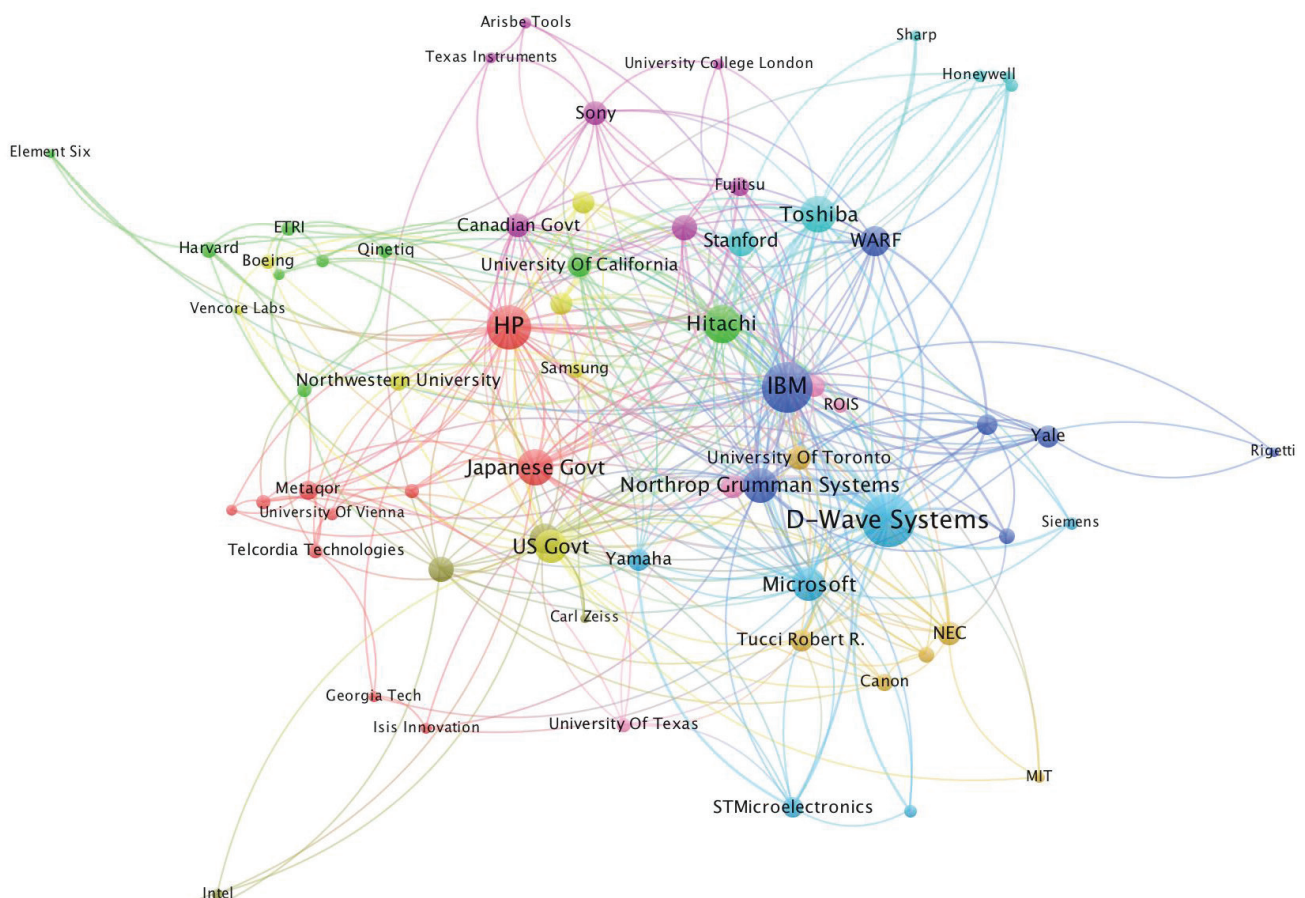


TECHNOLOGY DESCRIPTION:

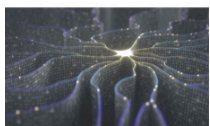
Classical computing is built at a base level on bytes which are used to perform calculations, and each bit represents either a 1 or 0. Quantum computing is built on quantum bits, known as qubits. These particles not only represent 1's and 0's but due to the quantum mechanical property of superposition, can actually exist as both 1 and 0 at the same time and any combination in between.

There are five different types of qubits:

- Super-conducting qubits are based on existing circuit technologies used in current semiconductors.
- Silicon quantum dots are artificial atoms that made by adding an electron to a small piece of pure silicon.
- Topological qubits are quasiparticles that can be seen in the behavior of electrons channeled through semiconductor structures.
- Trapped ion quantum computers use lasers to cool and trap ions or electrically charged atoms which put them in a superposition state.
- Diamond vacancies are a qubit creation technique where a nitrogen atom and a vacancy add an electron to a diamond lattice and its quantum spin state is controlled via light.



FORWARD CITATION NETWORK MAP



Patinformatics, LLC®
Patent Landscape Reports

ANALYSIS:

The field of quantum computing has seen exponential growth over the last two years, and is projected to continue through the end of 2017. More than half of the patent families associated with quantum computing discuss qubit generation.

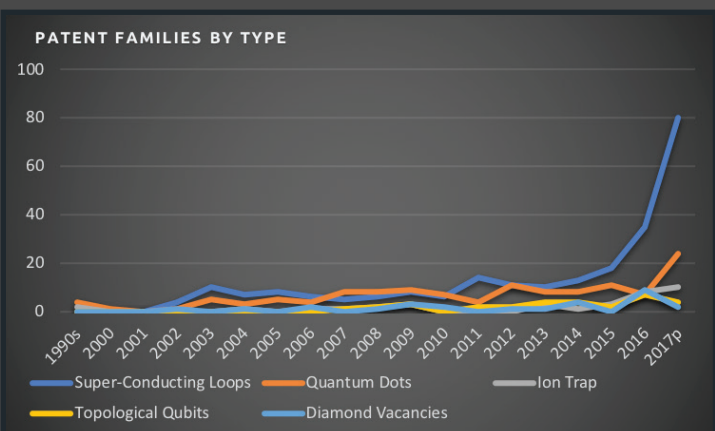
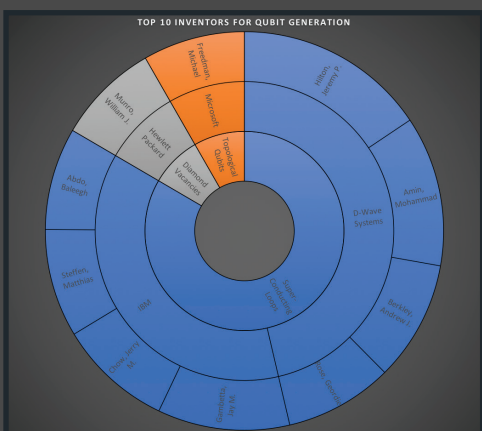
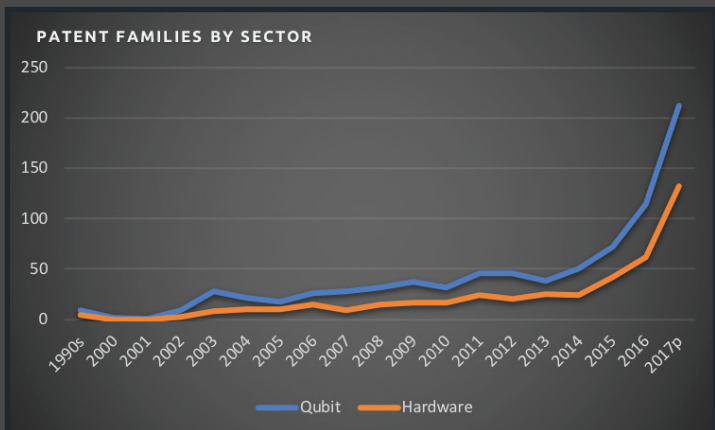
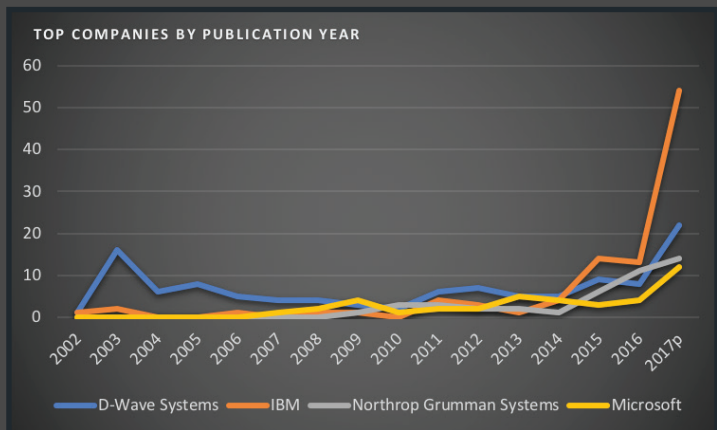
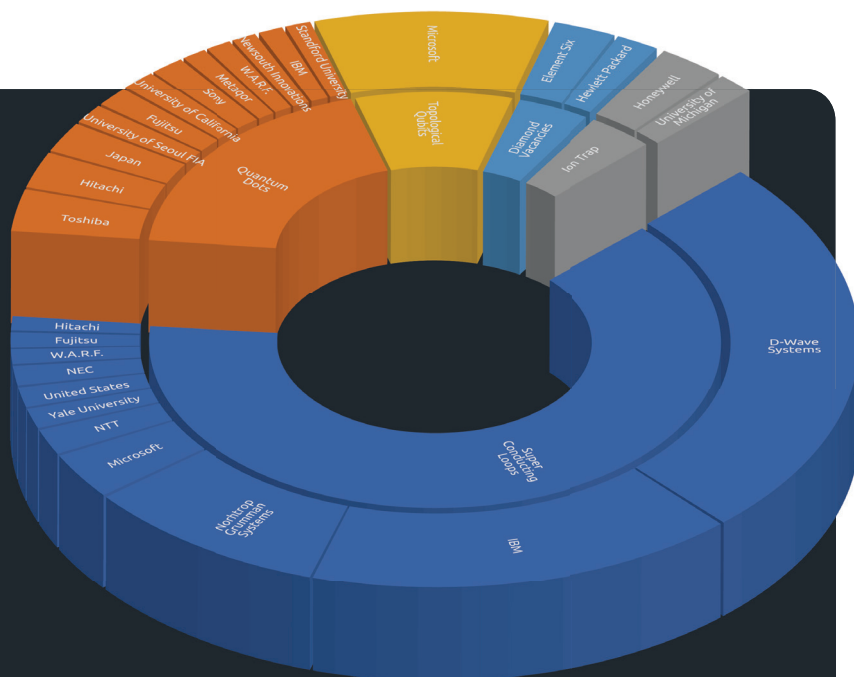
Super-conducting qubits have been the main industry focus in terms of qubit generation technologies since 2002, and for 2017 the number of publications related to this type is projected to be double the number of all other qubit types combined. Patenting on quantum dot qubits has also accelerated recently.

D-Wave, IBM, and Northrop Grumman are primarily interested in super-conducting qubits. Many of the Japanese companies in this area are interested in quantum dot qubits. Microsoft is the only organization pursuing topological qubits, a longer term solution. Element Six, a synthetic diamond manufacturer, is a leader in diamond vacancy technology while Honeywell is working with ion traps.

Eight of the top ten inventors in this area are evenly distributed across the top two companies, IBM, and D-Wave, and all of them are working on super-conducting loops. The final two top inventors come from Hewlett Packard and Microsoft, and are interested in diamond vacancies, and topological qubits respectively.

While D-Wave has been the traditional leader in this field, and still holds the highest number of patent families in qubit generation, IBM is in the midst of an enormous increase in patenting, and is projected to have the most publications by far in 2017.

Identified top companies in qubit generation including D-Wave, IBM, and Microsoft are prominently featured in the citation network associated with these patent families. Other key organizations based on the number of connections they make with others within the citation network include, HP, Northrup Grumman, University of California, WARF, Stanford, MIT, Yale, Hitachi, Toshiba, and Magiq.



www.patinformatics.com



Patinformatics, LLC®
Patent Landscape Reports