# Patent networks

## What are patent networks

* + **A patent is a legal process** which gives the applicant a timed monopoly on an innovation if they prove that it is novel.
  + Patents **must cite “prior art”** which describes other patents from which it inherits.
  + This describes a directed relationship which **forms a network**.
  + This is similar to academic citation networks (collectively **bibliographic networks)** Key differences being mechanics and reasoning behind citations.
    - Patent citations if missed can void the patent application.
    - Often added by a patent attorney so not ‘directed’
    - Often academic citations support the narrative not just what the research is based on.
    - Research of errors carried forward in academic networks.

## Innovation evolution

* + There is growing research considering innovation as primarily an evolutionary process through mutation and recombination of ‘prior art’
    - E.g. technology codes. These describe the technology (or combination of technologies) category niche the patent sits in. Similar to Dewey decimal. If these codes are combinations of parents, then combination. New codes not very common, primarily combinations.
    - Simulations of an innovation network using logic gates shows similar network structure to observed.

## Bibliographic networks

* + Example of a complex/scale-free network.
    - Preferential attachment
    - **Valverde** describes USPTO (1975+) network using graph theory.
      * Number of patents
      * Preferential attachment + aging.
      * Hierarchical organisation
      * Modularity
      * Etc.
  + Predictability of growth
    - Why did the rich get rich in the first place?
      * Model = preferential attachment + inherent value
      * Early growth will still be very stochastic.
      * At what point can you **predict success**
    - As I’m a data scientist I would like to add data mining to this.
      * Can additional features predict success?
      * What features will you use?
        + Normalise date / industry… text, number of examiners…