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ARTIFICIAL INTELLIGENCE PROGRAM
APPLICATION PROJECT - I
ARTIFICIAL INTELLIGENCE IN EDUCATION
STRATEGIC TRANSFORMATION AND ECOSYSTEM

"Natural Language Processing and Education" Artificial Intelligence Workshop - 3
FINAL REPORT

"Natural Language Processing and Education" titled Artificial Intelligence in Education Workshop - 3 was held by the Education, Industry and Technology Institute (ESTEN) on February 8, 2019 at KWORKS - Koç University Entrepreneurship Research Center in İstanbul.

In the moderation of Dr. Sevinç TUNALI, the workshop was held with the aim of to evaluate the developments in "Natural Language Processing" to discuss areas that have the potential to be used in education sector. In the workshop, presentation on "Natural Language Processing" was made by Başak BULUZ and the presentation on "Assessment and Evaluation in Education - Assessment of Open-Ended Exams" by Bengi BİRGİLİ.

The speed of development in intelligent systems in the digital era has increased the studies on language. Starting from Linguistics, these studies begin with an examination of the structure (grammar, phonetics, syntax, content integrity, etc.) of the language (Turkish, English, etc.). Subsequently, Computational Linguistics[1] (Statistical Natural Language Processing), turning the language into mathematical statements by subjecting the information obtained from linguistics to statistical analyzes. In Natural Language Processing, the information obtained from Linguistics and Computational Linguistics is used to enable computers to perform linguistic operations in a more humanoid (imitating a human) way through machine learning. Natural Language Processing (NLP) has started to be used in many different fields such as Sentiment Analysis, Answering a Question, Information Retrieval, Machine Translation, Text Summarization, Text Classification.

When examining, "intelligent" language approaches used in educational environments, it should be to consider two different perspectives: "learning" and "teaching". In the perspective of "Learning", it is necessary to examine the practices aimed at people who are with the aim of learning something and at the point of "Teaching", for the purpose of teach something, it is

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[1] An interdisciplinary field concerned with the statistical or rule-based modeling of natural language from a computational perspective.

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necessary to examine the practices aimed at increasing the level of effective and comprehensibleness and often assisting the educator.

Nowadays, online education platforms, synchronous and asynchronous e-learning systems and distance education programs are extensively encountered. Each of these environments is a system that requires communication with the student, mostly through texts, by way of an intermediary virtual environment.

At this point, there is also a need arises which is evaluate the texts that we encounter as a means of communication. Automatic detection of inappropriate and/or profanity sharing in the texts shared by individuals for the purpose of communicating in educational environments called "virtual classrooms" on these related platforms and preventing the sabotage of the educational environment is one of the examples of Natural Language Processing applications. When evaluated with a wider perspective, substantial inferences such as, analysis of the student profile and the level of interest of the participants to the course by monitoring for a certain period of time the textual sharing of these participants whose physical behavior is not examined, determination of the potential to exhibit anomalous behavior to disrupt the environment can be made by Natural Language Processing methods. In addition, situations that make learning level difficult and slowing down such as dyslexia and attention deficit can also be detected automatically by long-term monitoring of the misspellings that people frequently make.

Especially in foreign language education, reading comprehension and exercises to express thoughts in writing with different sentences are often applied to people. These exercises enable the assessment of many metrics such as individuals' vocabulary breadth, the level of grammar, the ability to make correct sentences, and the determining whether the text is correctly comprehended. Educators' determination of this information from the texts written by the students, a challenging process bring along with. Yet, with the Natural Language Processing methods, processes such as semantic similarity between the two texts, synonym identification, related word analysis, grammatical errors detection can be performed easily and with high performance.

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This situation makes it possible to automatically evaluate and grade the written texts adhere to certain criteria. Automatic Spell Check applications such as "Grammarly" and "The Writing Mentor by ETS", can perform processes such as find grammatical errors in the written texts and suggest synonyms.

It is possible to say that in our world where 2.5 exabytes of data - for easier understanding; it is up to about 250 thousand US Library of Congress - are produced every day, it is very difficult to do research on any subject. While determining which of the millions of sources in digital environments is reliable is an issue of itself, bringing together the information obtained from all sources is a process that is almost impossible. Especially in the digital era, where technology is developing at an incomprehensible speed, being able to follow the developments can be a source of stress for educators who striving to transfer the most up-to-date information to the students. Produced to minimize these problems, Text Summarization enables you to access summary information about a topic within seconds by using software, only keywords, various optional date filters, and which resources to use. One of the significant points here is that the semantically close ones of the data in the sources are brought together in a certain order and presented to the end-user.

In order to reinforce what is learned in educational environments and develop power of creative thinking, assignments are often given to students by educators. While these tasks sometimes require researching a topic and bringing together a lot of information from different sources, as well as they can sometimes be a role in developing one's creativity too. It is a very easy and preferred method for students to gather information from digital sources that sometimes secure and often insecure, especially for assignments that require different sources to be scanned. At this point, control mechanisms such as identifying the source from which the information is obtained (detection of plagiarism) and Natural Language Processing applications that help educators have been developed.

Following the topics teaches to the students during the semester, many students' nightmare; exams step in to determine how much is learned by the students. Exam periods are seen as stressful for students as well as a very exhausting process for educators. Question-making and Question-answering Software that accepts the course notes in texts as input, comes to the aid of the educators. There are, for sure, solutions to help the students who get lost in hundreds of pages of textbooks and lecture notes during the exam period. At this point, Natural Language

Processing applications, which successfully perform the Text Summarization task, are become available to service.

While the control mechanisms that help the educators develop, systems that ease the work of the students continue to develop rapidly on the other hand. While Natural Language Processing eases human life in many subjects, it can gateway to the come about of practices that provide ease to students in the field of education, but which in reality have negative effects in developing learning skills. For example, automated Article/Notice Writing applications that require only keywords to be submitted are already in use, and even notices created with these systems are accepted at international congresses! On the other hand, Machine Translation is yet another application that provides great ease especially in the translation of international education resources into the native language and it has shown great technical progress in recent years. However, on the long term, there is also the possibility that people may weaken their ability to form sentences and express themselves in a foreign language.

With Natural Language Processing, in addition to applications such as Answering a Question, Information Retrieval, Machine Translation, Text Summarization, Text Classification, different sectors can develop new applications according to their needs. For example, Banks carry out many banking transactions of their depositors through "Digital Assistants". In the education sector, digital assistants are used to meet the learning needs of a subject; it simulates interaction with the teacher and personalizes learning by providing learner - teacher communication. For example, while "My Science Tutor" developed by Boulder Language Technology helps students in science lessons, applications like "Alphary by Alphary GmbH" are used in foreign language learning.

One of the uses of Natural Language Processing in education is the evaluation of open-ended exams. Open-ended exams can be prepared in the form of essay or question-answer that students form according to their own answering style. This method is considered more challenging by students as it requires higher-order thinking skills than multiple-choice questions or gap-filling questions. The extent of multiple-choice exams is broad, objective scoring can be done, it has high reliability and easy to evaluate. But it does not reflect the learner's perspective and the world of ideas. These questions cause increase the number of students who focus only on a certain point and cannot see the other extent of the fact (Berberoğlu ve İş-Güzel, 2013). The extent of open-ended exams is limited but useful for evaluating productive skills. The scoring of these questions depends on the evaluator (subjective) and therefore its reliability is

low. For educators, it is difficult to evaluate the open-ended exams, and for students, it often seems difficult to answer and unfair to evaluate (Berberoğlu ve İş-Güzel, 2013).

There are multiple answers to open-ended questions, and what is important here is to see how the person receives the information and expresses himself/herself to the other one, whether his/her experience is enough and how successful he/she is in transferring it to the other one. Although it provides more information on learning for educators; long time spent for evaluation has become a less preferred method over time due to crowded classes and heavy work load density. However, in more recent times, the number of studies that draw attention to the strengths of open-ended exams and mentioning its re-dissemination has increased. Open-ended exams reveal not only the level of knowledge about a topic, but also the high-level thinking skills such as cognitive strategy skills and self-control skills.

Cognitive strategy skills include sub-skills such as; (1) Using multiple ways to solve the problem, (2) Re-expression and repetition with other words to better understand the question, (3) Selecting and organizing related and given information (from the stem of the question) to solve the problem, (4) Thinking about the meaning of the problem before starting to solve, (5) Spending more time to better understand the difficult questions and (6) Converting the problem into different forms.

Self-control skills include: (1) Controlling the processes during the solution, (2) Going through upon solutions, (3) Judging the accuracy of processing, (4) Asking how well do while continuing to solve problems, (5) Error correction and (6) Keeping track of how works going during the solution.

The fundamental steps to be taken in the discussions about how to design an assessment using Natural Language Processing in the evaluation of open-ended exams for educators are listed as follows.

1) Designing artificial intelligence systems to generate questions for the stable progression of in-class, in-school, national and international examinations.

2) The use of the central education program (national curriculum) can be used as an advantage, and the evaluation of the results of common open-ended exams for each course in schools can be done by using Natural Language Processing in a system to be established by the Ministry of National Education (MEB).

3) It may be possible to training artificial intelligence models by analyzing and accumulating the answers received by adding trial questions to the national exams.

As a result; the development of Turkish Natural Language Processing in terms of semantic structures, scanning how complex or simple sentences are, synonyms, word phrase, sentence structure and Turkish grammar is the first condition for making more accurate evaluations in every field. In order to use Natural Language Processing in education, educators need to learn the basic working principles of this system and they must have at least a basic awareness of their use in their disciplinary areas.

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Presentation
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Moderation and Reporter
Dr. Sevinç TUNALI, ESTEN Director

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