**Researches about theory (R)**

8\_R.

Do a research about the following topics:  
  
- The law of large numbers LLN, the various definitions of convergence  
  
- The convergence of the Binomial to the normal and Poisson distributions  
  
- The central limit theorem [in anticipation of a topic we will study later]

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**Applications / Practice (A)     [work on this at least 30' a day, all days]**

8\_A. Exercise (also partially described in video 04)  
  
Generate and represent m "sample paths" of n point each (m, n are program parameters), where each point represents a pair of:

time index t, and **relative frequency** of success f(t),  
  
where f(t) is the sum of t Bernoulli random variables with distribution B(x, p) = p^x(1-p)^(1-x) observed at the various times up to t: j=1, ..., t..

At time n (last time) and one other chosen inner time 1<j<n (where j is a user parameter) represent with a histogram the distribution of f(t).

See also what happens if you replace the relative frequency f(t) with the **absolute frequency** n(t) or by **normalized relative frequency**: f(t) / sqrt(p(1-p)/n).  
  
Comment briefly on the result.

(The general scheme of this exercise, will also be "reused" in next homeworks where we will consider other more interesting stochastic processes.)

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**Researches about applications (RA)**

6\_RA. Do a web research about the various methods proposed to compute the running median (one pass, online algorithms).  
Store (cite all sources and attributions) the algorithm(s) that you think is(are) a good candidate, explaining briefly how it works and possibly try a quick demo.

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