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❖ Instructor Intervention in MOOC forums

- MOOC forums are the primary medium for classmates to talk among themselves and to talk to the instructor.
- However, at MOOC scale instructors need a discussion forum triage to selectively intervene on student discussions given their limited bandwidth.
- Machine learning models to aid instructor interventions are hampered by biased training data.

❖ Discussion Forum Corpus

# of courses	# of intervened	# of non-intervened
14	2635	4584

❖ Does Position Bias predict intervention?

Courseid	EDM			EDM + PB		
	P	R	F ₁	P	R	F ₁
ML-005	81.1	46.5	59.1	92.8	55.7	69.6
RPROG-003	47.2	50.0	48.6	67.3	51.5	58.3
CALCI-003	65.4	88.5	75.2	100	49.6	66.3
MATHTHINK-004	36.8	17.1	23.3	100	48.8	65.6
BIOELECTRICITY-002	76.9	60.6	67.8	100	24.2	39.0
BIOINFOMETHODS-001	35.3	26.1	30.0	100	56.6	72.2
COMPARCH-002	42.9	60.0	50.0	100	30.0	46.2
MEDICALNEURO-002	83.3	83.3	83.3	100	100	100
SMAC-001	23.5	15.4	18.6	100	73.1	84.4
COMPLERS-004	33.3	50.0	40.0	33.3	50.0	40.0
CASEBASEDBIOSTAT-002	8.3	50.0	14.3	20.0	50.0	28.6
GAMETHEORY2-001	25.0	14.3	18.2	100	57.1	72.7
MACRO AVERAGE	43.0	43.2	43.1	78.0	49.7	60.7

❖ Method: Debiased Classifier using Instance Reweighting

- Instance level weighted Support Vector Machine (SVM)
- Weights computed from propensity scores, that is propensity for a thread to be intervened. Ex: Rank 1 on UI => high propensity to intervene
- Weigh high propensity intervention less as they are likely to be biased intervention
- Weigh low propensity interventions high as they are likely to be unbiased interventions
- Weigh repeatedly rejected non-intervention (likely unbiased) high
- Similarly, interventions with fewer rejections (likely biased) are weighed low

❖ Results from a debiased classifier

Intervention Ratio Range	Biased			Debiased		
	P	R	F ₁	P	R	F ₁
0.48 < I. Ratio < 3.01	55.5	54.9	55.2	53.4	79.3	63.4
0.0 < I. Ratio < 0.2	33.1	23.9	27.7	22.7	15.0	18.1

❖ Biased UI of Coursera's discussion forum

The screenshot shows a list of forum threads. The threads are sorted by 'Last updated' time, which is highlighted with a red box. The threads include 'Sectional Quiz 2, Question 4', 'Assignment AT3G59490 Qtn.1 - InterProScan doesn't find sequence', and 'Hard Deadline'. Each thread shows its score, number of posts, and number of views.

Figure 1. Instructors are presented with a list of threads sorted by their ..Last Updated Time% by default inducing a bias in their of choice discussion to read and intervene.

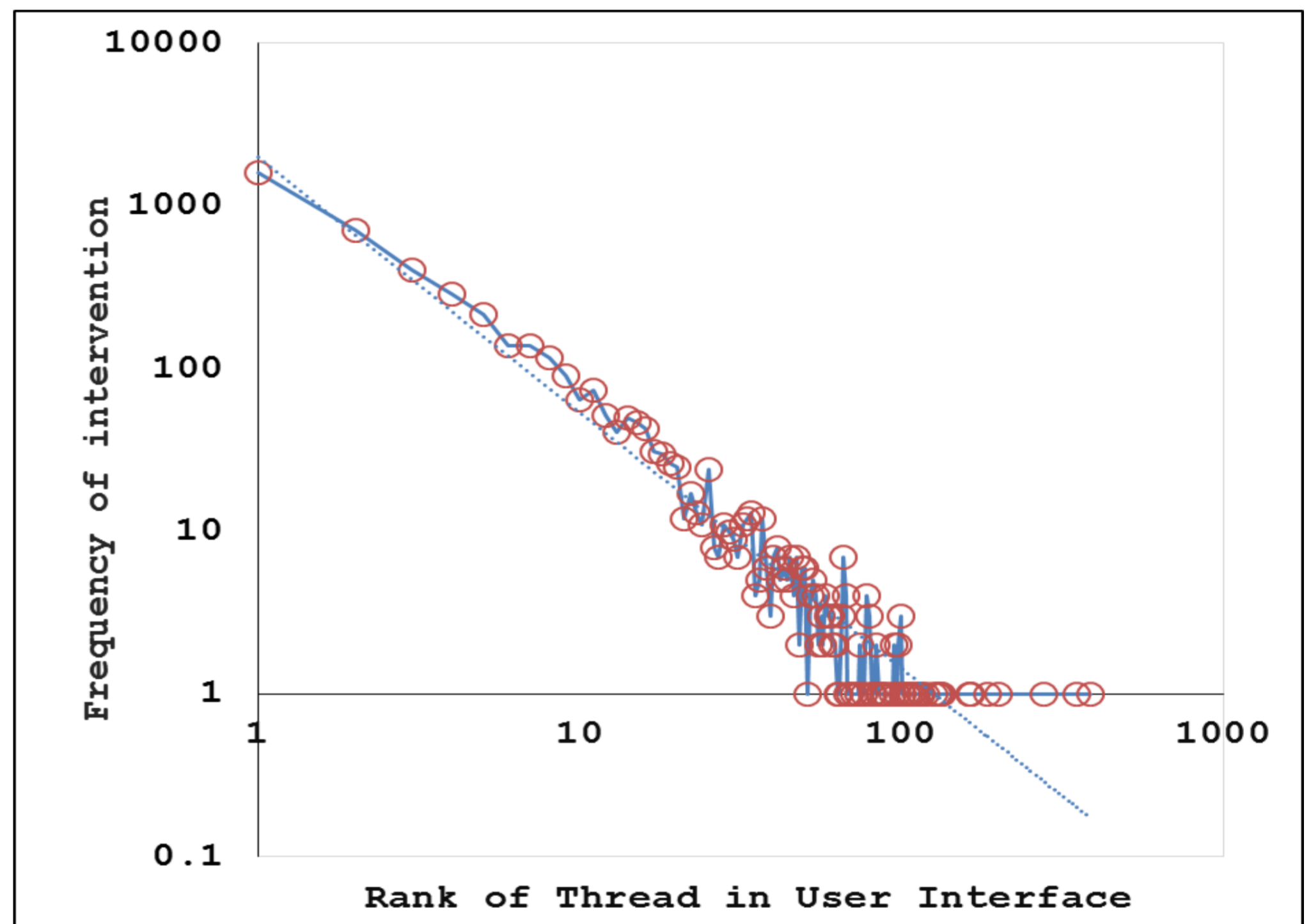


Figure 2. The log-log Plot shows the intervention frequency over the rank of threads on the UI follows a log-linear distribution.

Ex 1: Thread Title: There is a mistake at 6:00 in the Week 3 Regularization Cost Function lecture

Original Poster: The error can be seen and heard in the Week3, Regularization, Cost Function lecture at 6 min. The summation should be over variable j, Andrew Ng also orally refers to "summation over i" of that term, which again should be summation over j. The next slide shows a typeset version of the formula with the correct subscripts. <Screenshot>

Ex 2: Thread Title PS6 #2

Original Poster: I misses this one so I thought I'd seek clarification Can someone help me understand because set theory is definitely a weakness of mine.

(various student answers follow)

Original Poster: I understand the empty set is a subset of every set, and I agree .. But in the proof Just confused about how ...

Figure 3. Two threads that should have been intervened where EDM+DB correctly identifies as needing intervention.

❖ Conclusion

- We confirm the existence of position bias in instructor interventions in MOOC forums
- We propose a debiased classifier to counter the bias
- Further the debiased classifier identifies clear cases where intervention is warranted but was overlooked by the instructor
- Community should be mindful of the UI / UX bias and make careful design choices