Editor’s comment: On the list as a literary form

Nicholas Findler sent this in and I can’t resist adding a note on the venerable literary genre of the list. Rabelais, Borges, Nabokov (among others) have created famous lists, and Nabokov has set out some of the requirements of the form — chiefly that the relation between one item and the next be surprising, even puzzling. It is in this that the genius of a really good list is to be found.

Findler’s list has a hallucinatory fractal quality. Every item has another list within it, unexplained — what is the story of the doctor, the missionary, and the computer scientist? — an infinite Borgesian shop of cakes all full of nuts, fruit, mysterious bits…

On artificial intelligence

I started work in Artificial Intelligence (AI) in Australia in 1957, without knowing what had been done in AI before (not much really…). In the fifty years since, AI has become a diverse area of research activity, intersecting many disciplines from biology and psychology to engineering. Dozens of books and hundreds of refereed journal articles appear every year. Practically every university offers courses on AI-related subjects at the undergraduate and graduate levels. International and national conferences are organized on topics related to AI and its subareas.

The history of AI is not without controversy and opposing views, as is any endeavor which seems to some to duplicate our humanity in a machine or which interprets human activity as the result of machine-like processes. Witness the current arguments over cognitive psychology or, from the early years of AI, the threat of a poetry-writing computer. This now seems laughable, and publications that oppose AI on philosophical or scientific ground no longer appear in the scientific literature.

The basic objective of AI (also called heuristic programming, machine intelligence, or the simulation of cognitive behavior) is to
enable computers to perform such intellectual tasks as decision making, problem solving, perception, understanding human communication (in any language, and translate among them), and the like. Proof of this objective is the blind test suggested by Alan Turing in the 1930s: if an observer who cannot see the actors (computer and human) cannot tell the difference between them, the objective is satisfied.

The present-day pervasiveness of AI, given how little it is noticed in everyday life, suggests that in important ways this objective has been reached. We find the notion of a refrigerator which calls in its own grocery orders a bit funny — one thinks of cartoon parrots who order pizzas — but it may surprise people to know just how much we have come to rely on this sort of intelligence which we no longer bother to label as artificial. The following list is drawn from my own past projects in the field of AI. It is incomplete — I have not worked in several important subdomains — but nevertheless suggestive.

**Game playing**

Vast. The first AI was a computer game. I worked on such a game 'Dama' myself. Within just the game of poker, I have researched:
- Computer models of gambling and bluffing.
- Gambling machines.
- Poker studies: decision making, machine cognition, inductive discovery processes leading to a heuristic poker program.
- New objectives for game playing programs.

**Problem solving**

Cryptanalysis on computers.
- Machine learning from noisy information.
- Human decision making under uncertainty and risk.
- Computer based experiments and a heuristic simulation program.
- Human learning versus machine learning.
- A machine that generates and optimizes its strategy.
- Computer models of the learning process.
- Computer simulation of highly organized mental activities.
Computer studies of perception.
A computer program that generates and queries kinship structures.
The story of the doctor, the missionary, and the computer scientist.
Computer simulation of a demographical and kinship model.
Some new approaches to machine learning.
A universal word puzzle solver.
On problems of time, retrieval of temporal relations, causality and co-existence.
A computerized self-teaching matchmaker.
Some ideas about the solution of cryptarithmetic puzzles.
Reasoning by analogy in problem solving.
On a sufficient cognitive structure for competitive robots.
Discovery processes in analogical reasoning.
Analogical reasoning in problem solving.
Analogical reasoning in design processes.
Distributed planning and problem solving systems.
On a computer-based theory of strategies.
Automatic analysis and synthesis of strategies.
Distributed knowledge-based systems in manufacturing.
An approach to supplementing simulation models with knowledge-based planning systems.
Some techniques of reducing the dangers of combinatorial explosion in automatic knowledge acquisition.

Decision making

An information processing theory of human decision making under uncertainty and risk
Studies on the behavior of an organism in a hostile environment
A learning robot system
The complexity of decision trees, the Quasi-Optimizer, and the power of heuristic rules
A pruning algorithm for finding all optimal decision graphs
A system to analyze and optimize decision making strategies
On the comparison of five heuristic optimization techniques of a certain class of decision trees
A decision support system for automatic rule discovery in anthropology
Analogical reasoning by intelligent robots
A note on computing the asymptotic form of a limited sequence of decision trees
Representing causal knowledge
On the concept of causality and a causal modelling system for scientific and engineering domains
A methodology for modeling coordination in intelligent agent societies
An empirical approach to a Theory of Coordination
A heuristic information retrieval system based on associative networks.

**Machine learning**

Computer simulation of a self-preserving and learning organism
An automatic program writing system that can repair itself
On a sufficient cognitive structure for competitive robots
Some effective models of computer learning
Two approaches to automatic knowledge acquisition
Machine learning — Why do we need it?
Distributed control of collaborating and learning expert systems
Dimensions of learning in a real-time knowledge-based control system
Design of an interactive environment to study the behavior of several robots which can learn, plan their actions, and co-exist
Aspects of computer learning
Teaching strategies to an Advice Taker/Inquirer system
On automating computer model construction
A multi-level learning technique using production systems
Analogical reasoning by intelligent robots
A pattern search technique for the optimization module of a morph-fitting package.
Traffic control

The role of strategies in Air Traffic Control
An examination of distributed planning in the world of air traffic control
A general-purpose man-machine environment with special reference to air traffic control
Air traffic control: A challenge for AI
A distributed artificial intelligence approach to air traffic control
A predictive man-machine environment for training and evaluating air traffic control operators
An examination of distributed planning in the world of air traffic control
Some Ideas about Future Air Traffic Control Systems — Theoretical and Experimental Investigations in a Simulated Environment
A distributed approach to optimized control of street traffic signals
Distributed control of street traffic signals by real-time, collaborating and learning expert systems
A knowledge-based approach to urban traffic control
A semi-autonomous decentralized system for controlling street traffic signals
A note concerning on-line decisions about permitted/protected left-turn phases
Harmonization for omni-directional progression in urban traffic control
Knowledge-based approach to urban traffic control
Application-oriented distributed, real-time systems.

Linguistics, psychology, and the humanities

Some conjectures in Computational Linguistics
On a heuristic search strategy in long-term memory networks
A few steps toward Computer Lexicometry
MARSHA, the daughter of ELIZA — A simple program for information retrieval in natural language
An excursion into Social and Cultural Anthropology by Artificial Intelligence — an automated discovery system to identify rules for inheritance, succession, marriage, injunction against incest and exogamy

Memory-based hypothesis formation: Heuristic learning of commonsense causal relations from text

Automatic rule discovery for field work in Anthropology

Alliances and social norms in societies of heterogeneous, interacting agents

A system for human-like retrieval of legal information and facts

An explanatory mechanism for déjà vu and related psychological phenomena

A model-based theory for déjà vu and related psychological phenomena

The role of exact and non-exact associative memories in human and machine information processing

Studies on the behavior of an organism in a hostile environment

An Artificial Intelligence Technique for Information Retrieval

An Application in Medical Knowledge Processing

An automatic knowledge acquisition tool

Kinship structures revisited

On an approach to the automatic evaluation of the subjects' behavior in Roemer's Inkblot Test

On the automatic verification and validation of models

SHRIF, a general-purpose system for heuristic retrieval of information and facts, applied to medical knowledge processing

Social structures and the problem of coordination in intelligent agent societies.

**Miscellaneous applied areas**

Sufficiency investigations in robotology — An example in Applied Cognitive Science

Pattern recognition and generalized production systems in strategy development

Implications of Artificial Intelligence for Information Retrieval
Morph-fitting — An effective technique of approximation
An expert subsystem based on generalized production rules
A module to estimate numerical values of hidden variables for expert systems
A note on the functional estimation of values of hidden variables — An extended module for expert systems
On automatic generation of descriptive and normative theories
A heuristic approach to optimum experimental design
A conceptual framework and a heuristic program for the credit-assignment problem
Two theoretical issues concerning expert systems
A balanced view of Expert Systems
Distributed knowledge-based systems in manufacturing
Distributed planning control for manufacturing
Perceiving and planning before acting — an approach to enhance global network coherence
A model of law enforcement activities of the United States Coast Guard
Multi-agent planning and collaboration in dynamic resource allocation
Distributed goal-oriented dynamic plan revision
Multi-agent collaboration in time-constrained domains
Agent modelling in distributed intelligent systems
Models of and experiments with e-markets for electric utilities
The Automatic Generation of Empirically-Based Theories of Coordination in Multi-Agent Systems.