MINISTRY OF EDUCATION AND RESEARCH OF THE REPUBLIC OF MOLDOVA

Technical University of Moldova

Faculty of Computers, Informatics, and Microelectronics

Department of Software Engineering and Automation

Approved for defense
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DEVELOPMENT OF INTELLIGENT GENERATIVE MODELS FOR MELODIES. MELODY GENERATION

Master's project

Student: _____ **Tcacenco Igor, IS-231M**

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ANNOTATION

For the diploma: "Development of intelligent generative models. Melody generation",

developed by Tcacenco Igor, Chisinau, 2025.

Keywords: neural networks, dataset, data preprocessing, machine learning, LSTM, chords, generative model

The purpose of this work is to explore the integration of deep learning models, particularly LSTMs, in generating harmonically coherent and stylistically diverse chord progressions based on established music theory. To create a system capable of producing musically meaningful outputs that cater to both academic research and creative industries.

Tools used: Python programming language, Google Colab.

Explanatory note contains: introduction, 3 chapters, conclusions, bibliography with 20 titles, 4 figures.

Chapter 1: Explores the significance, current applications, and limitations of AI in music, setting the stage for the project's goals.

Chapter 2: Details the architecture, workflow, and theoretical foundation of the chord progression generator system.

Chapter 3: Describes the development process, including dataset preparation, model architecture design, training and validation results, and optimization techniques used for chord progression generation.

ADNOTARE

Pentru diploma: "Dezvoltare de modele intelegente generative pentru melodii. Generare de melodii",

dezvoltat de Tcacenco Igor, Chișinău, 2025.

Cuvinte-cheie: rețele neuronale, set de date, preprocesare a datelor, învățare automată, LSTM, acorduri, model generativ

Scopul acestei lucrări este de a explora integrarea modelelor de învățare profundă, în special LSTM-uri, în generarea de progresii de acorduri armonic coerente și stilistic diverse, bazate pe teoria muzicală consacrată. Crearea unui sistem capabil să producă rezultate semnificative din punct de vedere muzical care se adresează atât cercetării academice, cât și industriilor creative.

Instrumente utilizate: Limbajul de programare Python, Google Colab

Nota explicativă conține: introducere, 3 capitole, concluzii, bibliografie cu 20 titluri, 4 figure.

Capitolul 1: Explorează semnificația, aplicațiile actuale și limitările AI în muzică, creând scena pentru obiectivele proiectului.

Capitolul 2: Detaliază arhitectura, fluxul de lucru și fundamentul teoretic al sistemului generator de progresie a acordurilor.

Capitolul 3: Descrie procesul de dezvoltare, inclusiv pregătirea setului de date, proiectarea arhitecturii modelului, rezultatele antrenamentului și validării și tehnicile de optimizare utilizate pentru generarea progresiei acordurilor.

CONTENTS

LIST OF ABBRIVIATIONS AND DEFINITIONS

Tonality – the sonic characteristic of a musical piece. Tonal music works by establishing a specific note as a tonal center, creating tension by moving away from the tonal center, then resolving the tension by returning to it again.

Harmony – two or more notes being heard in unison and usually have a pleasing effect on the listener. These notes can be played by an instrument or sung by someone, which makes up a sequence.

Functional harmony - a term used to describe the relationships between chords in music. It refers to the idea that chords have specific functions within a key and that their relationships to each other can be used to create cycles of tension and resolution that contribute to add movement to a piece of music. The three most important chords in the context of functional harmony are the tonic, subdominant, and dominant chords.

Chromaticism - the name given to the use of tones outside the major or minor scales.

Cadence/Chord progression - harmonic movement from one chord to another.

Degree - relative position of a particular note or chord to the tonic.

Diatonic chord – a chord built from notes of the key.

Non-diatonic chord – a chord built from notes, that are not native to the key.

Key – a definite set of notes that are used to create a piece of music.

Modal interchange – a technique that consists in temporarily borrowing chords from a parallel tonality or mode that shares the same root without abandoning the established key.

Parallel keys/Parallel tonalities - a major scale and a minor scale that have the same starting note (tonic).

Scale - any consecutive series of notes that form a progression between one note and its octave.

Major and minor - adjectives that may describe an interval, chord, scale, or key. When referring to scales or chords, major and minor signify the presence of a major third or a minor third, respectively.

INTRODUCTION

The brain is a complex biological neural network capable of receiving information from the senses and processing it. Scientists have been trying for decades to endow machines with human intelligence, so that a technical device could perform tasks independently. In 1956, computer scientist John McCarthy proposed to use the term “Artificial Intelligence”. Artificial Intelligence is a branch of computer science that deals with solving problems intended for human intelligence using machines. Man cannot possess all the knowledge of the world, but he can mine and accumulate knowledge, and artificial intelligence to process them, or, for example, a person is not able to work without rest, monotonous labor is not easy. A technical device is endowed with artificial intelligence so that a person is freed from certain tasks and performs what the machine is not capable of. Currently, artificial intelligence solves problems in different spheres of human life.

Neural networks and neurocomputers is a branch of knowledge that is very popular nowadays. This is evident, in particular, in the large number of publications, conferences, and various applications. One of the reasons for this popularity is their remarkable ability to learn from observed examples and to form acceptable inferences from incomplete, noisy and inaccurate input information. Work on neural networks was originally started by biologists. With the help of neural networks, researchers sought to study the properties and peculiarities of the brain. The development and application of neural networks in various fields is an important direction of modern science and technology. Neural networks are computer systems that model the operation of the human brain and are capable of processing information in the same way as neurons. One of the industries influenced by the development of neural networks is medicine. Through the use of neural networks, doctors can make more accurate diagnoses, predict diseases, and develop individualized treatments. Neural networks are also widely used in neurobiology to study the structure and functioning of the brain.

In financial services, neural networks are used to analyze the market, predict changes in stock prices, and determine optimal trading strategies. This helps investors make informed and sound decisions based on a large amount of data. In the transportation and automotive industry, neural networks are used to control autopilot systems, analyze the road environment, and predict accidents. Such systems provide safer driving conditions and improve vehicle efficiency. Neural networks are also finding their application in urban planning and resource management. They are used to predict traffic, optimize energy consumption, and develop intelligent systems for managing urban infrastructure. This helps to improve the quality of life of city dwellers and increase the efficiency of resource utilization. The development and application of neural networks has a significant impact on various industries and fields of endeavor. This technology continues to evolve and progress, opening new opportunities for innovation and improvement.

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