The "Machine Intelligence" series

Note by Donald Michie

(Prepared in response to a suggestion made at the recent York meeting of the new MI Board)

In every field of enquiry, propagation occurs primarily through the regular journal literature. In general this is well tuned to the dissemination of mainstream developments. Only rarely is separate provision available for radically new paradigms of thought or technique that, lying as they do outside what Thomas Kuhn has called "normal science", face a struggle to come into existence. Yet many of the latter have played major roles in AI's history, successively remoulding the landscape through which the mainstream has then found altered channels of flow. A disproportionate number gained early encouragement and consolidation through the *Machine Intelligence* series.

Identifying and fostering new departures demands a correspondingly radical editorial style. Paradigm−spotting in science is in spirit closer to maritime exploration than it is to the administration of the settled landfalls that follow. Atypically in human affairs boldness is all, both in new sightings and in immediate follow−up. With equal boldness, editorial leadership must select contributors and themes for each new Workshop on one single criterion: are they likely to engender the proliferation of influential novelty?

In this spirit the first Machine Intelligence Workshop was convened in 1965. That year had seen a potential revolution in mechanizable aids to reasoning. Thanks to the vigilance of the young Rod Burstall, it was instantly spotted and given prominence in this first volume, namely Robinson's resolution principle. The first Workshop's unsurpassed tutorial introduction by David Luckham, and subsequent contributions by Robinson and others to succeeding volumes, opened new doors to theorem proving, program validation, logic programming, and situation−action planning.

The following year saw another conspicuous innovation, namely the appearance of Hunt, Marin and Stone’s 1966 book *Experiments in Induction*. Although limited to propositional–level forms, the work demonstrated the feasibility of precisely the machine capability to learn concepts from data which Alan Turing had foreseen as essential in his 1951 proposal of learnable "indexes of experience", which Arthur Samuel had sought to capture in the "signature tables" of his 1960 paper, and to which the engineer–psychologist Richard Gregory had applied the metaphor of updateable "internal file cards" in this same first volume.

From the first, MI Workshop policy embraced whatever might arise of special timeliness in the cognitive science world. Yet somehow the following Workshops missed Hunt’s new demonstration entirely, directed as it was to a strictly Psychology readership. Only in the Eighth MI Workshop held in 1975 at Santa Cruz did rule–based inductive inference finally make its entry. Ironically, the AI community at large had been equally blind to rule–induction’s 1966 emergence. So ten years late, the *Machine Intelligence* series was still well placed to play a significant pioneering role.

A brief overview follows of the first volume’s Table of Contents.

Ian Scoins’ opening tutorial outlined the mathematics of graphs and trees. The object was to imbue the Workshop’s participants with the basics of what, along with Robinson’s resolution of first–order logic clauses, was foreseen as a prolific representational form for future work.

The papers constituting the remainder of the volume for the most part detailed the application of one or the other or both of the above two formalisms to proving properties of programs (Cooper), automatic theorem–proving (Popplestone), electrical network design (Burstall), game–playing (Elcock and Murray), problem–solving (Doran, Schofield, Michie), models of human word storage (Kiss), picture processing (Clowes), speech recognition (Hill), and the design of AI–oriented programming languages (Brooker and Rohl, Napper, Foster).

Additionally, a deeply thoughtful review by R.L. Gregory asked "Will seeing machines have illusions?" The 1965 audience must have started with the unspoken thought "Why would they?" By the end they would have switched to "If not, why not?" Anyone who in 2000 has not yet made this switch to what today’s cognitive neuroscientists take for granted could do worse than study Gregory’s 1965 essay.

To maintain the role and guiding aim of the MI series entails certain requirements. I propose the following.

- § AI's regular Journal supplies a distinguished venue for the community's "normal science" activities and sensitively discharges its primary duty of responsiveness to evolving readership demands.

- § Our own *Machine Intelligence* series has complementary springs of action that flow top–down rather than bottom–up. The unifying theme is machine *understanding,* with emphasis both on the *two–way* nature of understanding and on its *incremental* acquisition and broadening. According to this principle, machine partners in human intellectual endeavours should be capable of retaining and re–using (as human children do) a generalizable core that grows from one publishable exercise to the next. The model, then, is closer to the collective building of a communal asset (compare the genome project) than to the individual building of personal careers.

- § With the exception of students and staff of the host institution, traditionally free to attend, Workshops should continue to be invitation–only.

- § We should gladly accept Stephen's offer to make York the default venue. We should also remain ready and vigilant to respond opportunistically, if and when especially attractive inducements of variant venues come forward from time to time.

- § We should invite each contributor for the qualities of his or her own work, not as a spokesman for whatever group or relationship carries titular responsibility.

- § We should never forget that our duty is to the next generation, and not to the last.

Let us take risks freely, back hunches with confidence, and be impervious to dismay over misfires. In creative editorship we can't win them all. But without look–outs and navigators there is much in the exploratory young field of Machine Intelligence that will not be won at all. A special commitment to scan the far horizons has been accepted by Koichi Furukawa, International Secretary to our reconstituted Board. The relaunch under ETAI's flag through Erik Sandewall's good offices and his hoped–for participation promises a conspicuous and durable future.