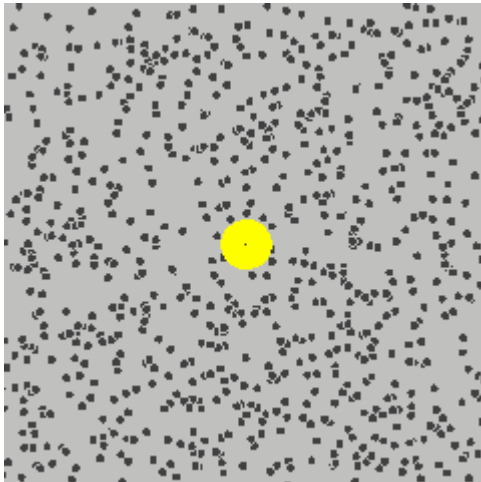


Szimmetrikus bolyongás:

- 1 és 2 dimenzióban visszatérő
- 3 dimenziótól kezdve nem visszatérő

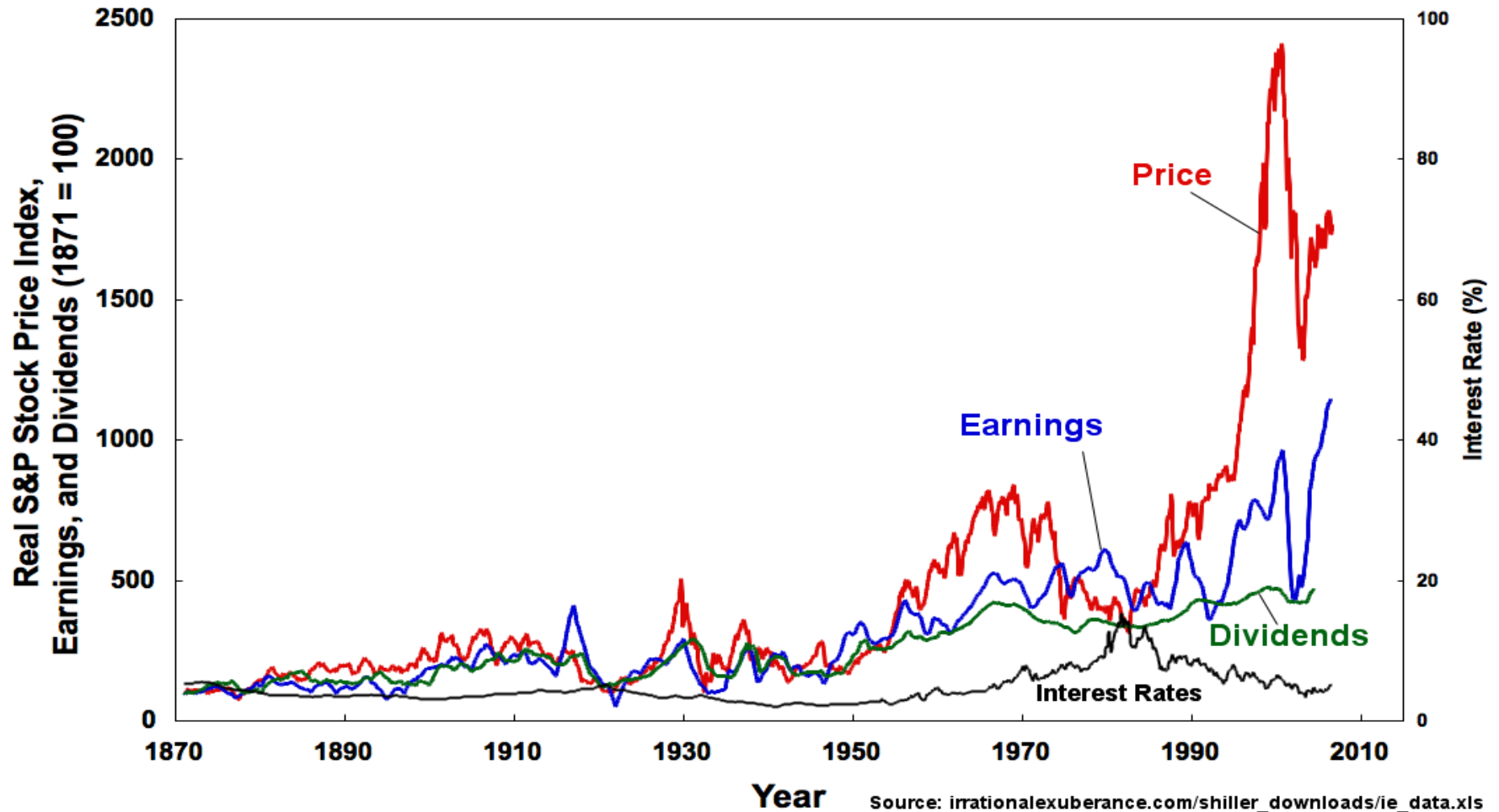
Brown-mozgás

gázokban és folyadékokban lebegő részecskék véletlenszerű mozgása



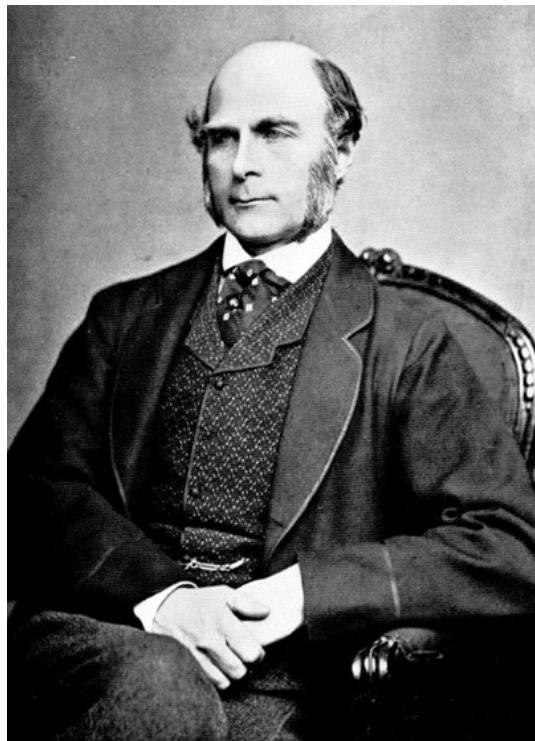
Robert Brown (botanikus, 1773 – 1858)

Részvényár és kamatláb ingadozása

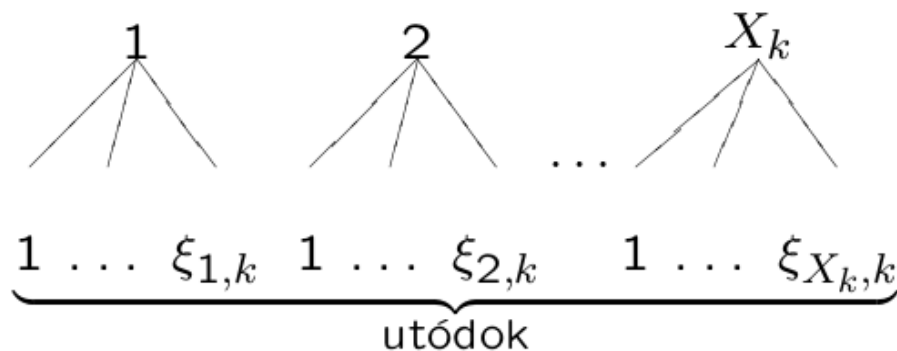


Galton-Watson elágazó folyamat

Sir Francis Galton (1822-1911)



X_k : k -adik generáció létszáma; $k = 0, 1, 2, \dots$



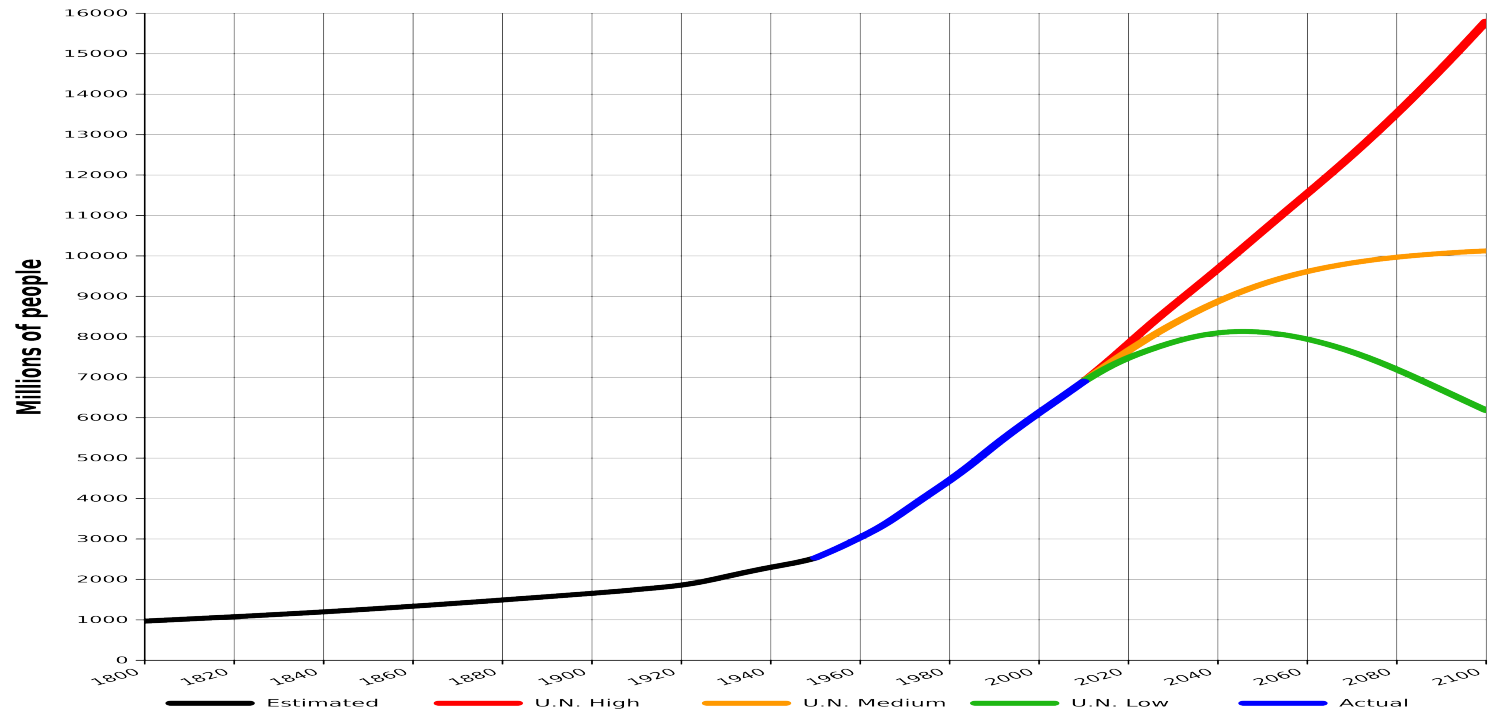
$$X_{k+1} = \sum_{j=1}^{X_k} \xi_{j,k}$$

Rev. Henry William Watson (1827-1903)

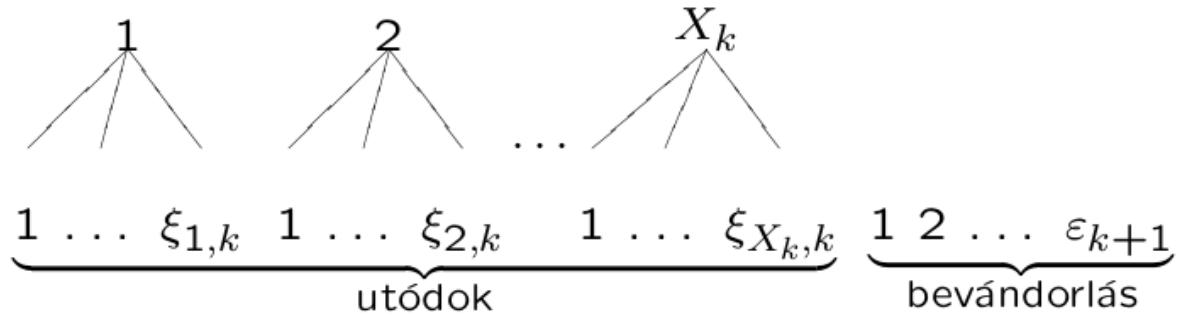
Galton-Watson elágazó folyamat

Kihalás valószínűsége:

- < 1 , ha az átlagos utódszám > 1
- $= 1$ egyébként



Galton-Watson elágazó folyamat bevándorlással



$$X_{k+1} = \sum_{j=1}^{X_k} \xi_{j,k} + \varepsilon_{k+1}$$

Branching processes are used to model reproduction; for example, the individuals might correspond to bacteria, each of which generates 0, 1, or 2 offspring with some probability in a single time unit. Branching processes can also be used to model other systems with similar dynamics, e.g., the spread of **surnames** in **genealogy** or the propagation of neutrons in a **nuclear reactor**.



Köszönöm!

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