Artificial Intelligence innovations in a small medical practice: perspectives and obstacles

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Context

AI (Artificial Intelligence) in medicine is one of the most promising, but at the same time, one of the most difficult issue. Diagnostics, automatization, robotization, treatment plans and biopharmaceuticals are the main areas of the medical field where AI has already become reality.

One clinic consists not only of medical personnel, but it is a complex organizational ecosystem that includes management system, marketing, advertising, accounting and finance, etc. The use of AI pursues, first of all, the reduction of health care costs.

But there are some questions: how much clinics are ready to use or are already using AI technologies in their practice; what are the obstacles to wider application of existing innovations.

Aim

- Analyze the factors and economic effect of Artificial Intelligence use at an orthopedic clinic, which specializes in outpatient treatment of patients (a specialized private medical center (European Center for Orthopedics and Pain Therapy) in Moscow, Russia).
- Analyze and consider the prospects and obstacles of AI application for the economic growth of the medical organization

Methods

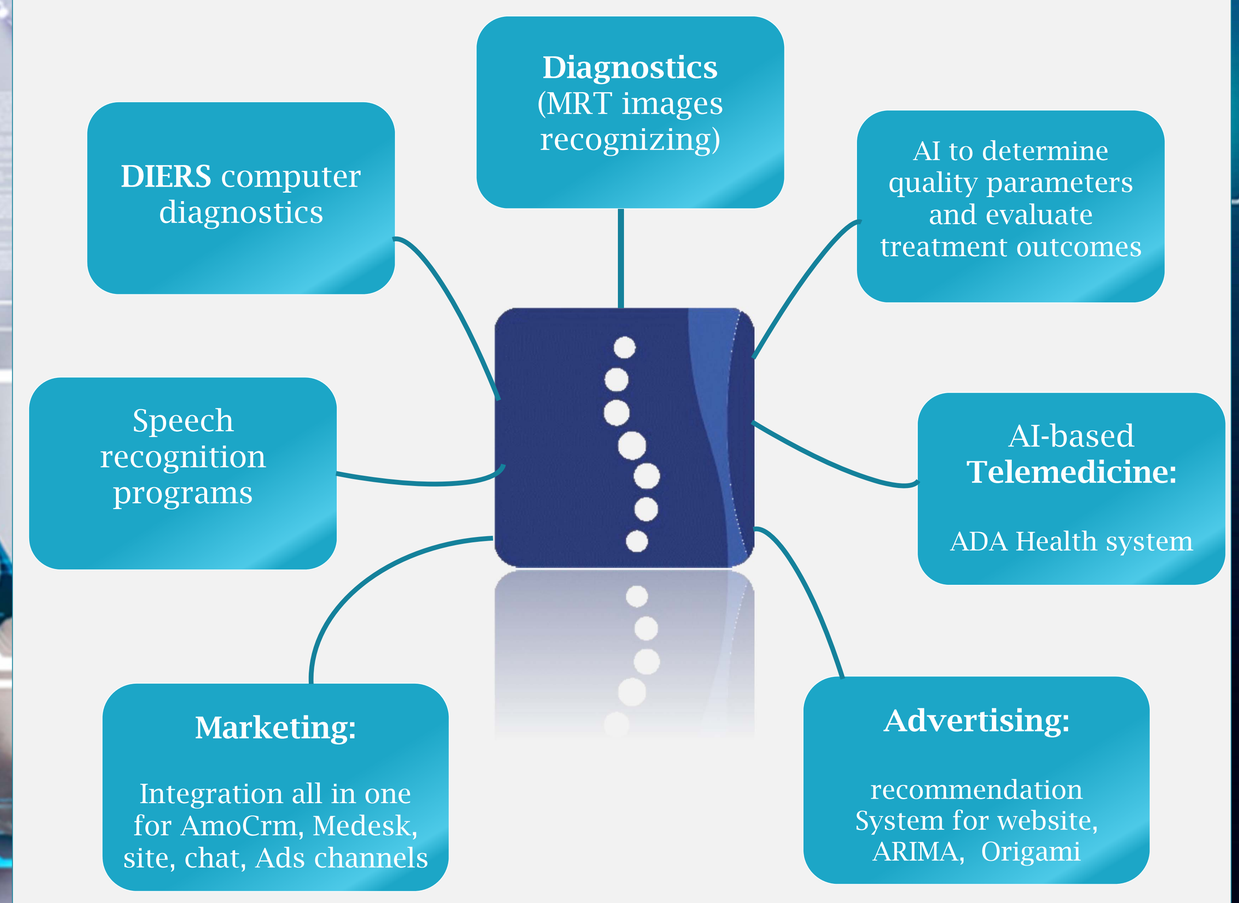
- **Analyses:** in order to better understand the processes associated with AI introduction into real practice, the activities of an orthopedic clinic in Moscow (Russia) were analyzed.
- **Monitoring and observation:** an analysis was done on the basis of monitoring the processes established in its activities. Examples of changes in business processes and possible alterations of the economic changes and growth after the introduction of a number of the AI-based technologies and applications were considered.
- **Survey:** In order to establish an involvement of the clinic employees in the process of introducing AI in their work and to acquire their opinion on the benefits of AI using, a survey was conducted.
- **Deep learning algorithms:** a deep study of the technological charts and standardization in orthopedics for the high-quality operation of the system for assessment of the medical services quality.

Discussion

AI is one of the most promising factors for the health care development, both from the point of view of medicine itself and in the field of management of a medical institution and marketing strategies.

In a small clinic, it is important to have a clear understanding of how much cost and speed, as well as the ability to adapt its functionality for a specific task will be necessary before technologies or robotics with AI are introduced.

AI in a Private clinic EMA in Moscow. Technologies



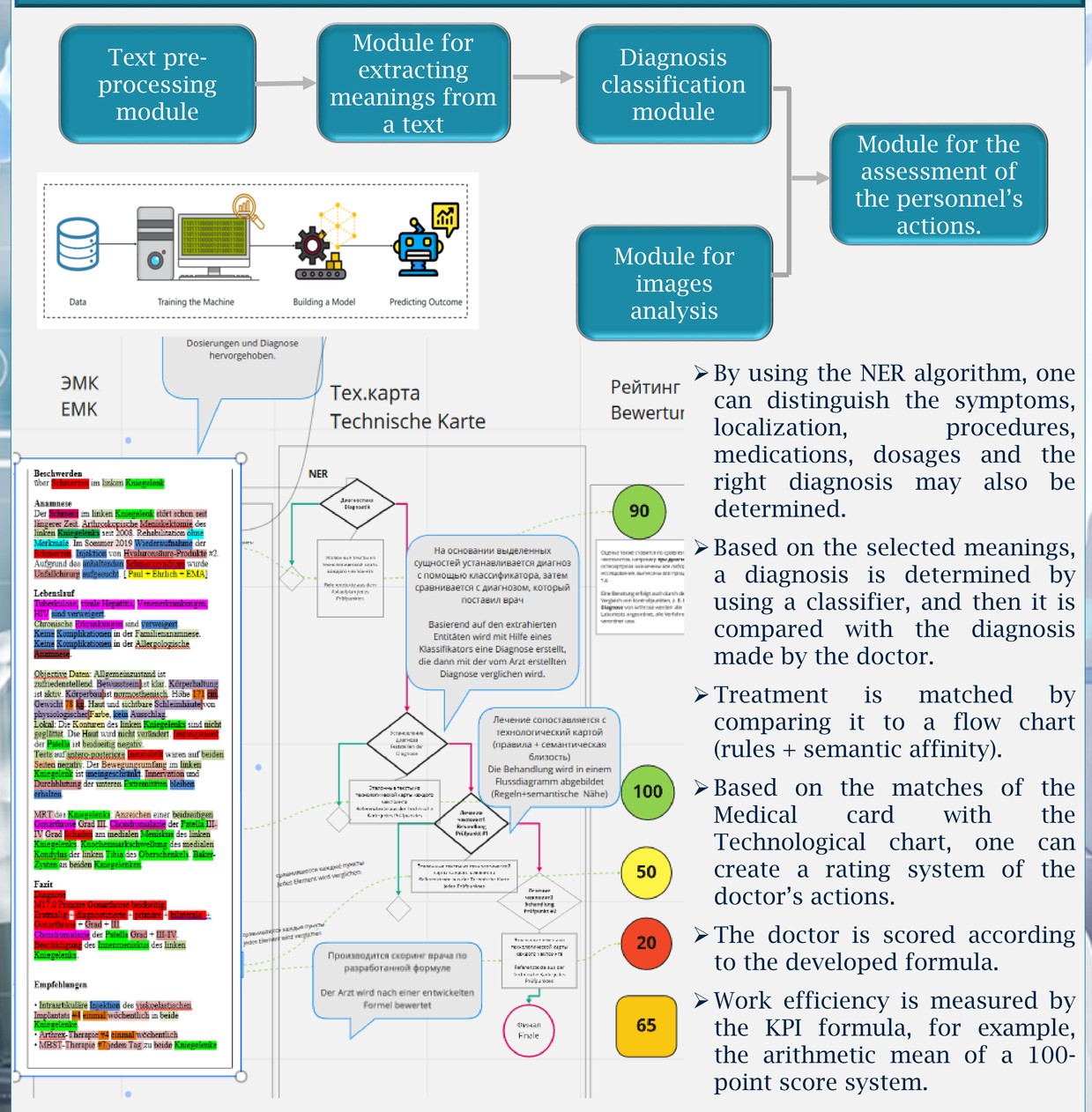
Purpose

Development and implementation of an intelligent system for assessment of the medical services quality:

by analyzing the correctness of prescriptions that are made by doctors and monitoring of the progress of patients' condition based on the medical reports, analyzes, MRI results and computer diagnostics by using machine learning.

System elements	Tasks / Functions	Approach
Module for text analysis	1. Processing of the named meanings 2. Classification of the identified symptoms	1. Intelligent parsing of documents 2. Neural network methods for the data analysis 3. Approaches for the machine learning
Module for images analysis	Analysis of the MRI pictures (such as the degree of the spine curvature)	Neural network approaches, basic computer vision (for example, using the OpenCV library)
Decision making system	1. Decisions analysis in real time; 2. Recommendation for solutions; 3. Retrospective review of the made decisions	Machine learning methods (e.g. decision trees)

Product Architecture



- By using the NER algorithm, one can distinguish the symptoms, localization, procedures, medications, dosages and the right diagnosis may also be determined.
- Based on the selected meanings, a diagnosis is determined by using a classifier, and then it is compared with the diagnosis made by the doctor.
- Treatment is matched by comparing it to a flow chart (rules + semantic affinity).
- Based on the matches of the Medical card with the Technological chart, one can create a rating system of the doctor's actions.
- The doctor is scored according to the developed formula.
- Work efficiency is measured by the KPI formula, for example, the arithmetic mean of a 100-point score system.

Advantages

1. The effectiveness of the activities of professional healthcare providers increases.
2. A reduction of costs for the patients (when the patient pays for the treatment) or the health care system as a whole (when the state pays for treatment).
3. The use of the Artificial Intelligence-based program Origami resulted in a reduction in advertising costs and an increase in the number of applications / patient flow.
4. Reasonable and thoughtful implementation as well as the use of AI can reduce personnel costs.
5. Reduction of the medical errors at the stages: diagnosis, choice of treatment recommendation, result;
6. Increasing the speed of medical decision making;
7. Increasing the output of the diagnostic department of the clinic;
8. A reduction of the time and cost for checking the performance of each doctor that he/she makes for each patient: speed, objectivity, clear indications for evaluating the result.

Disadvantages

1. Insufficient level of technical equipment in the clinic.
2. Rather weak computer literacy of staff.
3. Diversity of specific processes and tasks to be solved by AI, high development and implementation costs.
4. Doctors do not believe that AI could help in their work (according to the survey.
5. The most important factor, which is especially severe for doctors and administrators who work directly with patients, is compliance with the Personal Data Law.
6. There are problems with AI using: bias, black box, loss of human jobs, ethical issues, etc.

Results

The main goal for any (private) clinic is leadership via cost savings. The use of technologies based on AI makes it possible to save on expensive labor of doctors and specialists, as well as improve the work of the call center and save on advertising by optimizing campaigns using AI.

There are many obstacles of using AI in the activities of a clinic, but AI is developing with an amazing speed and will become an indispensable tool in healthcare.

AI will allow **objectively** evaluating the work of a doctor, establishing and preventing unnecessary costs (both for clinics and for patients), it will allow saving time.

Quality indicators become traceable, and the results are correlated with the medical standards and innovations in the treatment of certain diagnoses, which solves the issue of assessing the doctor's work and paying for the result.

References

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