MAGPIE: Multi-Task Analysis of Media-Bias Generalization with Pre-Trained Identification of Expressions

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Presentation plan

1. Motivation
2. Media Bias detection
3. Methodology
4. Experimental results
5. Conclusion

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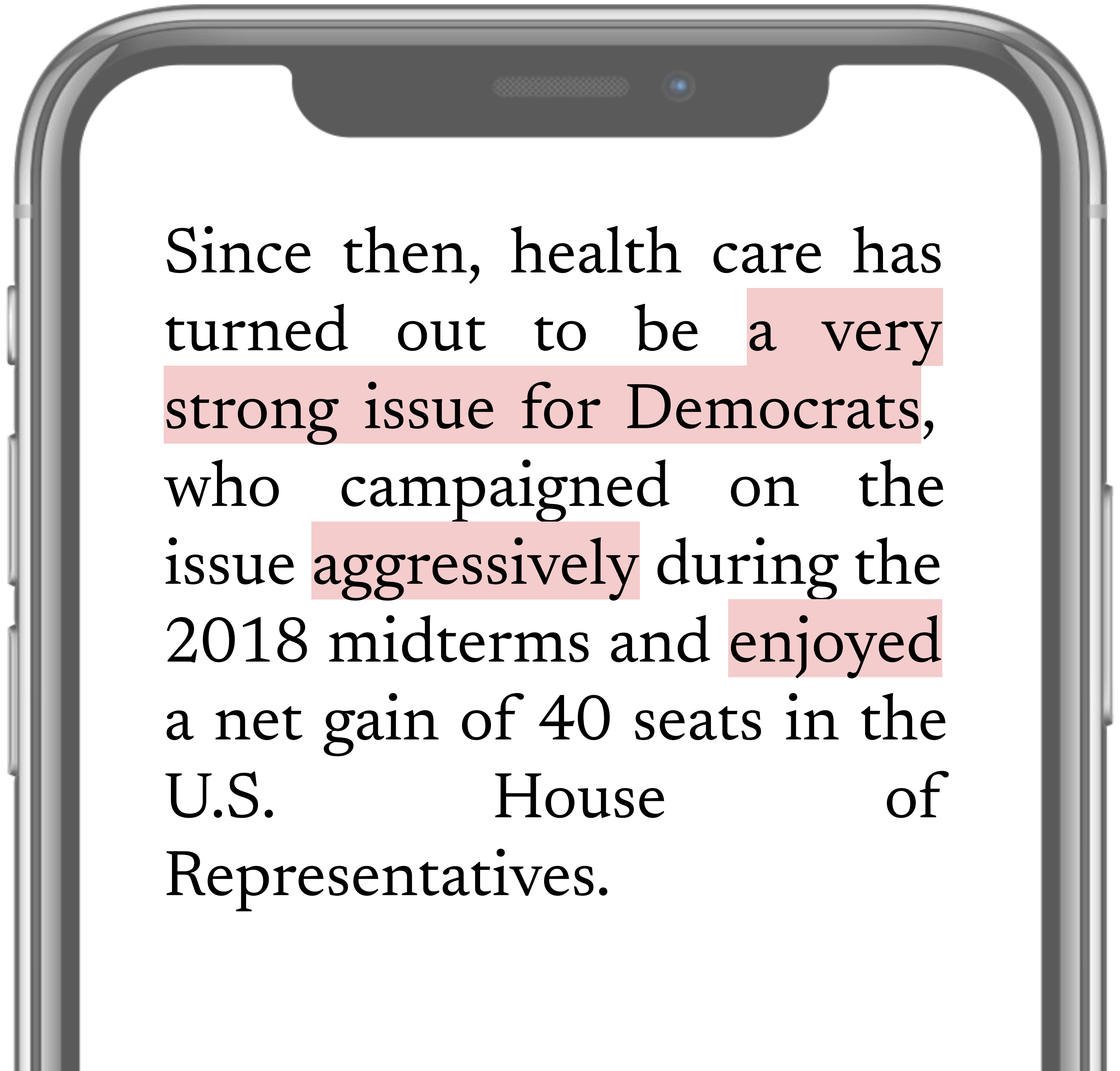
Media bias

- **Media Bias** — *noun*. The tendency of news media to report in a way that reinforces a viewpoint, worldview, preference, political ideology, corporate or financial interests, moral framework, or policy inclination, instead of reporting in an objective way.



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Detecting media bias

- A binary classification problem
- Granularity - article vs sentence level
- Main datasets:
  - BABE (~4k sentences)
  - Basil (~8k sentences)
- There has been a substantial number of efforts in improving the classifiers
- the main issue remains : lack of quality datasets

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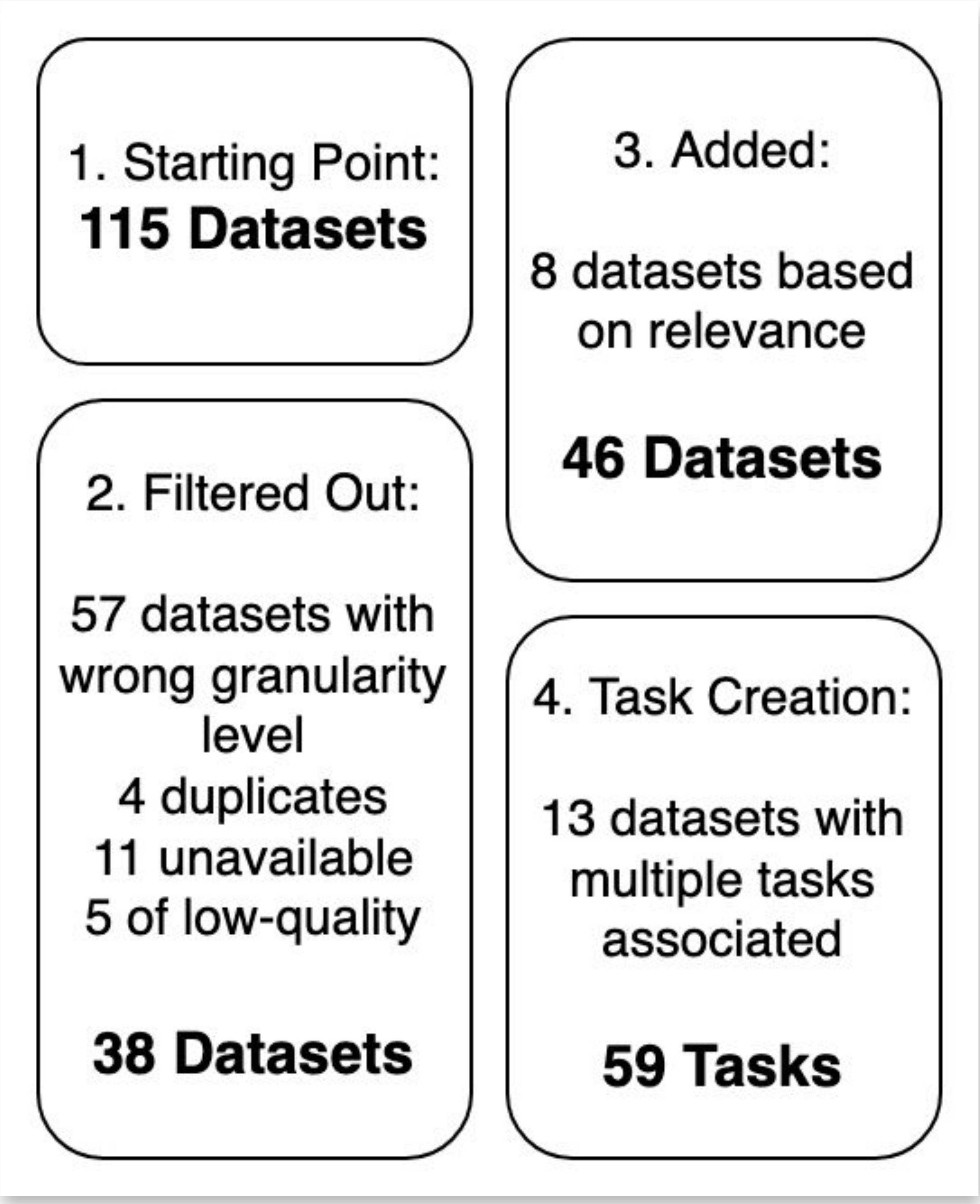
Multi-task learning

- Media bias is a multifaceted phenomenon
- In this work we use MTL for media bias detection as a solution to the problem of the lack of high quality data
- We base our work on findings of ExT5 and Muppet [1,2]

Method

LBM - Large Bias Mixture

- 59 tasks
- over 1.200.000 labeled sentences



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LBM - Task families

Task Family	#sentences
News bias	19 759
Subjective bias	69 610
Hate-speech	485 179
Gender bias	121 983
Sentiment analysis	199 273
Fake news	39 063
Group bias	19 782
Emotional bias	218 589
Subjective bias	45 686

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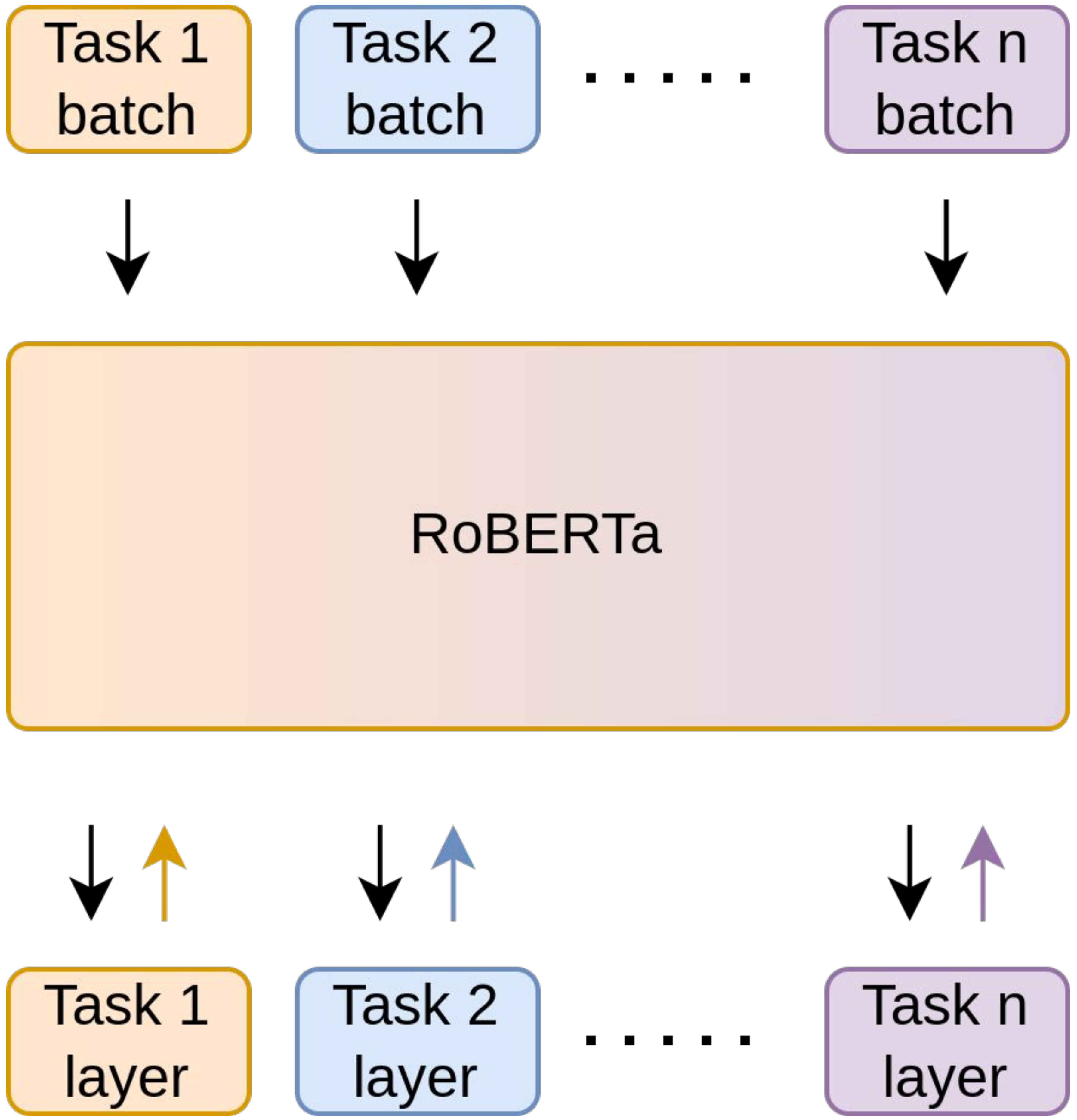
Multi-task Training strategy

- RoBERTa with hard-shared parameters
- Gradient aggregation - PCGrad [3]
- Loss scaling - Static scaling [2]
- Task selection - GradTS [4]



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Experiments

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Experiment 1: Evaluation of the MTL model on media bias task

- ***Objective***: We want to compare different sets of tasks and its effect on downstream performance on BABE dataset

- We use multi-task learning for pre-training and then fine-tune and evaluate the model on BABE dataset
- All are averaged on 30 random seeds

Experiment 1: Comparison of different task-selection strategies

- ***Objective***: We want to compare different sets of tasks and its effect on downstream performance on BABE dataset

- We use multi-task learning for pre-training and then fine-tune and evaluate the model on BABE dataset
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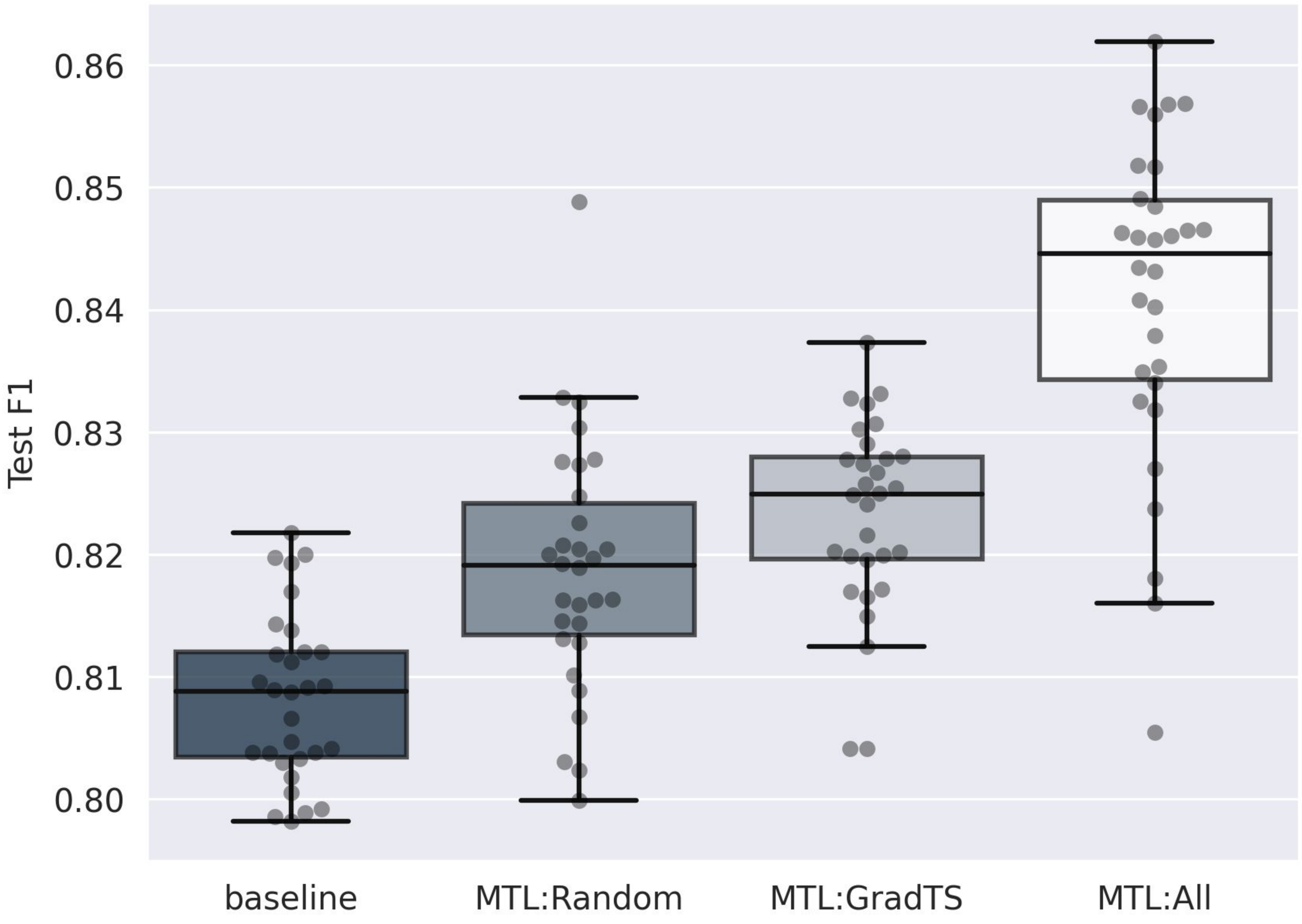
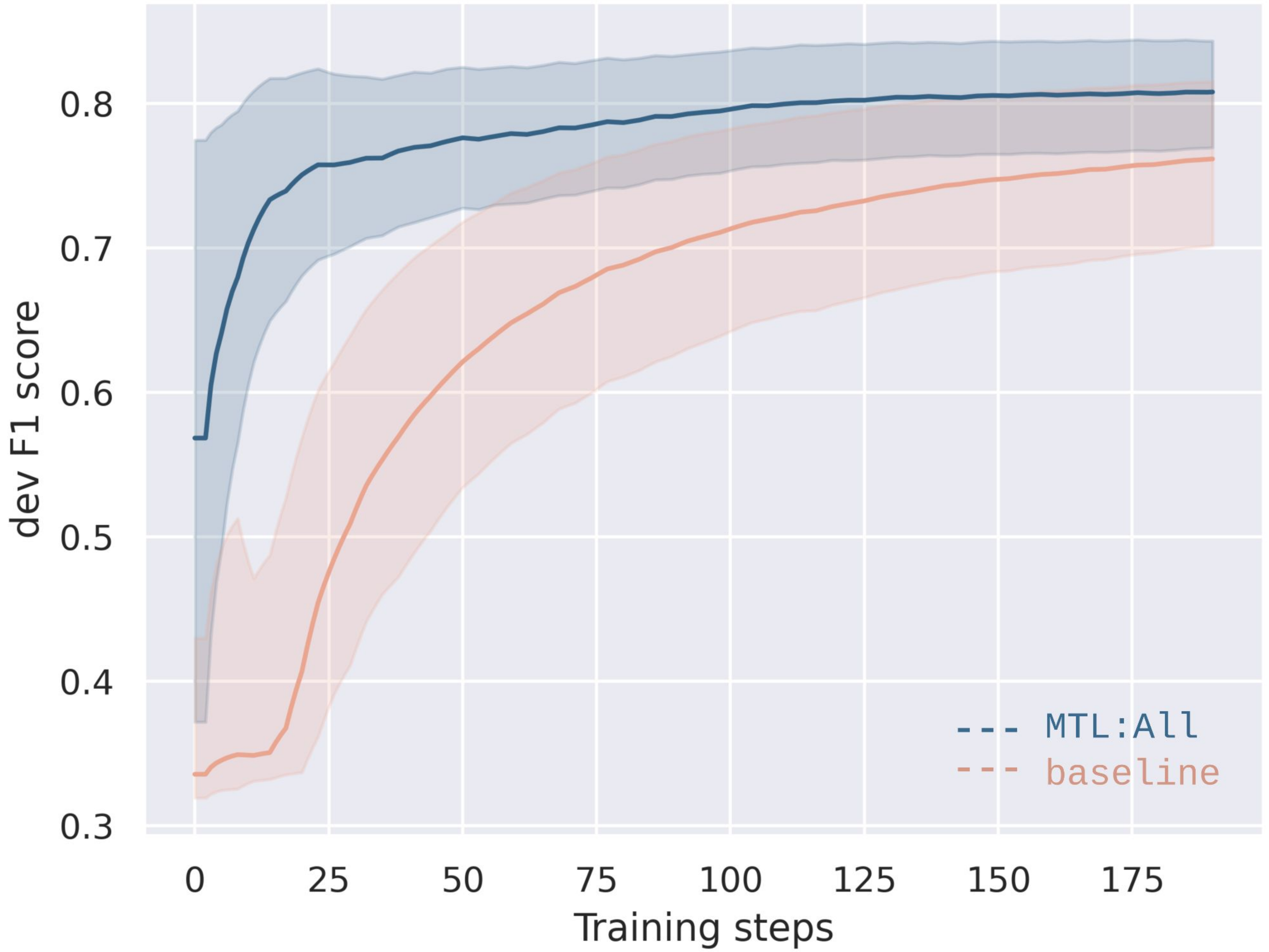


Experiment 1: Downstream performance

Model	F1	Acc	loss
Baseline (RoBERTa base)	80.83 (±0.69)	81.19 (±0.69)	43.6 (±3.54)
DA-RoBERTa	77.83 (±1.4)	78.56 (±1.3)	47.84 (±2.97)
MUPPET	80.56 (±1.3)	81.18 (±1.16)	44.19 (±4.65)
UnifiedM2	81.91 (±0.91)	82.41 (±0.88)	44.86 (±3.99)
MTL:Random	81.88 (±1.02)	82.28 (±0.97)	40.35 (±1.73)
MTL:GradTS	82.32 (±0.79)	82.64 (±0.8)	40.96 (±2.36)
MTL:All	**84.1** (±1.33)	**84.44** (±1.25)	**39.46** (±2.41)

Experiment 1: Downstream performance

- 15% steps are required to match the single-task performance

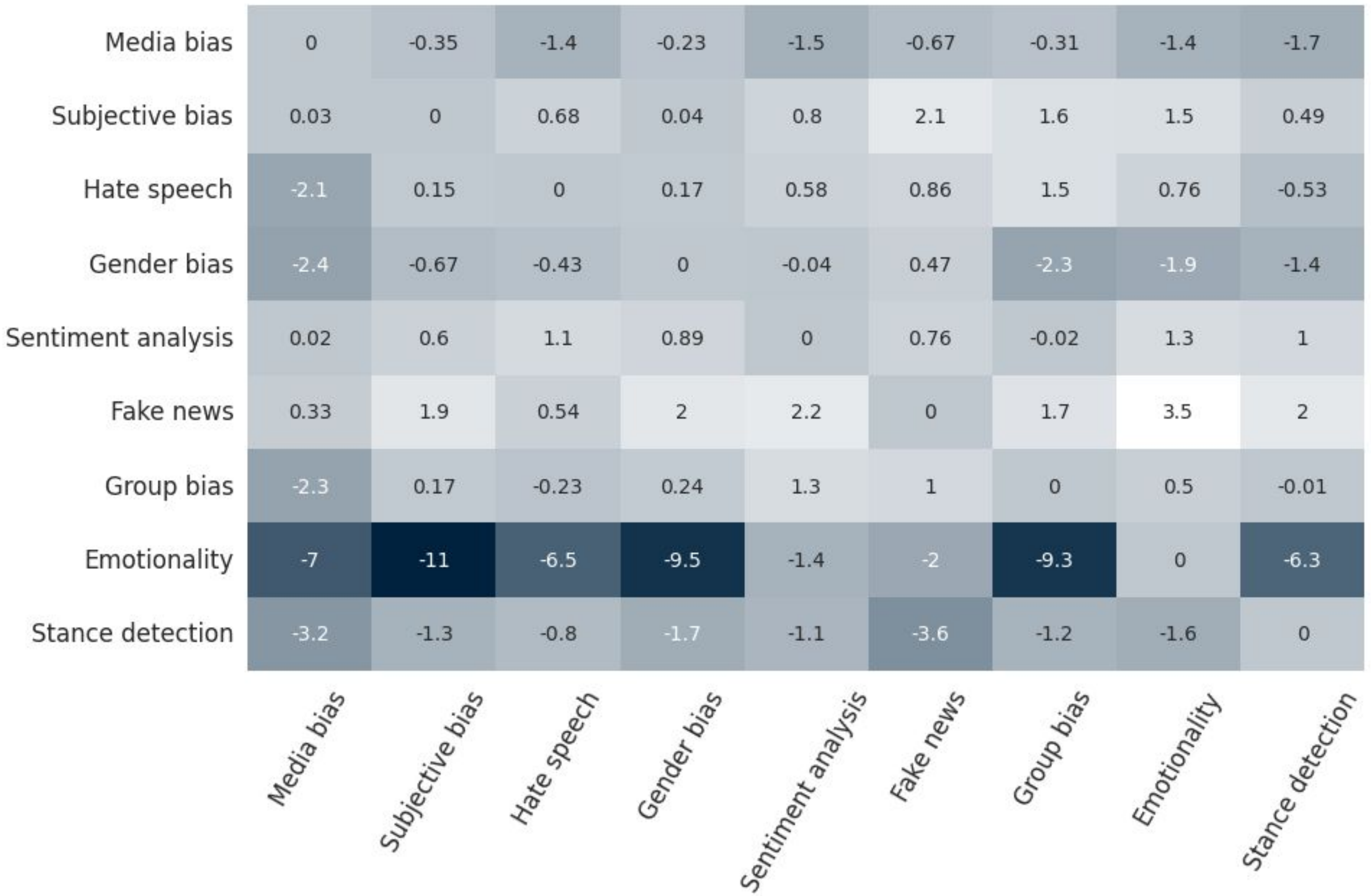


Experiment 2: Can we improve the performance further?

- How do task families affect each other?
- Can we exploit the task families for more focused subset of tasks?

- We pairwise train task families together and report and average improvement within the task families

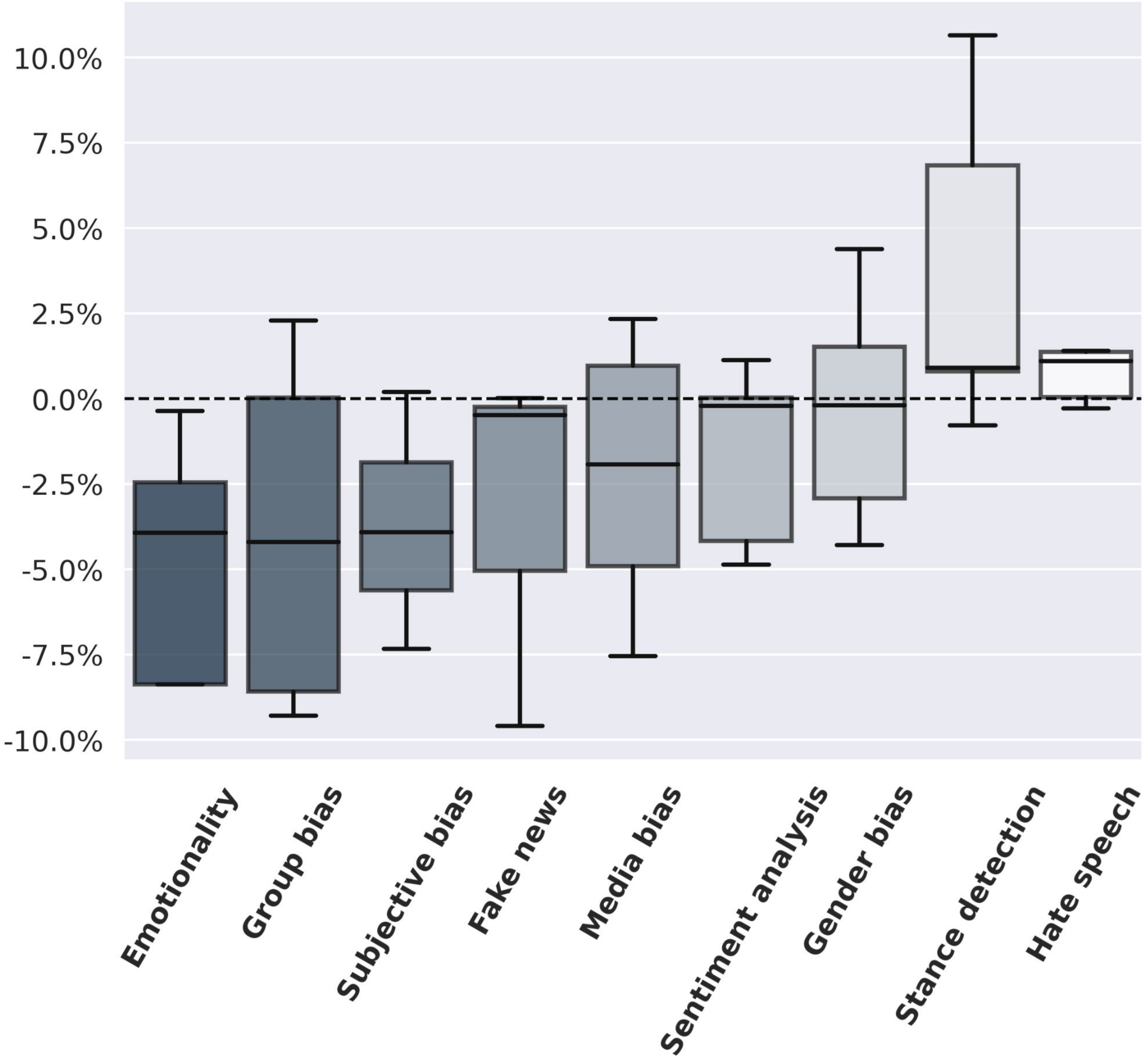
Experiment 3: How do task families affect each other?



Task Family	Transfer **from**	Transfer **to**
media bias	-2.07%	-0.94%
subjective bias	-1.26%	0.89%
hate speech	-0.87%	0.17%
gender bias	-1.01%	-1.07%
sentiment analysis	0.11%	0.72%
fake news	-0.13%	1.79%
group bias	-1.04%	0.09%
emotionality	0.34%	-6.56%
stance detection	-0.79%	-1.83%

Experiment 3: How do task families affect each other?

- Almost all task families underperform in MTL setting
- The negative transfer is not a reliable measure for large-scale MTL performance



Summary : contributions

- We release an LBM - a curated set of datasets for multi-task pre-training
- We release a pre-trained model for downstream tasks
- We show a new state-of-the-art method for media bias dataset, surpassing previous efforts by 3.3%

mediabiasgroup/magpie-babe-ft

mediabiasgroup/magpie-pt

github.com/magpie-multi-task

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Thank you for your attention

References

[1] Aribandi, Vamsi, et al. "Ext5: Towards extreme multi-task scaling for transfer learning." arXiv preprint arXiv:2111.10952 (2021).

[2] Aghajanyan, Armen, et al. "Muppet: Massive multi-task representations with pre-finetuning." arXiv preprint arXiv:2101.11038 (2021).§

[3] Yu, Tianhe, et al. "Gradient surgery for multi-task learning." Advances in Neural Information Processing Systems 33 (2020): 5824-5836.

[4] Ma, Weicheng, et al. "GradTS: a gradient-based automatic auxiliary task selection method based on transformer networks." arXiv preprint arXiv:2109.05748 (2021).