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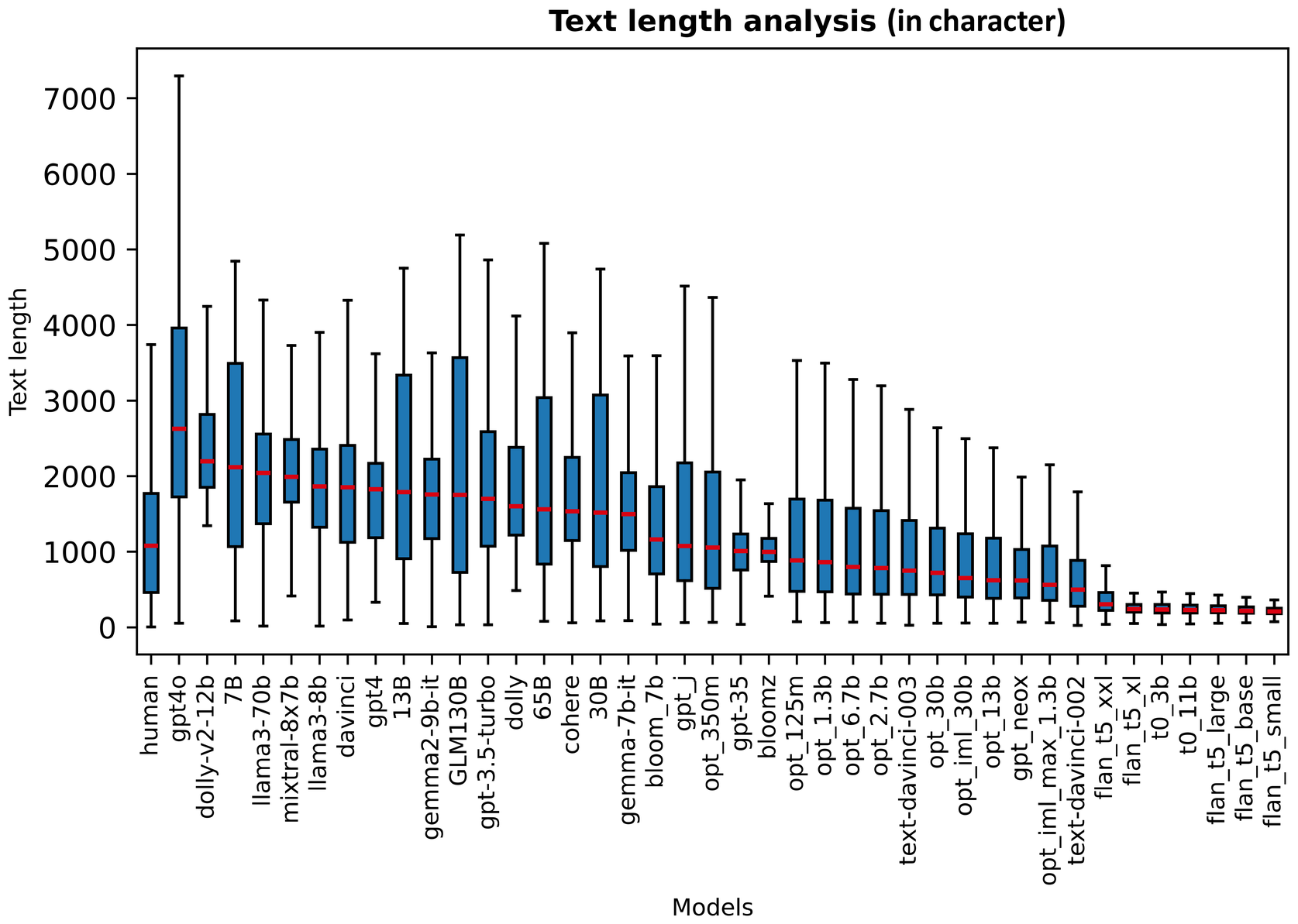
ARTIFICIAL INTELLIGENCE National Laboratory

Beyond Binary - Soft-Voting Multi-Class Classification for Binary Machine-Generated Text Detection Across Diverse Language Models

Mihály Kiss, Gábor Berend

SZTE UNIVERSITY OF SZEGED


Text length analysis (in character)
Text length
0
1000
2000
3000
4000
5000
6000
7000
human
gpt4o
dolly-v2-12b
7B
llama3-70b
mixtral-8x7b
llama3-8b
davinci
gpt4
13B
gemma2-9b-it
GLM130B
gpt-3.5-turbo
dolly
65B
cohere
30B
gemma-7b-it
bloom_7b
gpt_j
opt_350m
gpt-35
bloomz
opt_125m
opt_1.3b
opt_6.7b
opt_2.7b
text-davinci-003
opt_30b
opt_iml_30b
opt_13b
gpt_neox
opt_iml_max_1.3b
text-davinci-002
flan_t5_xxl
flan_t5_xl
t0_3b
t0_11b
flan_t5_large
flan_t5_base
flan_t5_small
Models

Text quality comparison

Flan_t5_small

A 0day bug exists in iOS 13.4.1 that allows malicious attackers to steal iMessage history. The bug allows apps to access sms.db and send it to a remote server. Steps 0day bug exists in iOS 13,4.1 that allows malicious attackers to steal iMessage history.

GPT4o

In this study, we address the challenge of distinguishing genuine gravitational-wave (GW) burst signals from spurious noise artifacts in interferometric detectors. Our primary objective is to enhance the reliability of GW detections by developing robust physical instrumental vetoes. We propose a novel methodology that leverages auxiliary channels to identify and exclude non-astrophysical triggers. By systematically analyzing correlations between GW burst triggers and instrumental noise, we establish criteria for vetoing false positives...

Experiments

Argmax – Deberta – 512 token

Experiments

- **41 class**

A straightforward approach: treat each model as a separate class.

Experiments

- 41 class
- **5/6 class (parameter-based)**

Human	Below 1 billion	1.3-5 billion	6-10 billion	11-130 billion	Above 130 billion
human	flan_t5_small, opt_125m, flan_t5_base, opt_350m, flan_t5_large	opt_1.3b, opt_iml_max_1.3b, opt_2.7b, t0_3b, flan_t5_xl	dolly, gpt_j, opt_6.7b, mixtral-8x7b, gemma-7b-it, bloom_7b, 7B, llama3-8b, gemma2-9b-it	t0_11b, flan_t5_xxl, dolly-v2-12b, 13B, opt_13b, gpt_neox, opt_iml_30b, 30B, opt_30b, 65B, llama3-70b, bloomz, GLM130B	davinci, gpt-35, text-davinci-003, text-davinci-002, gpt-3.5-turbo, cohere, gpt4o, gpt4

Experiments

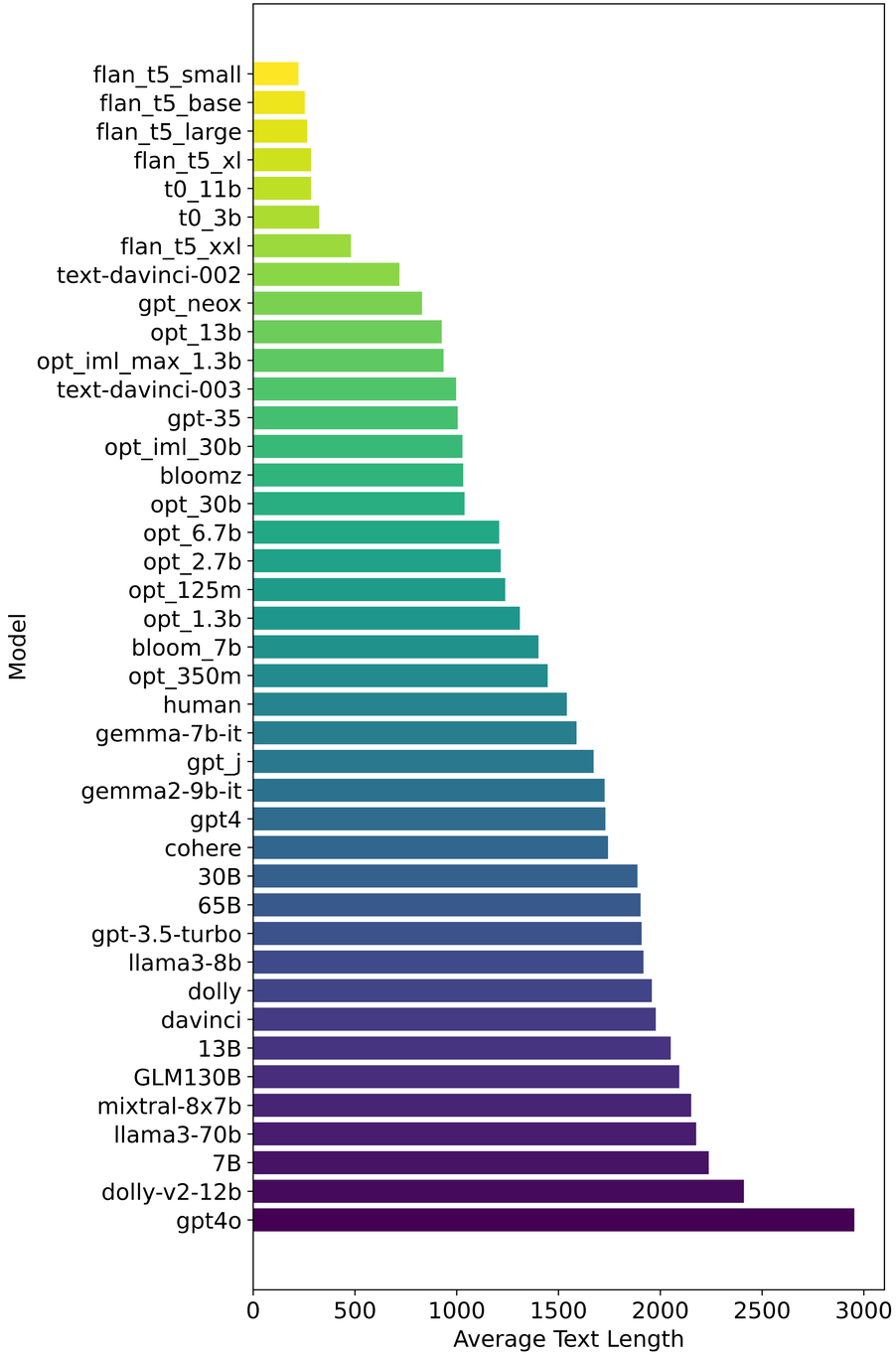
- 41 class
- 5/6 class (parameter-based)
- **3 class (strength-based)**

Human	**Weak**	**Strong**
human	Flan_t5 Opt_3b Bloom_7b ...	GPT4 Mixtral Llama3 ...

Experiments

- 41 class
- 5/6 class (parameter-based)
- 3 class (strength-based)
- **Length-based (41 class)**

3 intervals, 3 expert models



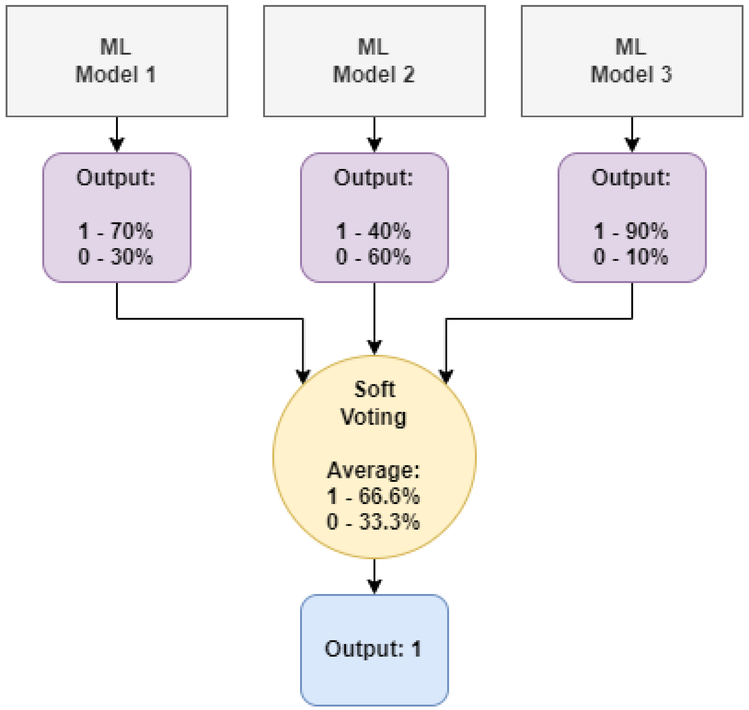
Experiments

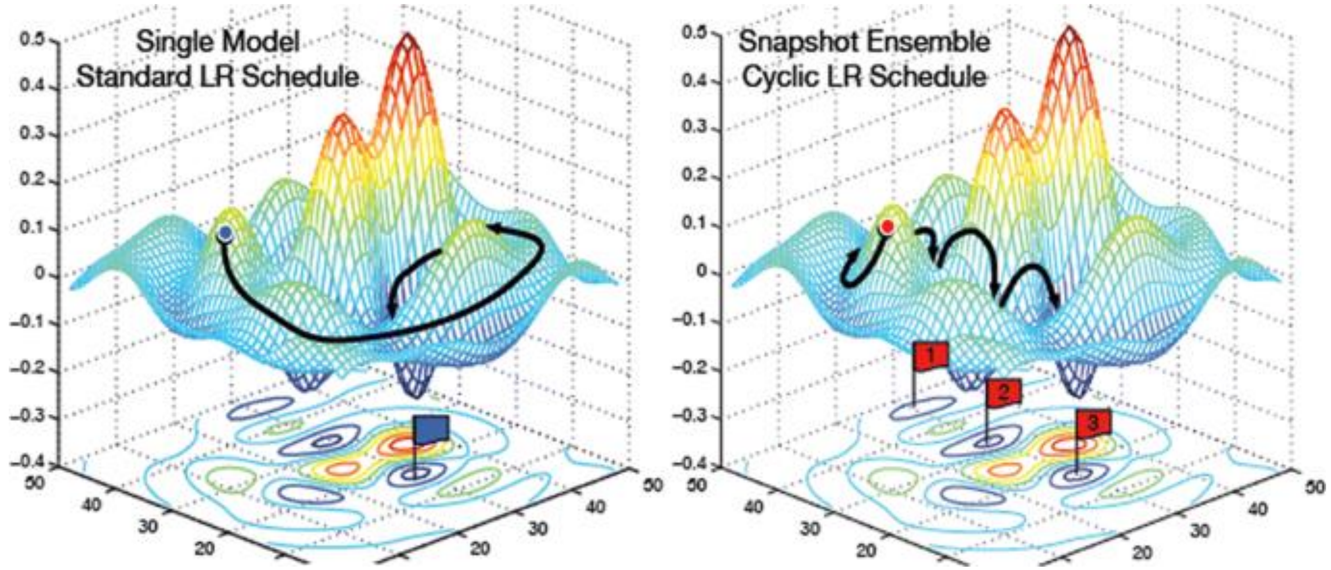
- 41 class
- 5/6 class (parameter-based)
- 3 class (strength-based)
- Length-based (41 class)

Reduced to binary (using argmax)

Ensembles

Standard and snapshot ensembles





Results

Experiment	Without Ensemble	Ensemble
Binary	0.780	0.795
3-class	0.750	0.754

Results

Experiment	Without Ensemble	Ensemble
Binary	0.780	0.795
3-class	0.750	0.754
5-class	0.790	0.796
6-class	0.771	0.791

Results

Experiment	Without Ensemble	Ensemble
Binary	0.780	0.795
3-class	0.750	0.754
5-class	0.790	0.796
6-class	0.771	0.791
41-class	0.806	0.826
Snapshot	0.796	0.810
Length-based	**0.820**	**0.827**

Results - zeroGPT

Experiment	F1-score
zeroGPT	0.715
Binary	0.797
3-class	0.767
5-class	0.814
6-class	0.805
41-class	0.836
Snapshot	0.826
Length-based	**0.845**

Results - zeroGPT

Experiment	F1-score
zeroGPT	0.715
Binary	0.797
3-class	0.767
5-class	0.814
6-class	0.805
41-class	0.836
Snapshot	0.826
Length-based	**0.845**

Experiment	F1-score
zeroGPT	0.615
Binary	0.794
3-class	0.830
5-class	**0.841**
6-class	0.838
41-class	0.831
Snapshot	0.812
Length-based	0.807

Summary

- It is worth considering the problem as non-binary
- The ensemble methods helped in all the experiments
- Length-based expert models achieved the best result

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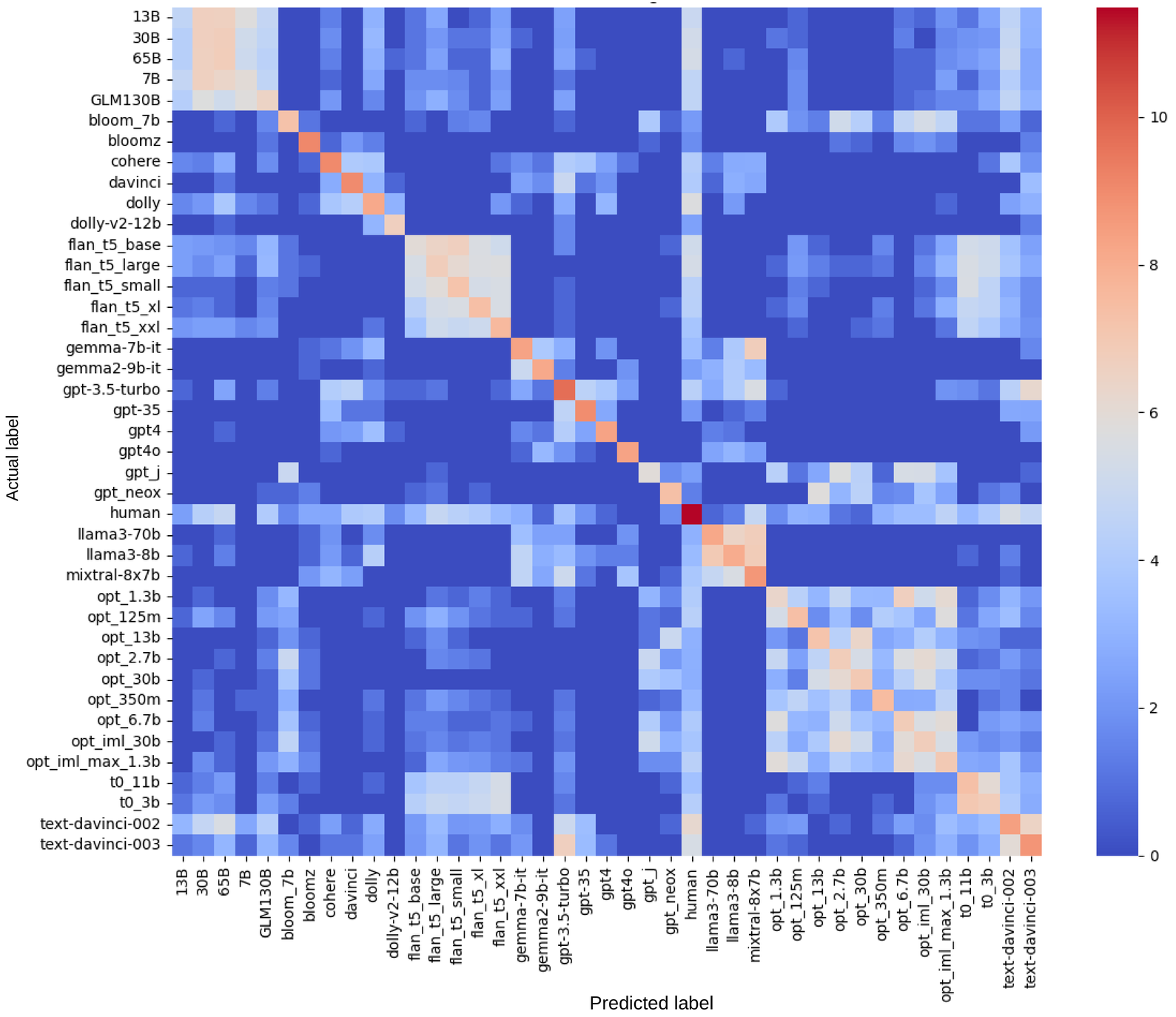
SZTE University of Szeged


Actual label
Predicted label
13B
30B
65B
7B
GLM130B
bloom_7b
bloomz
cohere
davinci
dolly
dolly-v2-12b
flan_t5_base
flan_t5_large
flan_t5_small
flan_t5_xl
flan_t5_xxl
gemma-7b-it
gemma2-9b-it
gpt-3.5-turbo
gpt-35
gpt4
gpt4o
gpt_j
gpt_neox
human
llama3-70b
llama3-8b
mixtral-8x7b
opt_1.3b
opt_125m
opt_13b
opt_2.7b
opt_30b
opt_350m
opt_6.7b
opt_iml_30b
opt_iml_max_1.3b
t0_11b
t0_3b
text-davinci-002
text-davinci-003
0
2
4
6
8
10