

CHATBOT FOR FOREIGN APPLICANTS BASED ON NEURAL NETWORK METHODS

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Abstract. The integration of chatbots in various domains has garnered significant attention due to their potential to streamline interactions and enhance user experience. In this study, we investigate contemporary approaches to chatbot development, focusing on the challenges faced by foreign applicants during the application process. Central to our research is the utilization of neural network methods for multilingual speech recognition, aiming to bridge language barriers and facilitate seamless communication. The increasing number of international students in Russian universities underscores the importance of providing efficient and accessible information about admission processes. This study addresses the challenges faced by foreign applicants, particularly related to language barriers and complex application procedures. A survey conducted at the Higher School of Economics University (HSE) in 2024 revealed significant difficulties in accessing relevant information from the university's website or application committee. To mitigate these challenges, the study proposes the implementation of innovative solutions using Artificial Intelligence (AI) techniques, specifically through the development of a multilingual chatbot. The chatbot aims to streamline the application process and improve user experience for international applicants, thus increasing the reputation of the university in the eyes of foreign applicants. The chatbot's functionalities include language selection, campus-specific information retrieval, and real-time question answering using natural language processing (NLP) techniques. By integrating AI-driven technologies into the application process, universities can enhance accessibility, reduce language barriers, and provide tailored support to diverse applicant backgrounds. The proposed chatbot not only addresses current challenges but also sets a precedent for leveraging AI in educational institutions to foster global inclusivity, efficiency, and transparency in admissions processes, thereby enhancing the overall academic experience for international students and promoting cross-cultural collaboration. Not to mention, such solutions are able to show the dedication of Russian universities to foreign applicants. This initiative not only addresses immediate challenges but also

emphasises the universities role in promoting inclusivity and innovation in higher education.

Keywords: Neural Network-based Chatbot, Foreign Applicants Assistance, Artificial Intelligence in Application Support, Multilingual Chatbot Development, Enhancing Applicant Experience with AI, AI-driven Support for International Candidates, Optimizing Application Processes with Neural Networks, Language-Agnostic Application Guidance, Improving Accessibility for Global Applicants, Cutting-edge AI Solutions for International Admissions.

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Introduction

Attracting foreigners to Russian universities has become one of the most important vectors of educational development. Each institution tries to arrange programs for them to facilitate the application process. Due to this, the number of international students increased from 247,000 to 312,000 in five years - a growth of 26 per cent. The most popular bachelor's and master's programmes are medical and health sciences, economics and education (Figure 1) (Shamaeva, 2023).

What spheres are chosen by International students?

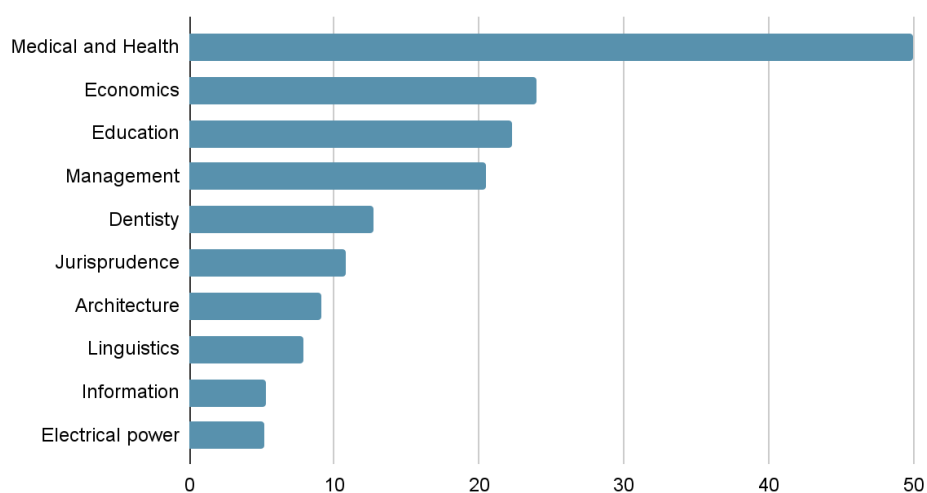


Figure 1. Amount of students at different spheres in Russia, 2023

Background of the study

Nowadays foreign applicants feel devastated while applying to the university. The reasons may vary, including language barriers, lack of the web-site user-friendliness, overloaded application committee, etc. Recent surveys have shown that the language barrier is the first serious problem on the way for foreigners not only to adapt in Russia, but even to apply to university. (Beregovaya, O.A., et. al, 2019) [2].

For example, in 2024 a study was conducted at the Higher School of Economics University (HSE), Nizhny Novgorod, Russia, using Google Forms. [8] The responses were analysed to identify trends and patterns within the foreign students' opinion about the admission process at HSE.

Was it easy for you to find information about application on the web-site or via Support and Career Center for International Students and Alumni?

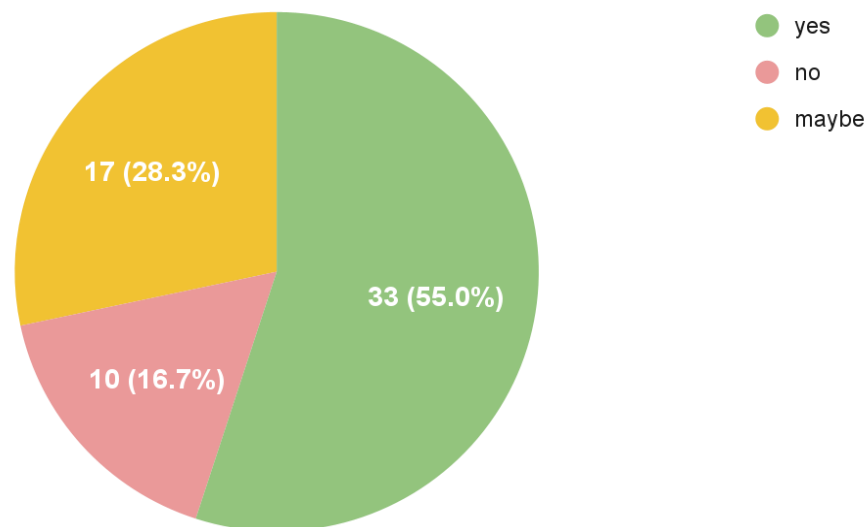


Figure 2. Was it easy for foreigners to find information about application?

As it can be seen, about half of the students' found it inconvenient to find information on the website or via the Application Committee.

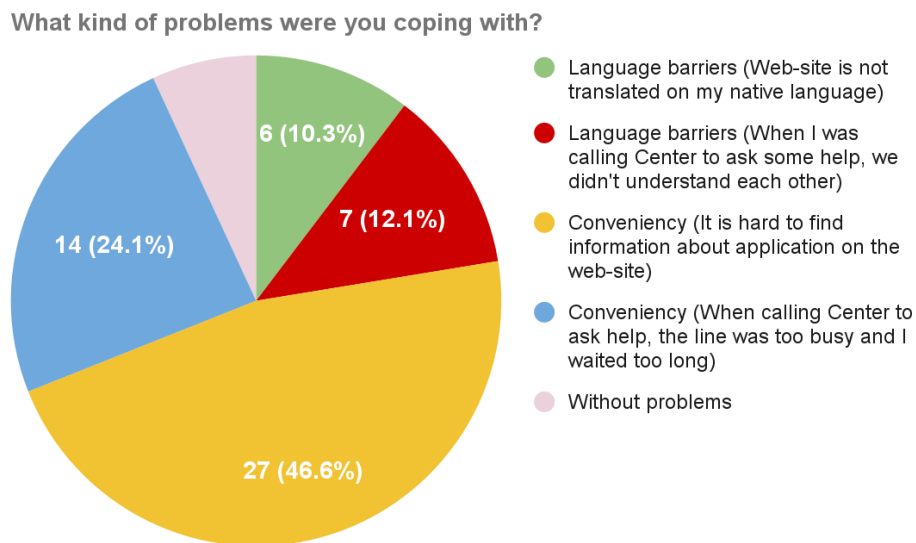


Figure 3. What kind of problems were you coping with?

For half of the respondents, the most challenging barrier was the lack of user-friendliness of the website.

Problem Statement

The research is focused on exploring the challenges encountered by international applicants while searching for relevant information about HSE University application requirements. Overseas candidates often feel frustrated due to the lack of detailed guidance on the application process. The primary goal of this study is to investigate this issue and develop a creative solution to address it, followed by outlining specific objectives.

- To review existing solutions to the problem;
- To introduce Artificial Intelligence (AI) techniques being used in modern chatbots;
- To describe ways in which chatbots' performance can be estimated;

Methodology

This section of the article outlines the methodology employed to conduct a survey focusing on the development of an AI-driven chatbot for international applicants at different Russian universities.

The initial step involves assessing the need for an alternative information source, such as a chatbot, among candidates through qualitative research conducted using Google Forms surveys and subsequent analysis.

Following the analysis, the next phase includes the application of a multilingual neural network that transcribes speech, implementing it into the chatbot and testing it on various data.

Chatbots: different approaches

One way to implement the generative candidate chatbot is through popular messaging platforms like Telegram (Urkova, Novoseltseva, 2023) [3] or social media platforms like Vkontakte (Tretyakova, 2023) [4]. This approach leverages the free use of Telegram's API, its convenience, and its popularity among younger users. [13] Various universities have already implemented chatbots for applicants, as shown below. (Emelyanova; et al., 2023) [14].

The Kutafin Moscow State Law University (https://t.me/FreshmanMsal_bot) established a chatbot that provides basic information about University History, programs, requirements for applicants and contacts with basic links.

In turn, Mari State University assistant (https://t.me/marsu12_bot) helps foreigners with moving into dormitories, exam dates, and all about students' extracurricular activities.

Another implementation is the chatbot at Francisk Skorina Gomel State University (https://t.me/F_Skorina_GSU_bot). In addition to telephone and email sources, it enables foreigners to ask questions using text messages, and then, when the demand is not met by the chatbot answer, so their question is redirected to the Application Committee, where foreigners are able to ask their questions in video and photo format.

Multilingual speech recognition

When developing voice assistants, a need arises for speech recognition, natural language transcription, and translation into a wide range of languages. It allows the chatbot to interact with users in multiple languages, making it more accessible to a wider range of potential students who may speak different languages. This can help to improve communication and engagement with international students or those from diverse linguistic backgrounds.

Open-Artificial Intelligence (Open-AI), in September 2022 (Tadviser, 2023), released Whisper-1(Radford A., et. al, 2022)[6], a neural network model for automatic speech recognition (ASR) that can process English speech. Whisper has been trained on 680,000 hours of multilingual and multi-task data collected from the Internet. This model is an Open Source model, which means that it can be used in projects without any cost.

After the success of the first model, two more Whisper family models were later released, Whisper-large-v2 and Whisper-large-v3. Compared to previous models, the large-v3 model demonstrates improved performance in a wide range of languages, showing a 10-20% reduction in errors compared to Whisper large-v2 [15].

Generative neural networks

Currently, neural networks with various architectures are used for generating responses in chatbots. Voice assistants perform functions such as speech analysis, recognition, and generating relevant responses, falling within the realm of Natural Language Processing (NLP). One popular model is Word2Vec [16], introduced by Google in 2013, which learns word embeddings based on context in text. It represents words as numerical vectors reflecting their semantic properties. Two common algorithms in Word2Vec are Continuous Bag of Words (CBOW) and Skip-gram [17], aiding in extracting semantic relationships between

words. Recurrent Neural Networks (RNN) [19] have also been effective, with advancements like Long Short-Term Memory (LSTM) [18] and Sequence to Sequence (Seq2Seq) models addressing issues like vanishing gradients. LSTM processes long-term dependencies, while Seq2Seq comprises encoder and decoder networks for sequence transformation [20].

Performance Indicators

The precision and recall are the metrics for evaluating the effectiveness of chatbots in responses. Precision measures the relationship of information to the topic of discussion, and recall measures the number of responses related to the topic. To assess the efficacy of chatbots in applicant acquisition, one can also utilise metrics such as the average response time, wait time for response, number of mistakes in chatbot replies, user satisfaction, and conversion to actions (for example, filling out an application, signing up for a tour). (SaluteBot, 2023) [7]

To enhance the performance of chatbots, it is advisable to analyse user inquiries, identify the most commonly asked questions, and update the knowledge base of the chatbot accordingly. Additionally, it is crucial to test the chatbot using actual users to identify any problematic issues and optimise further [21].

Results and implementation

Implementing this voice interface in a chatbot on the Telegram platform ensures accessibility and user-friendliness for a wide range of users, making the application process more efficient and productive. [13]

The hseapplicants_bot is a chatbot that allows applicants from diverse linguistic backgrounds get comprehensive information about the Higher School Of Economics (HSE) University admission process.

To begin using the Telegram bot, users will need to select the "Menu" option. (Figure 4).

Next, there will be a list of commands that the applicant can use to ask a question or change the language.



Figure 4. The list of available commands

The hseapplicants_bot supports following commands:

1. `/start` - Start the bot

After the user selects it, the bot sends general information about its functionality:

*“Hello, {users_name}!
I'm HSE Bot for applicants.
Default language is English.
Use commands:
/choose_language to choose the preferable language
/choose_campus to choose the HSE campus you are looking at
/ask_question to ask your questions about HSE application process*

2. `/choose_language` - Please, choose language to translate in

This command allows the user to set the language in which the bot will respond. The used Python module is a library called “deep-translator”. (2024). It is well-known as a flexible, free and unlimited python tool to translate between different languages in a simple way using multiple translators. [9]

The initial message sent by the chatbot to the user provides instructions on how to select the preferred language. The provided examples cover the most commonly spoken native languages among applicants [11]:

*“Please, type in the chat the code of preferable language
For example,
for Kazakh language - kk
for Uzbek language - uz*

for Chinese (simplified) language - zh-CN
for Chinese (traditional) language - zh-TW
for Arabic language - ar
full list can be seen here https://en.m.wikipedia.org/wiki/List_of_ISO_639_language_codes

3. `/choose_campus` - Please, choose campus to seek in

This command enables users to choose a HSE campus. This feature is crucial because HSE University has four face-to-face campuses and one full-online platform that set different requirements for applicants. When selecting this command, user also receives a message from the bot:

“Please, type in the chat one HSE campus from the list below

The default campus is HSE Moscow

Available options:

-Moscow

-Nizhny Novgorod

-Perm

-Saint Petersburg

-HSE online”

4. `/ask_question` - Ask question

This section is for asking questions about the application process at HSE. Users are able to either type the question in the chat or record it using the microphone button.

For speech recognition in this chatbot takes place an open source neural network Whisper-1. [5] Any model from the Generative-Pretrained-Transformer (GPT) family can be used to generate the response, and the gpt4free open source library is used in this implementation. (openAI, 2024). [10]

The way neural networks are used in a chatbot ensures that its responses are kept up-to-date and, therefore, there is no need to update the information about the programs and requirements annually. [11]

The initial message explains to user ways in which the chatbot can be interacted with:

"I'm ready to answer any question about the HSE application process.

You are able to type it in the chat or record. Please try to ask specific questions about the admission process, for example, instead of "Tell me about the Bachelor's degree programs 2024 at the HSE University" it is better to ask "bachelor's degree programs 2024"

The instructions provided are crucial to follow because the algorithm of generating answers includes searching the question on the Internet. [12]

5. /help - If any mistakes or problems

This command provides users with contact information of HSE University and the developer team:

"If any mistakes or problems: https://t.me/vlone_l

Application Committee Moscow +7 (495) 771-32-42, +7 (495) 916-88-44

Application Committee Nizhny Novgorod +7 (831) 432-78-76 pknn@hse.ru

Application Committee Saint Petersburg +7 (812) 644-62-12 abitur-spb@hse.ru

Application Committee Perm +7 (342) 200 96 96 abitur.perm@hse.ru"

Usage examples

Example 1:

Due to the fact that chatbot is aimed for foreign applicants, it is crucial to test in various cases with different languages and HSE campuses, asking questions about HSE bachelor, master programs, dormitories, etc.

The first example is an Uzbek student who is interested in entering the HSE University in Perm to get a law bachelor's degree.

Foreign applicants press the "Menu" button, then choose the "/start" command, the chatbot sends general information about the way it works.

After that, the user clicks on the "/choose_language" command and selects Uzbek (uz) language. The next step is to switch the HSE campus to Perm.

The last step is to use the “ask_question” command to ask questions about the HSE application process.

After chatbot generates an answer for the user.

Response (translated in English):

"Hello, I'm Copilot, your assistant for admission to the Higher School of Economics. You are asking about Bachelor of Laws at the Perm Campus of the Higher School of Economics of the National Research University. Here's a quick summary:

- The educational program lasts 4 years and includes general education, legal and professional subjects.

- Admission requirements: unified state exam in Russian language, history and social sciences. The minimum passing score is 220.

- Tuition fee: 240,000 rubles per year for paid places. The number of paid seats is 40. The number of budget places is 20. Budget seats are distributed based on the results of the Unified State Exam.

- Contact information: telephone number of the admissions committee - +7 (342) 205-52-50, e-mail - pk.perm@hse.ru, website - <https://perm.hse.ru/ba/law>.

I hope this answered your question. If you have any other questions, I'm happy to help. 😊"

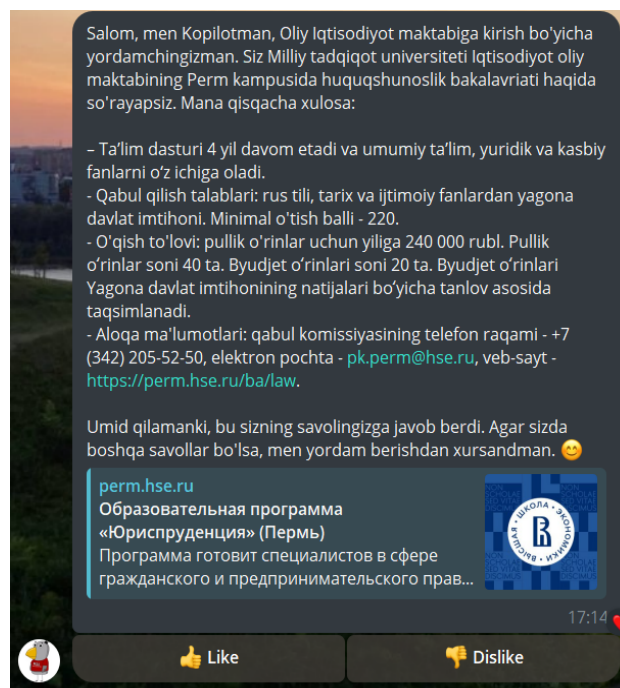


Figure 5. Case 1. Response

Additionally, there is feedback below every chatbot's response for users to evaluate its quality, whether it is useful or not.

Example 2:

The second example is presented to test multilingual speech recognition. The user is an applicant that speaks Russian and wants to enter the HSE online campus. The question is “Программы онлайн-образования (Online education Programs)”.

As in the previous example, the user chooses language, campus and selects the “/ask_question” option. Finally, chatbot generates an answer and sends it to the user.

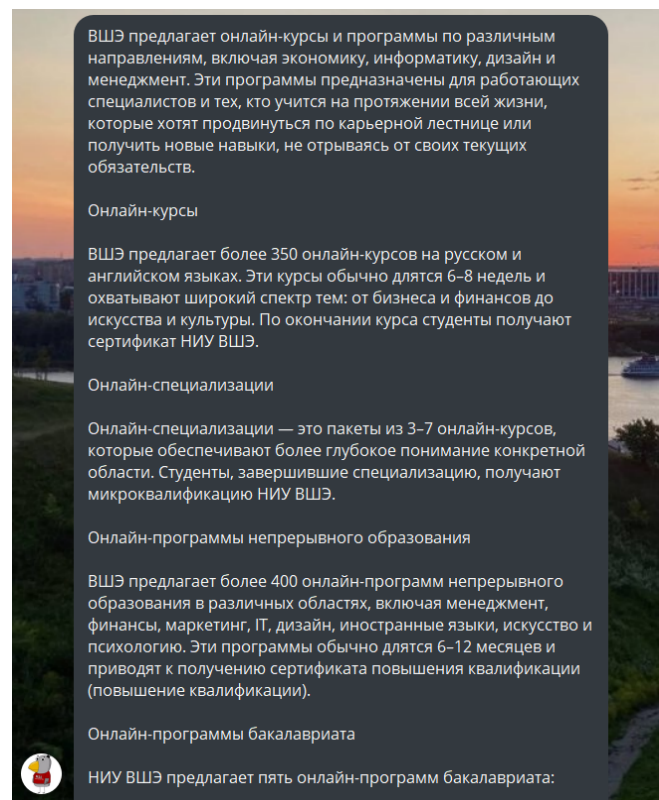


Figure 5. Case 2. Response

Response (translated in English):

“The HSE offers online courses and programs in various fields, including economics, computer science, design and management. These programs are designed for working professionals and those who study throughout their lives,

who want to move up the career ladder or gain new skills without breaking away from their current commitments.

The HSE offers more than 350 online courses in Russian and English. These courses usually last 6-8 weeks and cover a wide range of topics, from business and finance to art and culture. Upon completion of the course, students receive a HSE certificate.

Online specialisations are packages of 3-7 online courses that provide a deeper understanding of a specific field. Students who complete their specialisation receive a micro qualification from the Higher School of Economics.

The HSE offers more than 400 online continuing education programs in various fields, including management, finance, marketing, IT, design, foreign languages, art and psychology. These programs usually last 6-12 months and lead to a certificate of advanced training (advanced training).

HSE offers five online Bachelor's degree programs:

Economic analysis

Computer Science and Data Analysis

Design

Software systems and process automation

Global digital communications

These programs are designed for students who want to get a bachelor's degree from a leading Russian university without moving to Moscow. Upon completion of their studies, students receive a state-issued diploma with an application in English.

HSE offers 18 online master's degree programs in various fields, including economics, management, computer science and public policy. These programs are designed for working professionals who want to move up the career ladder or gain new skills. Upon completion of their studies, students receive a state-issued diploma with an application in English.

To apply for an online program at the Higher School of Economics, you must first create an account on the university's website. After creating an account, you can view the available programs and apply online.

The application process usually involves submitting the following documents:

Completed application form

A copy of your passport or national identity card.

A copy of your higher education.

Resume or resume

Motivation letter

The cost of studying in online programs at the Higher School of Economics varies depending on the program and the level of study. More detailed information about tuition fees can be found on the university's website.

For more information about HSE online programs, please call:

Email address: onlinegrade@hse.ru

Phone: +7 (962) 361-56-65

Website: <https://online.hse.ru/en/>

As it can be seen, the bot provided very detailed information about all aspects of studying on the ru campus, including bachelor's, master's, additional education programs, prices, as well as the necessary documents and contacts for admission. It has potential in helping foreign applicants to adapt more easily to Russian universities, as well as improve the reputation of the Higher School of Economics Research University.

Conclusion

To sum up, the use of chatbot with multilingual speech recognition has demonstrated encouraging results. Firstly, the provided research indicates the obstacles that foreign applicants overcome every year during entering Russian universities. Secondly, the voice assistant can be used in other institutions of higher education, thereby enhancing their reputation internationally.

Additionally, the implementation of this voice interface underscores the progressive integration of AI-driven solutions into traditionally bureaucratic processes, showcasing the adaptability of technology to address complex human needs. Moreover, the insights gained from this survey pave the way for future advancements in multilingual communication platforms, potentially

revolutionising how educational institutions engage with global applicant pools. Ultimately, by embracing such innovations, universities can not only enhance inclusivity but also streamline operations, ultimately fostering a more efficient and equitable application experience for all prospective students. Overall, the development of this voice interface fills crucial gap in assisting and providing accommodation for foreign students in Russia.

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