Technology’s advance is central to our understanding of economic growth and development. Furthermore, solutions for many of the planet’s most pressing challenges - economic recovery, poverty reduction, climate change, sustainability - require significant additions to society’s technological toolkit. Yet, our ability to quantitatively model and forecast technological change is limited due to difficulties in defining units of analysis and in collecting comparative empirical data.

Some inventions, namely patents, however, leave behind a documentary trail, enabling us to study the invention processes in a quantitative way. Here, we propose to develop a formal methodology to construct detailed technology “map” and its time evolution from large-scale U.S. Patent data spanning 220 years. We utilize a classification system consisting of codes as unit of analysis. These codes are means to succinctly describe a patent’s technology capabilities. When codes appear together in a patent, we consider them inter-related and assign links to between them. These micro-scale invention activities add up to form networks in time where macro-scale structures emerge through community structure. We observe and identify structural change over time with historic events. Analyzing and quantifying individual communities in time shed light on how a set of technologies’ life: birth, growth and death.

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