

## Some thoughts about the discovery of 'new knowledge'.

Although there is concern about complexity in the IPR system, some degree of difficulty is inevitable if we are to recognise intangible assets.

So why should we recognise intangible assets?

Because a knowledge economy depends upon insights and notions more than on artefacts and end-to-end effects.

In many fields of science, the ability to extract and acknowledge the discovery of 'new knowledge' is vital. Two illustrations are given below:

1. Climate change modelling is complex and controversial. Valid behaviours are essential in achieving consensus and provoking action. Let us assume that experiments can be automatically conducted on the basis of results from previous experiments. For instance if buoys in the Atlantic can sample temperature, salinity and current flow at various depths, then depending upon what is revealed from detected data, the buoys can automatically select promising patterns of exploration and data gathering. This 'freedom' of experimentation depends upon insights gained from the data collected. Suitable data-mining and discovery algorithms would need to be designed and implemented in order that such research patterns may ensue. The technologies involved are not easily patentable - mathematical algorithms, databases and software. But such a system would be a valuable and expensively won research asset. New knowledge can grow out of suitable monitoring and intelligent analysis of vast data sources. The ability to do this effectively is a valuable intellectual property for which there seems little prospect of protection.

2. Machine Learning systems that produce human-comprehensible hypotheses from data will increasingly be used for knowledge discovery within science. Ongoing developments in machine learning over the last five years have significantly increased the scope and power of machine learning. Three such developments in particular, have been pivotal, namely the widespread adoption of a Bayesian perspective, the use of graphical models to describe complex probabilistic models, and the development of fast and accurate deterministic techniques for approximate solution of inference and learning problems. These three areas of research will result in IP but almost by definition such innovative models and presentational interfaces are not eligible for patenting.

E.g., If research group A were to collaborate with software team B to implement research results (technologies) to explore and exploit vast databases for 'new knowledge', what would there be to stop the implementer from 'stealing' the algorithms and learning tools upon which the software implementation depended - they would after all become embedded in the code? If this occurred, the research group would be left without any reward for their efforts. It's not so much the ability to licence the 'new knowledge' that

is the issue, it is the need to finance research in maths and learning algorithms which will advance the field.

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