



**FACULTY  
OF MATHEMATICS  
AND PHYSICS**  
Charles University

**MASTER THESIS**

Bohdan Ihnatchenko

# **Multi-Target Machine Translation**

Institute of Formal and Applied Linguistics

Supervisor of the master thesis: doc. RNDr. Bojar Ondřej, Ph.D.

Study programme: Computer Science

Study branch: Artificial Intelligence

Prague 2020

This is not a part of the electronic version of the thesis, do not scan!

I declare that I carried out this master thesis independently, and only with the cited sources, literature and other professional sources. It has not been used to obtain another or the same degree.

I understand that my work relates to the rights and obligations under the Act No. 121/2000 Sb., the Copyright Act, as amended, in particular the fact that the Charles University has the right to conclude a license agreement on the use of this work as a school work pursuant to Section 60 subsection 1 of the Copyright Act.

In ..... date .....  
Author's signature

Dedication.

Title: Multi-Target Machine Translation

Author: Bohdan Ihnatchenko

Institute: Institute of Formal and Applied Linguistics

Supervisor: doc. RNDr. Bojar Ondřej, Ph.D., Institute of Formal and Applied Linguistics

Abstract: Abstract.

Keywords: Machine translation words

# Contents

<b>Introduction</b>	<b>2</b>
<b>1 Background</b>	<b>3</b>
1.1 History of machine translation . . . . .	3
1.2 Transformer model . . . . .	3
1.3 Translation evaluation . . . . .	3
<b>2 Experiment setup</b>	<b>4</b>
2.1 Dataset . . . . .	4
2.2 Training . . . . .	4
2.3 Experiments . . . . .	4
<b>3 Random choice of target languages</b>	<b>5</b>
3.1 Performance drop on massively multilingual setup . . . . .	5
3.2 Performance decrease on richer data sets . . . . .	5
<b>4 Group by language groups</b>	<b>6</b>
4.1 Language groups . . . . .	6
4.1.1 Germanic group . . . . .	6
4.1.2 Slavic with cyrillic script . . . . .	6
4.2 Selecting target languages by linguistic similarity . . . . .	6
<b>Conclusion</b>	<b>7</b>
<b>Bibliography</b>	<b>8</b>
<b>List of Figures</b>	<b>9</b>
<b>List of Tables</b>	<b>10</b>
<b>List of Abbreviations</b>	<b>11</b>
<b>A Attachments</b>	<b>12</b>
A.1 First Attachment . . . . .	12

# Introduction

# 1. Background

1.1 History of machine translation

1.2 Transformer model

1.3 Translation evaluation



## 2. Experiment setup

### 2.1 Dataset

### 2.2 Training

### 2.3 Experiments

## **3. Random choice of target languages**

### **3.1 Performance drop on massively multilingual setup**

1-to-3, 5, 7, etc. models on en-to-36 dataset (0.9 mil. sentences per target language)

### **3.2 Performance decrease on richer data sets**

1 to 3, 4, 5 on UN corpus (much more sentence pairs per target language)

## 4. Group by language groups

### 4.1 Language groups

1 to 2, 3, 4, 5, etc. models on en-to-36 dataset (0.9 mil. sentences per target language) compared with random runs

#### 4.1.1 Germanic group

#### 4.1.2 Slavic with cyrillic script

### 4.2 Selecting target languages by linguistic similarity

# Conclusion

# Bibliography

# List of Figures

# List of Tables

# List of Abbreviations



# A. Attachments

## A.1 First Attachment