**Artificial Intelligence in Medicine**

by

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in

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 Prof. Gino Crispieri

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 Date

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**ABSTRACT**

The report explains about the use of Artificial Intelligence in Medicine. AIM has progressed since 1970 in medicine to help the people out. The different strategies and ways of improvising the medical technologies. Majorly it would explain how AI is used in curing different diseases.

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# Introduction

Artificial Intelligence is the science and engineering of making intelligent machines programs. This intelligent program is basically a mimic of the human brain. It has been in use in various fields such as : Medical Diagnosis, Stock Trading, Robot control,Law,Remote Sensing etc. This paper would deal with the use of the technical brain in the field of medicine in improvising the fields and perceiving it in a better way.

## Motivation

The main purpose of applying Artificial Intelligence in Medicine is that the Doctors can make decision without consulting the Specialist. This would make to simpler and more efficient to provide service to the patients and increase the curability rate which sometimes becomes a necessity in uncertainty. Artificial Intelligence helps in reasoning, making decisions and learning to minimize the work in best possible way.

## Existing Scenario And Future Prospects

Artificial Intelligence is considered to be one of the domains which give ideas for improvement and growth. Practically this would happen only when there is development of integrated environments which allows merging of knowledge based tools. Mainly understanding in medical field is required more which needs to be taken care.

Future work should be related to socio-cognitive context which is a salient feature to understand the human beings. Human errors and risk analysis for a design of safe system for medical field. Improvement in biomedical Informatics as well research would lead to a great success in medical field.

# What is AIM?

Study to emulate human intelligence into computer technology is AIM(Artificial Intelligence in Medicine). In 1970 the AIM was started when the AI was 15 years old.

## Introduction

AI in Medicine (AIM) is AI specialized to medical applications. Although there are human- like reasoning methods in the programs written, choice can be as a commitment to a human/computer equivalence sought by some or as a good engineering technique for capturing the best-understood source of existing expertise on medicine--the practice of human experts. Most researchers go with the second point mention above.

The understanding of functioning in health and in disease of the human body is required by an individual to know the expertise which can be applied to improvise the condition of a patient in hand in the fastest possible way by taking a model for practice purposes.

Further, one could try out possible therapies on the model to select the optimum one to use on the patient.. The AIM methodology does not reject the use of non-human modes of expertise in the computer. Computations of probabilities and solutions of simple differential equations—tasks can be performed without special training--play a role in some of the programs. The techniques used in this program mimics those used by our clinician informants.

The knowledge of human experts to build expert computer programs is actually helpful for several reasons like: Decisions and recommendations of a program can be explained to the users and evaluators in terms which are familiar to the experts. Secondly, because we hope to duplicate the expertise of human specialists, we can measure the extent to which our goal is achieved by a direct comparison of the program's behavior to that of the experts. Lastly, within the collaborative group of computer scientists and physicians engaged in AIM research, basing the logic of the programs on human models supports each of the three somewhat disparate goals that the researchers may hold:

* To develop expert computer programs for clinical use, making possible the inexpensive dissemination of the best medical expertise to geographical regions where that expertise is lacking, and making consultation help available to non-specialists who are not within easy reach of expert human consultants.
* To formalize medical expertise, to enable physicians to understand better what they know and td give them a systematic structure for teaching their expertise to medical students.
* To test AI theories in a "real world" domain and to use that domain to suggest novel problems for further AI research.

## History

AIM was not the first use of computers in medicine. Many Administrative and Financial record keeping needs of the hospital, health center, and other small group medical practice has been switched to computer systems. Use of computers differs from similar applications to a wide range of businesses, and few technical developments have been motivated specifically by medical use of what could be called **"business computing."** Obviously, such use will continue to benefit from the increasing performance of general business-oriented systems; just as computer suppliers now aim for the small retail store as a possible market, they also envision the computerization of even individual doctors' offices, providing billing, scheduling, forms preparation, word processing, and other services.

It appears unlikely, however, that such business uses of computing in medical applications will fulfill the promise to "reshape" medicine.

The kinds of decisions and the ways which they are made are influenced by computers over the last fifteen years. It is believed that this can be traced in large part to the lack of proper perspective on the problems involved in augmenting the decision-making ability of management. Similarly, much of the business computing in medicine impacts only on the periphery of the physician's task.

Currently much smaller use of computers in medicine is their application to the substance rather than the form of health care. If Computer is a useful manager of billing records, it should also maintain medical records, laboratory data, data from clinical trials, etc. Three main approaches to this second type of medical computing have so far been used: the clinical algorithm or flowchart. the matching of cases to large data bases of previous cases, and applications of decision theory. Each of these has had notable successes, but also a more limited applicability than its developers had hoped. All contribute to the development of the AI approaches described here.

|  |  |
| --- | --- |
| YEAR | Achievements |
| 1970 | Application of AI in life sciences(Dendral Experiments) |
| 1978 | Leading Journal in the field devoted to AI M research papers. |
| 1980 | HELP System |
| 1988 | PUFF System |
| 1993 | GermWatcher |

Table 1 Progress of AIM through the years

In 1970 AI was applied in life science which was done by DENDRAL group applying AI to problems of the analysis of the mass spectra of organic molecules and the induction of new rules of mass spectral fragmentation. It involves chemistry and mass spectrometry.

In 1980 HELP system came into picture which is a knowledge based hospital information system. Not only does it support all the routine applications of the HIS but it also provides decision support function. This provides clinicians with alerts, reminders, data interpretation and patient diagnosis facilities, patient management suggestions and clinical protocols.

In 1988 **PUFF** system was for automatic interpretation of pulmonary function tests has been sold in its commercial form to hundreds of sites worldwide. It went into production at Presbyterian Medical Center in San Francisco in 1977, It is one of the very earliest medical expert system in use.

In 1993 **GermWatcher** came into picture which checks for hospital acquired infections

which represent a significant cause of prolonged inpatient days and additional hospital charges

## Decision Making Techniques

**Decision theory** is a mathematical theory of decision making under uncertainty. It assumes that one can quantify a priori and conditional likelihoods of existing states and their manifestations which can similarly determine an evaluation of all contemplated outcomes.

From the given data, decision theory offers a normative, *rational* theory of optimal decision making which is urged by its practitioners as an effective technique for structuring medical decision making problems . Although there is evidence that most human decision makers not specifically trained in decision analysis deviate from this model in their decision making activities , the theory is nevertheless appealing as a norm for helping to make explicit the bases of decision making and any existing disagreements among decision makers. Numerous computer programs for decision making in small domains of medicine have employed the decision theoretic formalism.

The chief disadvantages of the decision theoretic approach are the difficulties of obtaining reasonable estimates of probabilities and utilities for a particular analysis. Although techniques such as sensitivity analysis help greatly to indicate which potential inaccuracies are unimportant, the lack of adequate data often forces artificial simplifications of the problem and lowers confidence in the outcome of the analysis. Attempts to extend these techniques to large medical domains in which multiple disorders may occur, temporal progressions of findings can offer important diagnostic clues, or partial effects of therapy can be used to guide further diagnostic reasoning, have not been successful.

The typical language of probability and utility theory is not rich enough to discuss such issues, and its extension within the original spirit leads to untenably large decision problems. For example, one could handle the problem of multiple disorders by considering all possible subsets of the primitive disorders as mutually competing hypotheses. The number of a priori and conditional probabilities required for such an analysis is, however, exponentially larger than that needed for the original problem, and that is unacceptable.

## Areas of Interest

Robotic science has always been a basis for Hollywood entertainment, Sci-Fi novels and childhood fantasies. Artificial intelligence isn’t a new concept, and while the technology hasn’t advanced to Spielbergian expectations, AI is being used to transform manufacturing, education, business, and even the health care industry. The Areas of Interest in medicine are as follows:

## Reduced Mortality Rate

Artificial Intelligence gives the computer to learn , think, reason and understand human emotions. AI assists doctors and to reduce the mortality rate among patients awaiting care from specialists.

## Fast And Accurate Diagnosis

With respect to Artificial Intelligence the neural network of the brain is successfully imitated, even including the ability to learn from past cases. Studies on artificial neural network show that they are able to accurately diagnose some diseases which includes malignant melanoma, eye problems, and many forms of cancer by analyzing spectral information and diagnostic criteria.

## Therapeutic Robots

The Therapeutic Animal Robots have been developed to help patients suffering from Alzheimer. The Robotic pets help nurture brain function by delayed cognitive problems that in turn improves quality of life and reduces the reliance on social services. This allows the patient to stay longer at home with less Medical Assistance.

## Movement Assistance

The Medical community is still struggling to satisfy the needs of patients. The hospital would want to turn to robots so that they can outsource their workforce for help such as pharmacy operations and pill dispensing. The Hybrid Assistive Limb (HAL 5) has been designed to overcome mobility challenges and can double the amount of weight someone can carry making it a potentially valuable tool for health care Professionals.

## Minimally inasive surgery advances

The Da Vinci Si HD Surgical System has made major development in Surgical Robots. The system provides doctors superior visualization ,precision and comfort. These robots deliver smaller incisions, reduce patient pain, minimize the need for medication and shorten hospital stays. This in general reduces costs.

## improved radiology

The robotic radiosurgery systems like CyberKnife offer a non-invasive alternative in treating begnin and malignant tumors present anywhere within a body. They use image guided technology and computer controlled mobility to detect and remove tumor and help in movement of the body throughout the treatment process. Provides the correct amount of radiation without affecting the tissues surrounding the affected area.

## virtual presence

A remote presence robot, doctors are able to engage with patients and staff without actually being there. They move around as effective as if they are present. This helps specialist assist patients who cannot travel to see a doctor in some scenarios.

# Use Of AI In Diseases

The following figure shows the hardware specification of the workstation used for running the testing tools.

## Thyroid Diagnosis

## Material and Technique

## Design and Evaluation

## Artificial Neural Network

## LDA

## Expiremts And Analysis

Add important information. Figures and lists. Make sure the figures are inserted captions. Add in the paragraph these figures are cross-referenced.

# More more Body Text

Include as many sections as needed.

## Subsection of More More Main Body

Add important information. Figures and lists. Make sure the figures are inserted captions. Add in the paragraph these figures are cross-referenced.

# Conclusion

Here is where you describe what you learned and what you are reporting as lessons learned or summary of your studies. Make it brief but something that is significant or important to the reader highlighting the good, the bad or what need to left to be completed in the future.

# Glossary

**Regression Testing** - Retesting of a program following modifications to ensure the changes do not introduce faults as result of the changes.

**End-to-End Testing** - Test the end-to-end flows.  This testing focuses on mimicking real life scenarios and usage. End to end testing involves testing information flow across applications.  For example, from order creation until item return and checking.

**Functional Testing** - Functional testing focuses on testing software against design document(s), Use Cases and requirements document(s).

**Fuzz Testing** - Fuzz testing is a software testing technique that involves testing with unexpected or random inputs. The software monitored for failures or error messages due to input errors.

**Happy Path Testing** - Also known as Golden path testing, this type of testing focuses on selective execution of tests that do not exercise the software for negative or error conditions.

**Negative Testing** Negative tests are tests constructed to show error conditions from the product under test.

**Integration Testing -** Integration testing verifies the connectivity, compatibility, and function across the components of an application.

**System Testing** - System testing includes multiple software testing types that validate the built as a whole against the requirements. Complete system testing includes different types of tests (GUI testing, Functional testing, Regression testing, Smoke testing, etc.).

**User Acceptance** – Clients and users of the software perform the user acceptance test. User acceptance testing allows SMEs (Subject Matter Experts) to test the software with their actual business or real-world scenarios to check if the software meets their business requirements.

# Bibliography

Include all your resources.

Use proper formatting for references.