0.1 data

We considered the set of all court decisions made by the ECHR by a grand-chamber, chamber or commission (Judgments in HUDOC), and only decisions made after the application was deemed admissible by the court. We considered all decisions up to December of 2016. From the dataset, we created a network where each node is a specific decision (identified by a unique id, e.g. 001-168852) and each directed edge is a reference to another decision (from the meta-data "stransbourg court law (scl)"). In the original database, these references are in a textual form (are not a list of doc ids), and therefore we converted each textual reference on this field to a unique id with a script. This script was not able to classify a reference to a unique document for only ¡200 references of the 30.000 references, and, manually, we have not identified any mis-classification by the script.

0.1.1 Temporal network

Even though the network constructed above is static, the real network evolves in time as new decisions are made which cite previous decisions. To analyze the temporal evolution of the network, we considered the evolution of the network in a monthly basis: each node i has an associated initial month t_i when the decision was published, and we considered the network at month t to be the network constrained to all nodes with months $t_i \leq t$ and respective out-edges.

0.1.2 Evolution of the number of citations

For each node i and each month t, we extract from the network the in-degree of the node for the network up to that year, $k_i(t)$. The main focus of our analysis is to understand how highly cited decisions became so. Quantitatively, this corresponds to the adoption curve of highly cited decisions. Therefore, we focus on the quantity $x_i(t) = k_i(t)$ for $t = 0, ..., t_i^{\max}$ where $t = 0$ is the month the decision was published and $t_i^{\max}$ expresses the number of months the decision exists until 12/2016 (our final date). Using this notation, we have that $x_i(0) = 0$ and $x_i\left(t_i^{\max}\right) = k_i^{\max}$. We use $x_i\left(t_j\right)$ to represent the in-degree of the decision i at month t_j, and we analyse each decision independently.

0.2 Best fit using maximum likelihood

The deterministic description given by Eq. 2 is never observed in practice in data, as data always contains unaccounted fluctuations. Thus, to fit the data, we interpret $x(t)$ in Eq. 2 as the expected (average) behavior, and the fluctuations about the mean as noise. To obtain the parameters a, b and c that best describe the data, we use maximum likelihood estimates (MLE). To use maximum likelihood, we need to specify the conditional probability of the data given the parameters of the statistical model, the likelihood function. This requires making explicit assumptions about the distribution of the noise. We use the following two assumptions for the noise:

- (i) each data point $x_i\left(t_j\right)$ is normally distributed around a mean $x(t)$ (given by Eq. 2) with a standard deviation σ independent of t. This implies that the fluctuations $z_j = \left(x_i\left(t_j\right) - x(t)\right)/\sigma,\ t_j = 0, ..., t^{\max}$ are normally distributed around 0 with variance 1;
- (ii) the fluctuations z_j are independent from each other.

Under these hypothesis, the likelihood function is given by

$$\begin{aligned} L\left(\{x_i\left(t_j\right)\}_{t_j}; a, b, c, \sigma\right) &\equiv P\left(\{x_i\left(t_j\right)\}_j | a, b, c, \sigma\right) \\ &= \prod_{t_j=0}^{t^{\max}} N\left(x\left(t_j\right) - x_i\left(t_j\right), \sigma\right) \ , \end{aligned}$$

where $N(\mu, \sigma)$ is the Gaussian function. The parameters a, b, c and σ that best fit the data are obtained by maximizing the likelihood function, which is equivalent to minimize the minus log-likelihood,

$$\begin{aligned} -\log L\left(\{x_i\left(t_j\right)\}_{t_j}; a, b, c, \sigma\right) &= \log\left(\sqrt{2\pi}\sigma\right) \\ &\quad + \frac{1}{2\sigma}\sum_{t_j=0}^{t^{\max}}\left(x\left(t_j\right) - x_i\left(t_j\right)\right)^2 \ , \end{aligned}$$

which we do using a standard minimization algorithm.

0.3 Basic statistics of the ECHR

The European Court of Human Rights currently receives many more applications every year than it delivers decisions: in 2017 it delivered 12 399 Decisions and Judgments, but it received more than twice as many applications. By January first, 2018 56 250 cases were pending before the court See https://www.echr.coe.int/Documents/Stats_month_2018_ENG.pdf).