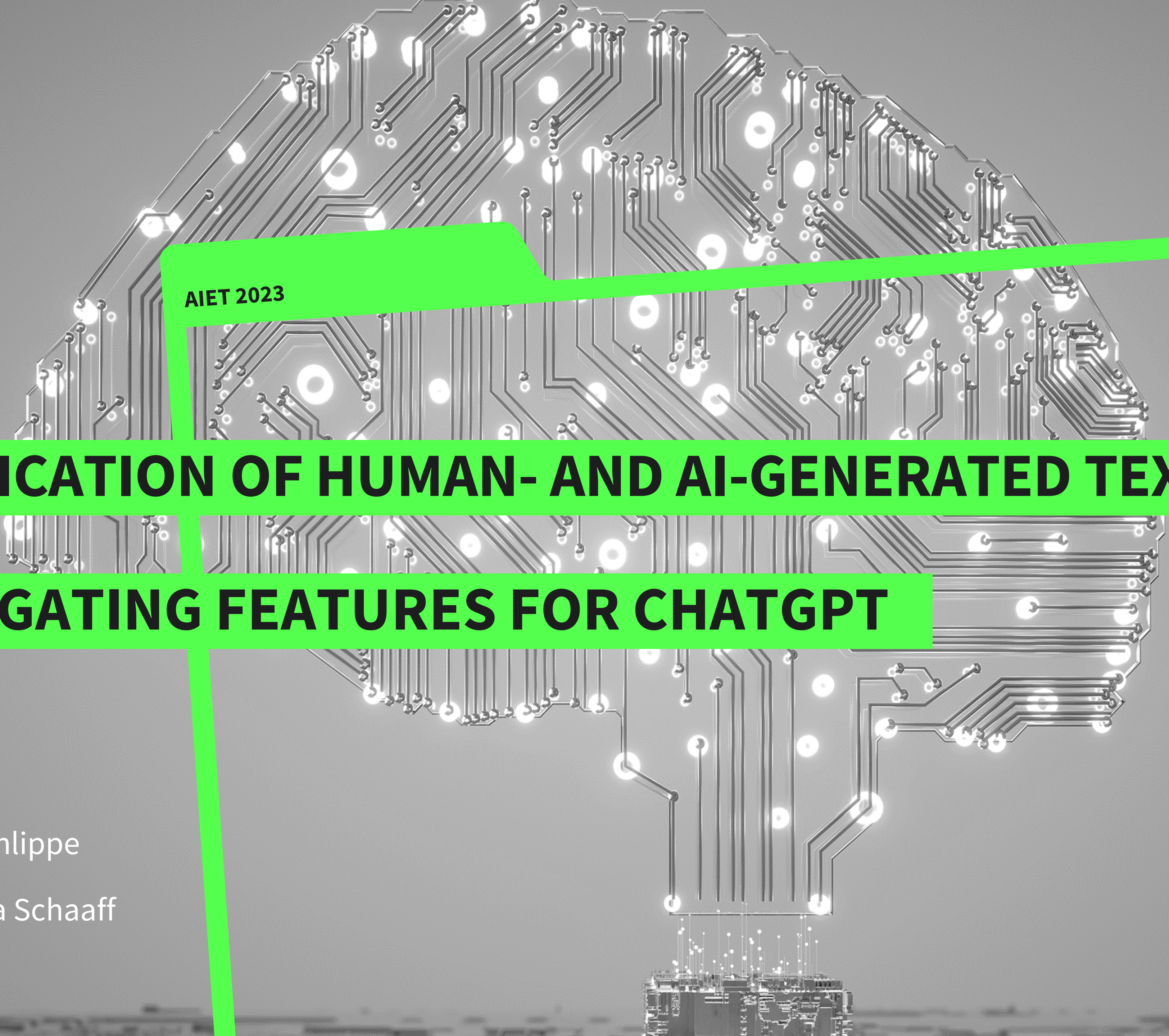

AIET 2023

CLASSIFICATION OF HUMAN- AND AI-GENERATED TEXTS: INVESTIGATING FEATURES FOR CHATGPT

Lorenz Mindner

Prof. Dr. Tim Schlippe

Prof. Dr. Kristina Schaaff

01.07.2023

OUTLINE

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- Related Research 2
- Human-AI-Generated Text Corpus 3
- Features 4
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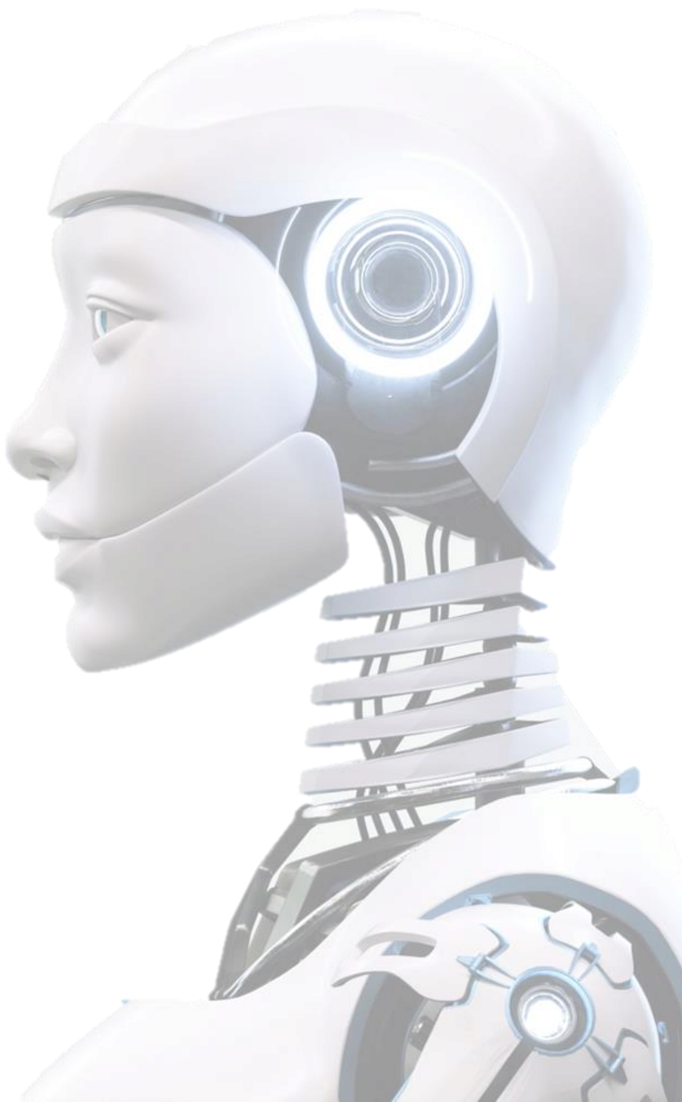


MOTIVATION

Human-generated text

VS.

AI-generated text

01

PROVIDE NEW CORPUS

to contribute to the improvement of research

02

GAIN INSIGHTS INTO FEATURES

to distinguish human- and AI-generated texts

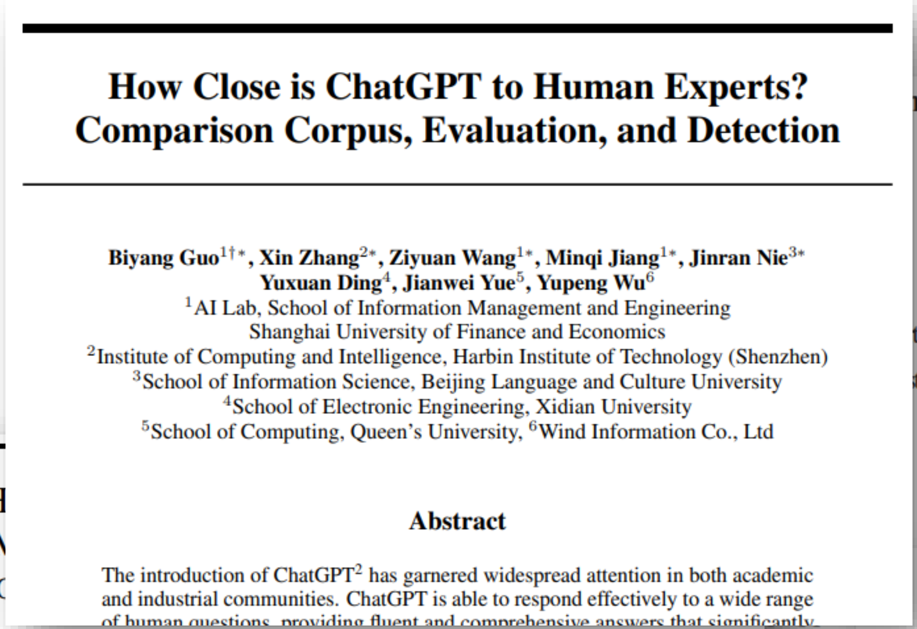
03

PROVIDE BENCHMARK

for future classifiers

RELATED RESEARCH

Study characteristics of human- and AI-written expert texts



How Close is ChatGPT to Human Experts? Comparison Corpus, Evaluation, and Detection

Biyang Guo[1†*], Xin Zhang[2*], Ziyuan Wang[1*], Minqi Jiang[1*], Jinran Nie[3*]
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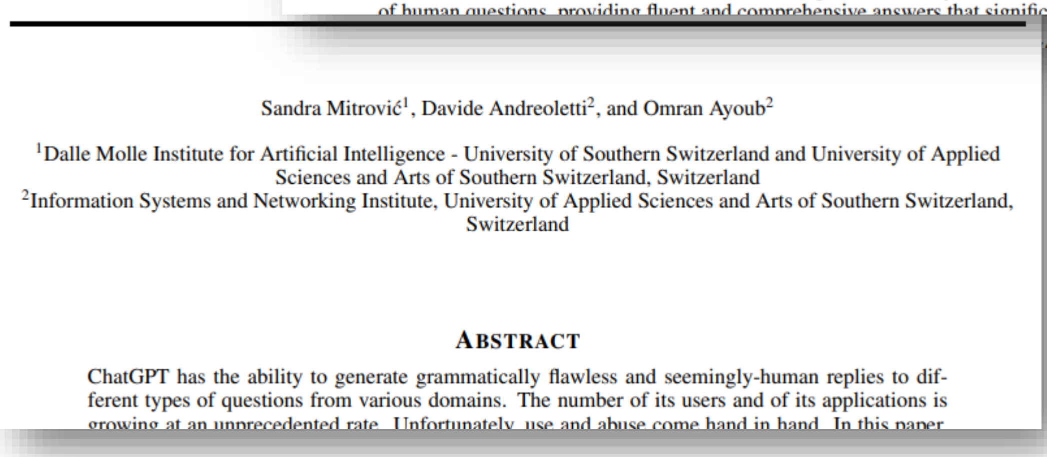
Abstract

The introduction of ChatGPT[2] has garnered widespread attention in both academic and industrial communities. ChatGPT is able to respond effectively to a wide range of human questions, providing fluent and comprehensive answers that significantly



ChatGPT or H
Decisions of M
Sho

Sandra Mitrović[1], Davide Andreoletti[2], and Omran Ayoub[2]
[1]Dalle Molle Institute for Artificial Intelligence - University of Southern Switzerland and University of Applied Sciences and Arts of Southern Switzerland, Switzerland
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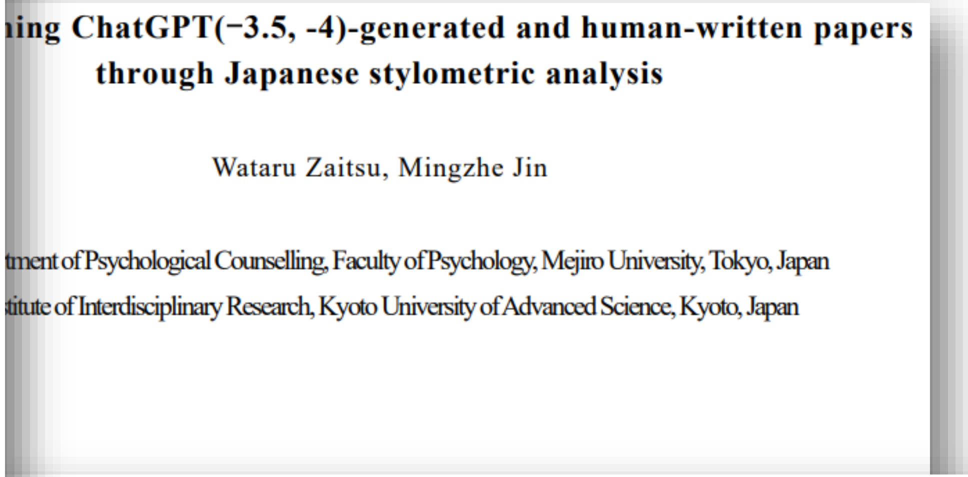
Abstract

ChatGPT has the ability to generate grammatically flawless and seemingly-human replies to different types of questions from various domains. The number of its users and of its applications is growing at an unprecedented rate. Unfortunately, use and abuse come hand in hand. In this paper

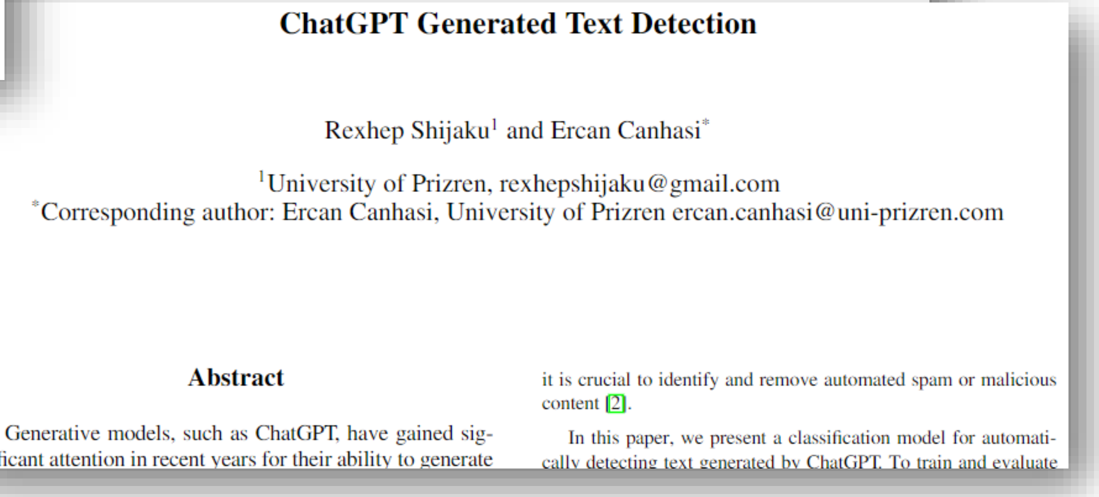
Detection of AI-written restaurant reviews

Focus on Japanese texts



ing ChatGPT(−3.5, -4)-generated and human-written papers through Japanese stylometric analysis

Wataru Zaitsu, Mingzhe Jin
tment of Psychological Counselling, Faculty of Psychology, Mejiro University, Tokyo, Japan
stitute of Interdisciplinary Research, Kyoto University of Advanced Science, Kyoto, Japan



ChatGPT Generated Text Detection

Rexhep Shijaku[1] and Ercan Canhasi[*]
[1]University of Prizren, rexhepshijaku@gmail.com
[*]Corresponding author: Ercan Canhasi, University of Prizren ercan.canhasi@uni-prizren.com

Abstract

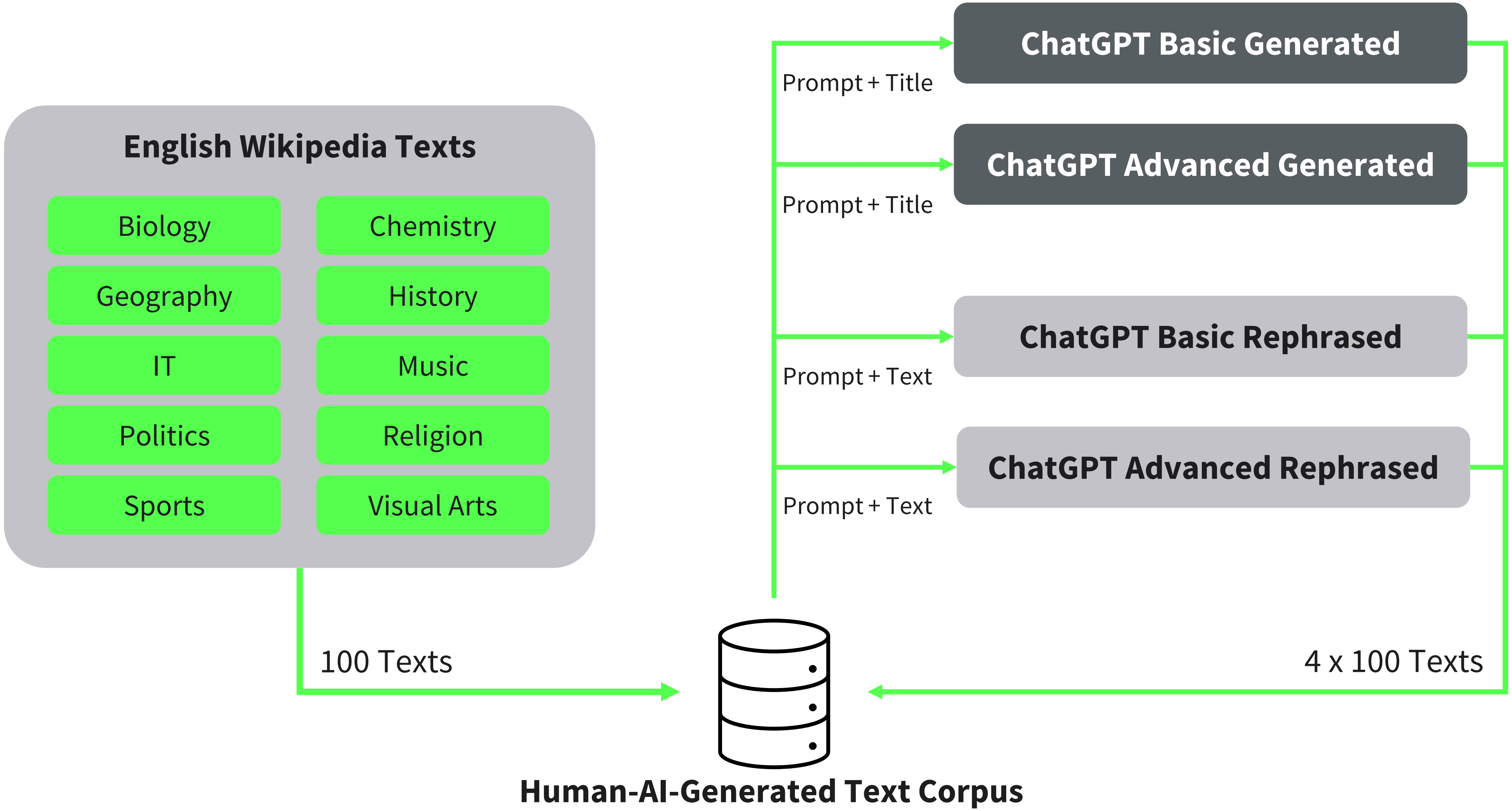
Generative models, such as ChatGPT, have gained significant attention in recent years for their ability to generate

it is crucial to identify and remove automated spam or malicious content [2].

In this paper, we present a classification model for automatically detecting text generated by ChatGPT. To train and evaluate

98% accuracy for detecting AI-generated essays

HUMAN-AI-GENERATED TEXT CORPUS



Corpus available on GitHub:
https://github.com/LorenzM97/human-AI-generatedTextCorpus

HUMAN-AI-GENERATED TEXT CORPUS

Basic Generated

Prompt

Generate a text on the following topic: Australia

Advanced Generated

Prompt

Generate a text on the following topic in a way a human would do it: Australia

Basic Rephrased

Prompt

Rephrase the following text: Australia, officially the Commonwealth of Australia, is a sovereign country […].

Advanced Rephrased

Prompt

Rephrase the following text in a way a human would do it: Australia, officially the Commonwealth of Australia, is a sovereign country […].

FEATURES

Perplexity Features

Mean & max perplexity

Semantic Features

Polarity

Objectivity vs. Subjectivity

List Lookup Features

Stop words (a, the, of)

Personal Pronouns (you, we, them)

Document Features

Mean & std of words per sentence

Unique words per paragraph

Error-Based Features

Grammar errors

Multiple blanks

Readability Features

Flesch Reading Ease

Flesch-Kincaid Grade Level

AI Feedback Features

@ChatGPT: *"Was this text generated by ChatGPT? [text]"*

Text Vector Features

TF-IDF

Sentence Vector

FEATURES

Perplexity Features

Semantic Features

List Lookup Features

Document Features

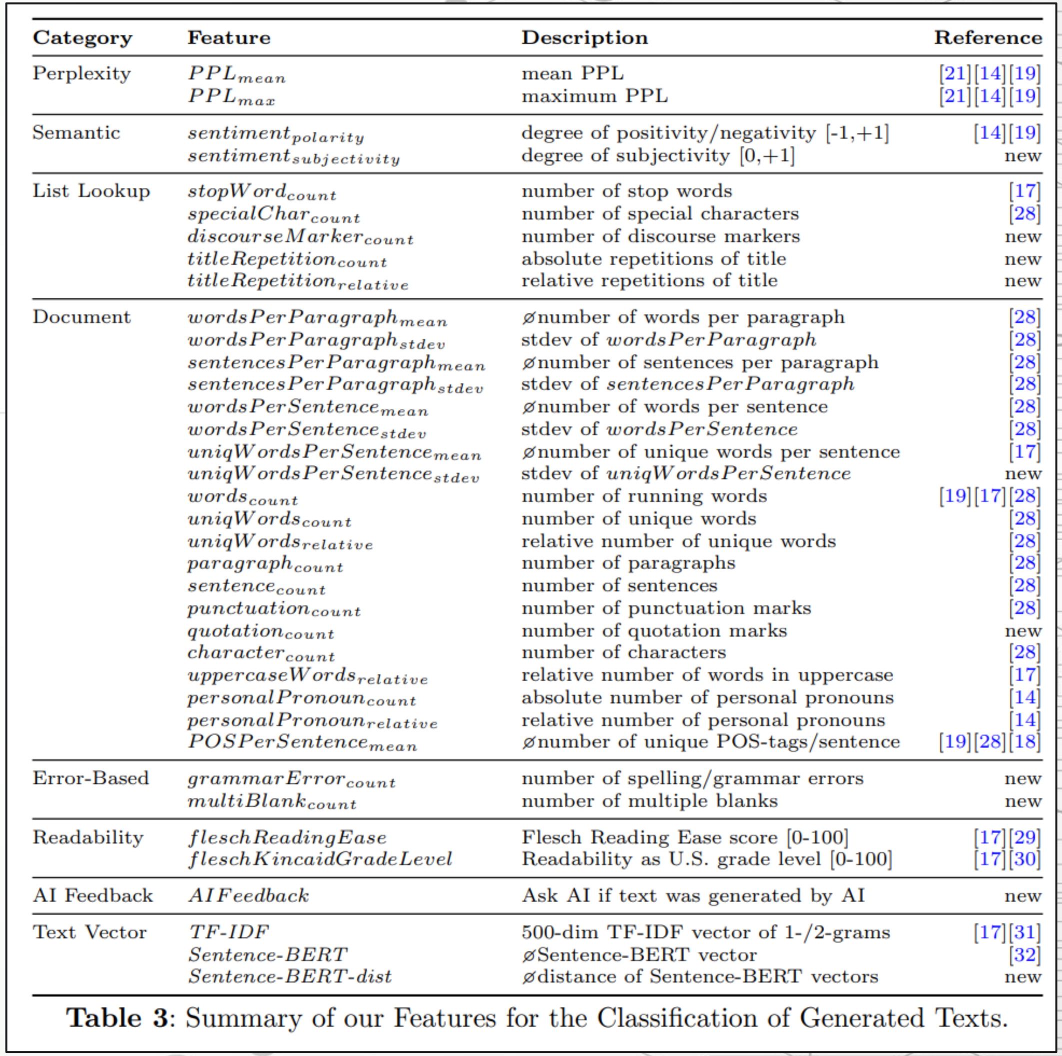
Error-Based Features

Readability Features

AI Feedback Features

Text Vector Features

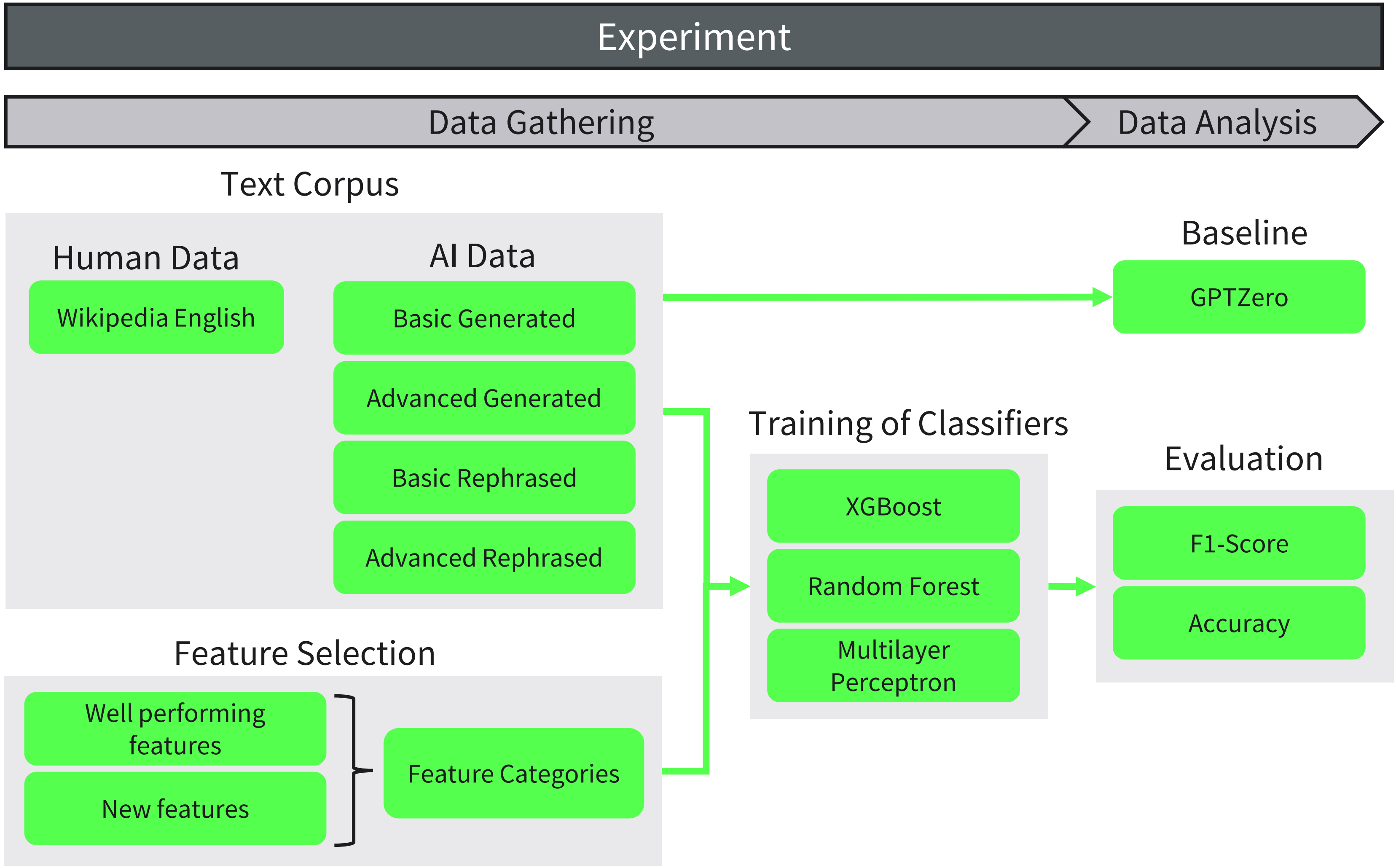
8 feature categories, 37 features



Category	Feature	Description	Reference
Perplexity	PPL_{mean}	mean PPL	[21][14][19]
	PPL_{max}	maximum PPL	[21][14][19]
Semantic	$sentiment_{polarity}$	degree of positivity/negativity [-1,+1]	[14][19]
	$sentiment_{subjectivity}$	degree of subjectivity [0,+1]	new
List Lookup	$stopWord_{count}$	number of stop words	[17]
	$specialChar_{count}$	number of special characters	[28]
	$discourseMarker_{count}$	number of discourse markers	new
	$titleRepetition_{count}$	absolute repetitions of title	new
	$titleRepetition_{relative}$	relative repetitions of title	new
Document	$wordsPerParagraph_{mean}$	⌀number of words per paragraph	[28]
	$wordsPerParagraph_{stdev}$	stdev of $wordsPerParagraph$	[28]
	$sentencesPerParagraph_{mean}$	⌀number of sentences per paragraph	[28]
	$sentencesPerParagraph_{stdev}$	stdev of $sentencesPerParagraph$	[28]
	$wordsPerSentence_{mean}$	⌀number of words per sentence	[28]
	$wordsPerSentence_{stdev}$	stdev of $wordsPerSentence$	[28]
	$uniqWordsPerSentence_{mean}$	⌀number of unique words per sentence	[17]
	$uniqWordsPerSentence_{stdev}$	stdev of $uniqWordsPerSentence$	new
	$words_{count}$	number of running words	[19][17][28]
	$uniqWords_{count}$	number of unique words	[28]
	$uniqWords_{relative}$	relative number of unique words	[28]
	$paragraph_{count}$	number of paragraphs	[28]
	$sentence_{count}$	number of sentences	[28]
	$punctuation_{count}$	number of punctuation marks	[28]
	$quotation_{count}$	number of quotation marks	new
	$character_{count}$	number of characters	[28]
	$uppercaseWords_{relative}$	relative number of words in uppercase	[17]
	$personalPronoun_{count}$	absolute number of personal pronouns	[14]
	$personalPronoun_{relative}$	relative number of personal pronouns	[14]
	$POSPerSentence_{mean}$	⌀number of unique POS-tags/sentence	[19][28][18]
Error-Based	$grammarError_{count}$	number of spelling/grammar errors	new
	$multiBlank_{count}$	number of multiple blanks	new
Readability	$fleschReadingEase$	Flesch Reading Ease score [0-100]	[17][29]
	$fleschKincaidGradeLevel$	Readability as U.S. grade level [0-100]	[17][30]
AI Feedback	$AIFeedback$	Ask AI if text was generated by AI	new
Text Vector	$TF\text{-}IDF$	500-dim TF-IDF vector of 1-/2-grams	[17][31]
	$Sentence\text{-}BERT$	⌀Sentence-BERT vector	[32]
	$Sentence\text{-}BERT\text{-}dist$	⌀distance of Sentence-BERT vectors	new

Table 3: Summary of our Features for the Classification of Generated Texts.

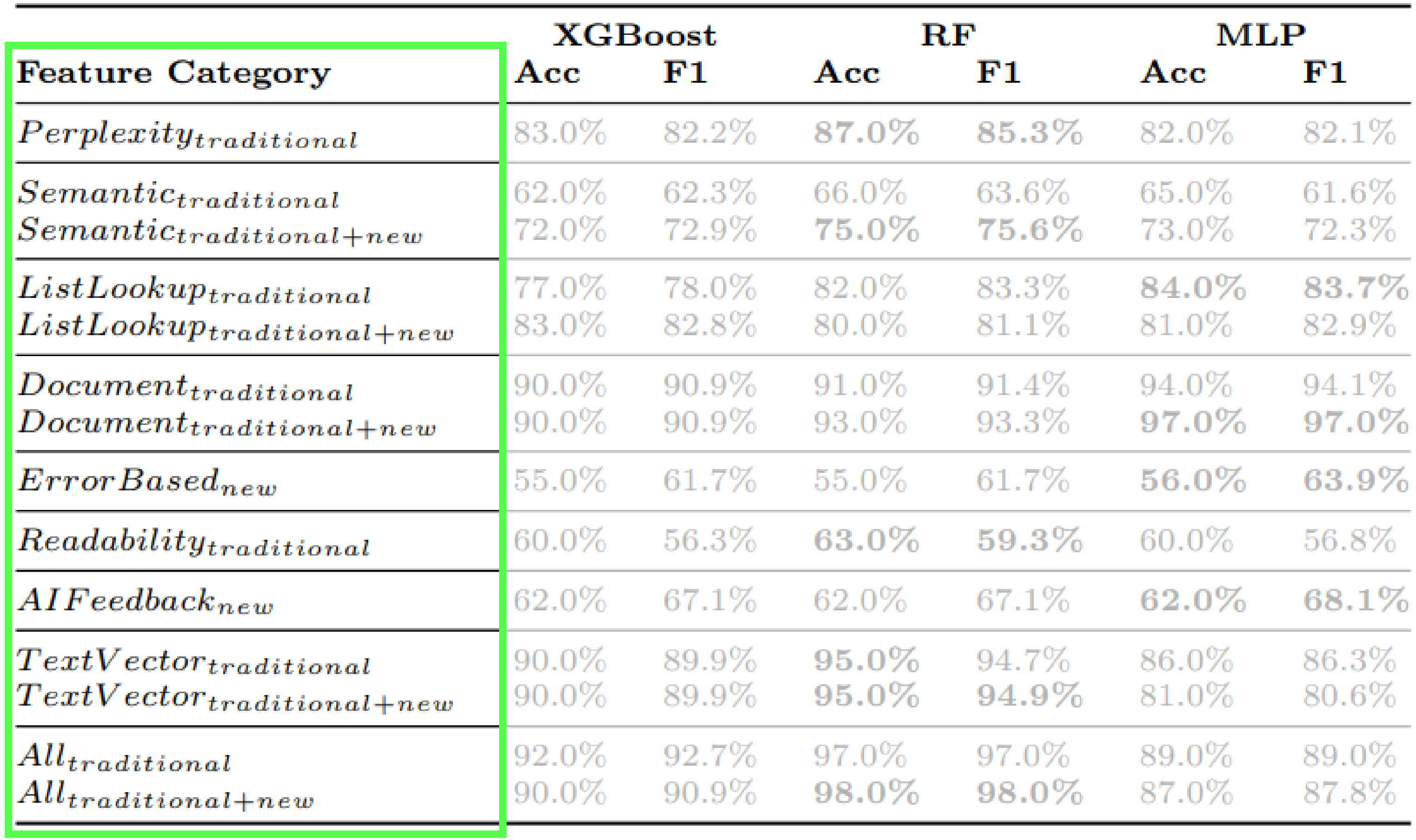
EXPERIMENTS AND RESULTS
OUR APPROACH



Training for:

- Human vs. basic AI-generated
- Human vs. advanced AI-generated
- Human vs. basic AI-rephrased
- Human vs. advanced AI-rephrased

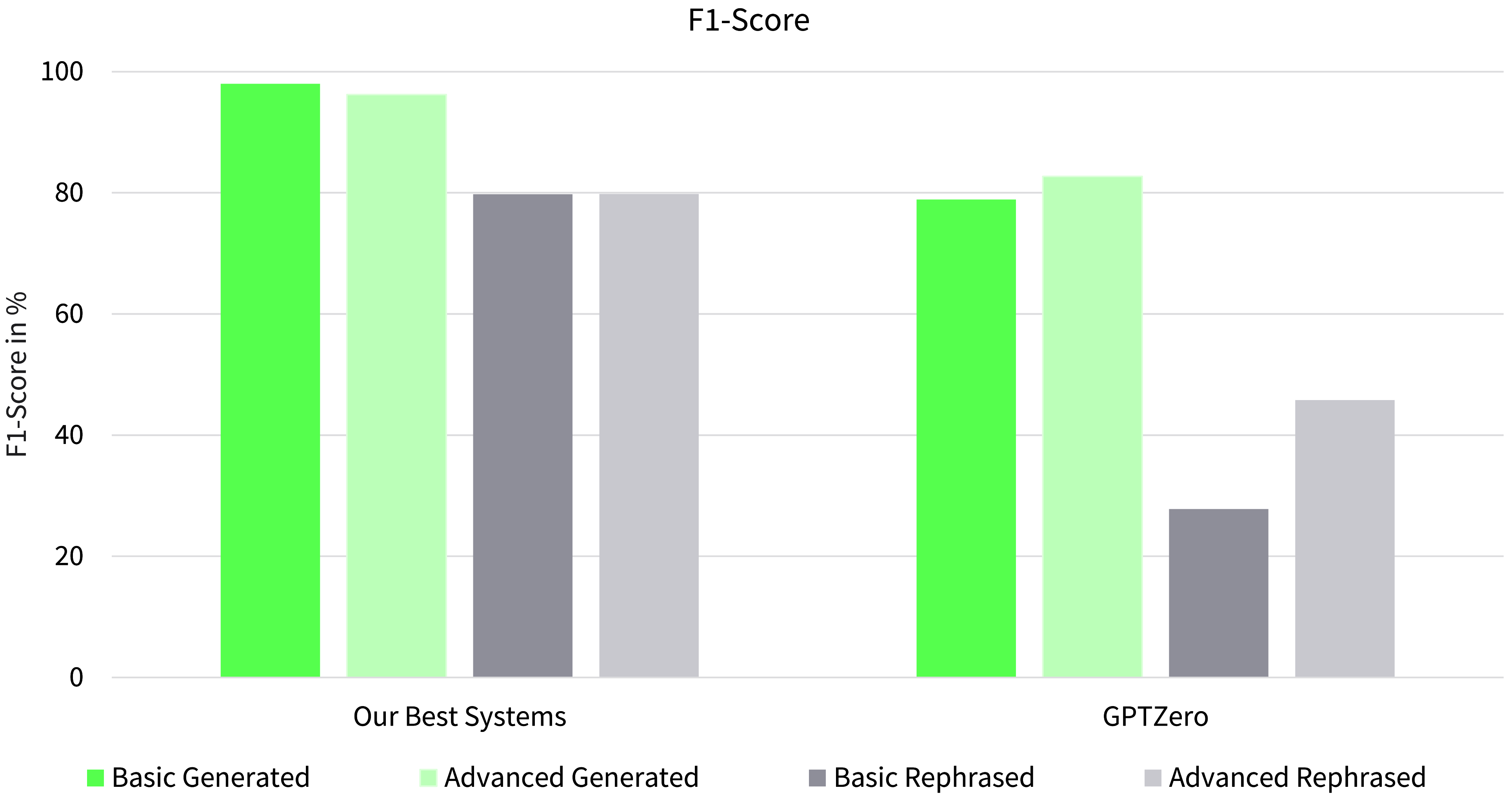
RESULTS



	XGBoost		RF		MLP	
Feature Category	**Acc**	**F1**	**Acc**	**F1**	**Acc**	**F1**
$Perplexity_{traditional}$	83.0%	82.2%	**87.0%**	**85.3%**	82.0%	82.1%
$Semantic_{traditional}$	62.0%	62.3%	66.0%	63.6%	65.0%	61.6%
$Semantic_{traditional+new}$	72.0%	72.9%	**75.0%**	**75.6%**	73.0%	72.3%
$ListLookup_{traditional}$	77.0%	78.0%	82.0%	83.3%	**84.0%**	**83.7%**
$ListLookup_{traditional+new}$	83.0%	82.8%	80.0%	81.1%	81.0%	82.9%
$Document_{traditional}$	90.0%	90.9%	91.0%	91.4%	94.0%	94.1%
$Document_{traditional+new}$	90.0%	90.9%	93.0%	93.3%	**97.0%**	**97.0%**
$ErrorBased_{new}$	55.0%	61.7%	55.0%	61.7%	**56.0%**	**63.9%**
$Readability_{traditional}$	60.0%	56.3%	**63.0%**	**59.3%**	60.0%	56.8%
$AIFeedback_{new}$	62.0%	67.1%	62.0%	67.1%	**62.0%**	**68.1%**
$TextVector_{traditional}$	90.0%	89.9%	**95.0%**	94.7%	86.0%	86.3%
$TextVector_{traditional+new}$	90.0%	89.9%	**95.0%**	**94.9%**	81.0%	80.6%
$All_{traditional}$	92.0%	92.7%	97.0%	97.0%	89.0%	89.0%
$All_{traditional+new}$	90.0%	90.9%	**98.0%**	**98.0%**	87.0%	87.8%

Table 4: Results for Basic Text Generation: XGBoost vs. RF vs. MLP ($Acc_{GPTZero} = 76.0\%$, $F1_{GPTZero} = 78.9\%$).

RESULTS


F1-Score
F1-Score in %
100
80
60
40
20
0
Our Best Systems
GPTZero
Basic Generated
Advanced Generated
Basic Rephrased
Advanced Rephrased

CONCLUSION & FUTURE WORK

INTERNATIONAL
UNIVERSITY OF
APPLIED SCIENCES

Generated > Rephrased

Best F1-score for AI-generated texts: **98%**

Best F1-score for AI-rephrased texts: **78%**

GPTZero < Our Systems

Our best basic text rephrasing detection system performs almost twice as good

Future Work

Improvement of text generation

Investigation of other domains & languages

THANK YOU

Human-AI-Generated Text Corpus

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