Philosophy in Artificial Intelligence

The big debate between empiricism and idealism

- David Hume - 18th Century Scottish philosopher & historian
  - attacked inductive reasoning and denied it’s logical admissibility
  - only empirically verifiable assertions are worth any value
  - everything else is “mere sophistry and illusion”
  - and “should be committed to flames” - religious texts (bible e.t.c)

- Immanuel Kant - 18th Century German philosopher and scholar
  - criticized Hume for being too empirical
  - said that Hume “awoke him from a dogmatic slumber”
  - our understanding of the world is not just based on experience
  - but also has foundations is a priori (before experience) concepts
Clarification of terms

**empirical** - something that can be measured or tested. Results produced as part of an experiment in chemistry, for example, are empirical results.

**a priori** - refers to knowledge that is obtained prior to experiment or experience. Tautologies are *a priori* statements are they are true before any experience.

**idealism** - the school of thought that suggests that ideas/thought make up a large part of how we experience reality.

**intrinsic** - something that is intrinsic is held within the object itself and cannot be separated from it, it is essential to the object.

**causation** – the idea that one event B is dependant upon the results of another event A, or that A's effects cause and effect on B.
Hume's thoughts on Induction

Strength Induction – all observed ducks are white, therefore all ducks are white

- although this statement may be false, we still have to prove otherwise i.e. disprove it

Weak Induction - I always eat with my left hand, therefore everyone eats with their left hand

- there is no reason to believe this link, it does not logically follow that because I use my left hand that everyone must as well. In this case we would need to prove the statement rather than disprove it

Hume gave a reason to use induction although he greatly criticized its use...
The Problem of Induction

* In our everyday experiences, our reasoning depends upon patterns of repeated events to allow us to interpret the world around us – inductive reasoning

* If we were thoroughly deductive in all aspects of life we would never be able to survive

* Imagine trying to prove that a loaf of bread would nourish us before we eat it

* We use induction to make common inferences about the world

* But Hume points out that there is no logical reason for believing in causation (that one event *causes* another)

* We are compelled to believe it due to the regularity and consistency of our perceptions
The belief in causation is external to logic, not implied by it.

Induction is founded on the persistence of regularities or the uniformity of nature.

But we cannot prove that nature is uniform from reason alone.

Basing a regularity on the fact that it has always operated in the past (using inductive reasoning) is arguing in a circle as inductive reasoning is the very thing we set out to prove.
Hume wrote about induction in his text “Enquiry into Human Understanding” (EHU) (chapters 2-3)

The thing that Hume failed to realise when he published his book was that he completely contradicted himself in the later chapters (9-10)

He asserted, in these later chapters, that the laws of nature were actually uniform and immutable, disallowing any event that claims to be miraculous

Surely if, as he asserted earlier, the laws of nature could change at any point because causation is a fallacious concept then a miracle could occur at any time?

Conclusion – Hume raised some interesting issues but failed to uphold them due to being inconsistent with his views. Along comes Kant to set things straight...
Kant's response to Hume

* Criticized Hume and empiricism as he claimed that our understanding of the world is not only based solely upon the experiences that we receive but also upon the knowledge that we gain *a priori* to experience.

* Kant asserted that we make two types of assertions about the world:
  * Analytic propositions - the predicate is contained in the subject
    “All bachelors are unmarried men”
  * Synthetic propositions - the predicate is not contained in the subject
    “All bachelors are happy”

* Analytic = true by nature
* Synthetic = true or false – the meaning transcends the content of the language used

* Before Kant, the general belief was that the only way to truly know a synthetic statement's validity was to verify it empirically.
Kant's views of synthetic (inductive) assertions

• Kant claimed that we can gain knowledge of the world around us independent of external experience

• Gave an example of mathematics – addition

• Once we know about the process of “addition” we do not need any empirical experience to verify that '8 + 4 = 12'

• So this statement must be analytically true?

• There is nothing in the numbers '8' and '4' that intrinsically hold any connection to '12', '8 + 4' also tells us something new about the world

• therefore, we have gained some new knowledge about the world
So, '8 + 4 = 12' is a statement that can be found *a priori* of experience but is synthetic in nature as it's predicate is not held in the subject.

“Intuitions without concepts are blind, concepts without intuitions are empty”

Without intuitively knowing about the values of numbers, the concept of addition is void.

Without knowing about addition, the intuition of the value of numbers are pointless.

Therefore theories like causality can be advocated as they can be verified *a priori* to experience even though it has a synthetic nature.

Here, Kant has shown that Hume was wrong to be such a strong empiricist.
Once Kant proved that synthetic statements could be verified without experience he went on to dissect human experience in general and tried to define how we can deduce the laws of nature from intuition.

Kant is now strongly followed, but in the field of AI many people agree that intelligent systems would need aspects of both empiricism and idealism.

Aaron Sloman has shown that a Kantian based system would acquire levels of understanding, using evolutionary techniques for learning.

A Humean system (like Bayesian nets) would ignore the deeper levels of causation and focus upon empirical data such as a probability net describing the connection between a disease and its symptoms.
Sources

David Hume's “Enquiry into Human Understanding” - 1748 – available from the library

http://tecolote.isi.edu/~wkerr/wonac/abstracts/sloman.html - Aaron's presentation on the understanding of causation

http://en.wikipedia.org/wiki/Kant - some useful information on Kant, although a bit summarised

http://www.gutenberg.org/etext/4280 - the site which Kant's “Critique of Pure Reason” and “Critique of Practical Reason” is available for free download