

**Thesis Proposal**

|  |  |  |
| --- | --- | --- |
| **Title** | ： | **Neural networks in mobile applications** |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| **Student** | **：** | **Chen Qichen** |
| **Advisor** | **：** | **A.A.Deryushev** |
| **Specialty** | **：** | **Mathematics and Computer Science** |
| **Faculty** | **：** | **Mechanics and Mathematics Faculty** |

**Submission Date** November 2024

**Thesis Proposal to Belarusian State University**

**Dissertation Title (Neural networks in mobile applications)**

**Student: Chen Qichen**

**Advisor: A. A.Deryushev**

**Belarusian State University**

**November 2024**

**Neural networks in mobile applications**

# ABSTRACT

In recent years, with the widespread use of mobile devices and the increasing demand for intelligent applications, the application of deep learning to mobile applications has become a natural trend.

Using GPU on mobile devices for deep neural network, collaborative computing engine ,optimizing Convolutional Neural Network Models, Deep Learning Inference Accelerator and Binary Neural Network Inference Engine, Efficient Convolutional Neural Network Architecture. It provide effective solutions for achieving efficient neural network inference and training on mobile devices, meeting the needs of mobile applications while reducing latency and power consumption.

**Key Words**: **Neural Network Models GPU Mobile Devices**

**Chapter 1 Introduction**

## 1.1 Research Background

The application of neural networks in mobile applications is developing rapidly. In recent years, with the widespread use of mobile devices and the increasing demand for intelligent applications, the application of deep learning to mobile applications has become a natural trend. Applying deep learning to mobile devices faces some challenges, including the contradiction between the miniaturization of mobile devices and the resource requirements of deep neural networks, as well as the privacy and security issues of personal data. However, in the past few years, this field has made significant progress. The application of deep learning in mobile applications mainly includes two aspects: efficient reasoning on mobile devices, and training using data collected by mobile devices.[1] These two aspects cover the main tasks of deep learning.

Specific application cases include: using convolutional neural networks to identify tomato leaf diseases on mobile devices[2], using convolutional neural networks for food and location image prediction[3], using magnetometers and convolutional neural networks for app identification[4], using convolutional neural networks for real-time voice activity detection[5],and Cluster-based methods are used in the pre-processing stages of various face recognition technologies.[6]

Understanding the current status and future trends of this field is important for promoting the development of mobile applications: In-depth research on the application of neural networks in mobile applications can help us understand the current status and future development direction of this field, and provide reference for the further development of mobile applications.

## 1.2 Research Purpose

Analyzing the challenges and solutions of deploying deep learning on mobile devices: Mobile devices have limited resources, and it is necessary to optimize the neural network model and deployment plan specifically, while also considering privacy and security issues. Researching these challenges and their solutions is important for promoting the development of mobile applications.

Exploring the future development direction of neural networks in mobile applications: With the continuous improvement of hardware performance and algorithm optimization, the application prospects of neural networks in mobile applications are broad. Researching future development trends can help us better grasp the direction of industry development.

Providing reference and guidance for mobile application development: By systematically reviewing the current status and future trends in this field, provide valuable references for mobile application developers, which can help promote the progress of mobile application technology.

This is of great significance for promoting the development of mobile application technology and improving the intelligence level of mobile applications.

## 1.3The main content of this project

Efficient reasoning on mobile devices and training using data collected by mobile devices：Compression and optimization techniques for running deep convolutional neural networks (CNNs) on mobile devices；Deployment methods of neural networks in mobile applications；Specific application scenarios of neural networks in mobile applications；Application of neural networks in mobile network environments.

in summary, the application of neural networks in mobile applications is constantly expanding, with both technical challenges in deploying neural network models on mobile devices and application scenarios for mobile network environments.

## 1.4 Methodology

the main methods for efficient neural network inference and mobile data training on mobile devices include utilizing mobile GPUs, collaborative cloud computing, local deep learning model deployment, software accelerator optimization, and efficient network architecture design. These methods can effectively improve the deep learning performance on mobile devices and meet the needs of mobile applications.

## 1.5 Expected outcomes

It maybe has the one of four:

Efficient execution of deep learning models on mobile devices, significantly improving inference speed and energy efficiency

Deep learning systems that collaborate between mobile devices and the cloud, reducing the computational burden and communication overhead on mobile devices

Training deep learning models suitable for mobile devices using data collected on mobile devices

Realizing deep learning applications on mobile devices, such as emotion recognition and user identification

## 1.6 References

1. Ji Wang, Bokai Cao, Philip S.Yu. Deep Learning Towards Mobile Applications[M].National University of Defense Technolog.2018:1-8
2. A Elhassouny, F Smarandache.Smart mobile application to recognize tomato leaf diseases using Convolutional Neural Networks[J].IEEE.ICCSRE.2019.8807737
3. O Qayyum, M Şah .Ios mobile application for food and location image prediction using convolutional neural networks[J].IEEE.ICETAS.2018.8629202
4. Rui Ning,Cong Wang.Sniffing Mobile Apps in Magnetic Field through Deep Convolutional Neural Networks[C].IEEE. PERCOM.2018.8444573
5. Abhishek Sehgal,Nasser Kehtarnavaz.A Convolutional Neural Network Smartphone App for Real-Time Voice Activity Detection[J]. IEEE. ACCESS.2018.2800728
6. А.В. АНТОНЧИК, А.А. ДЕРЮШЕВ.ОБЗОР МЕТОДОВ РАСПОЗНАВАНИЯ ЛИЦА НА ИЗОБРАЖЕНИИ[J] минск.ДОКЛАДЫ БГУИР 67-71.2009