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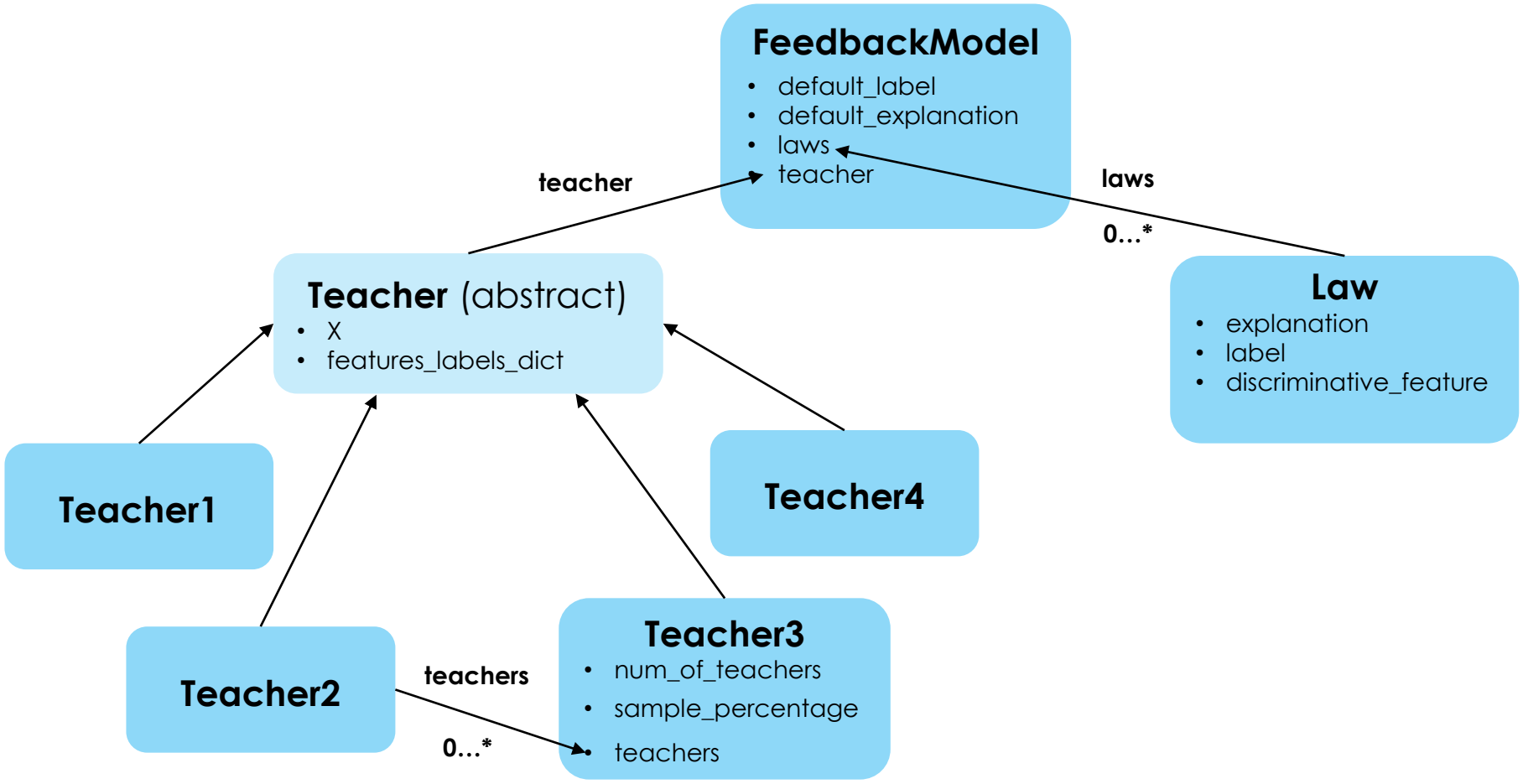
DATA ANALYSIS

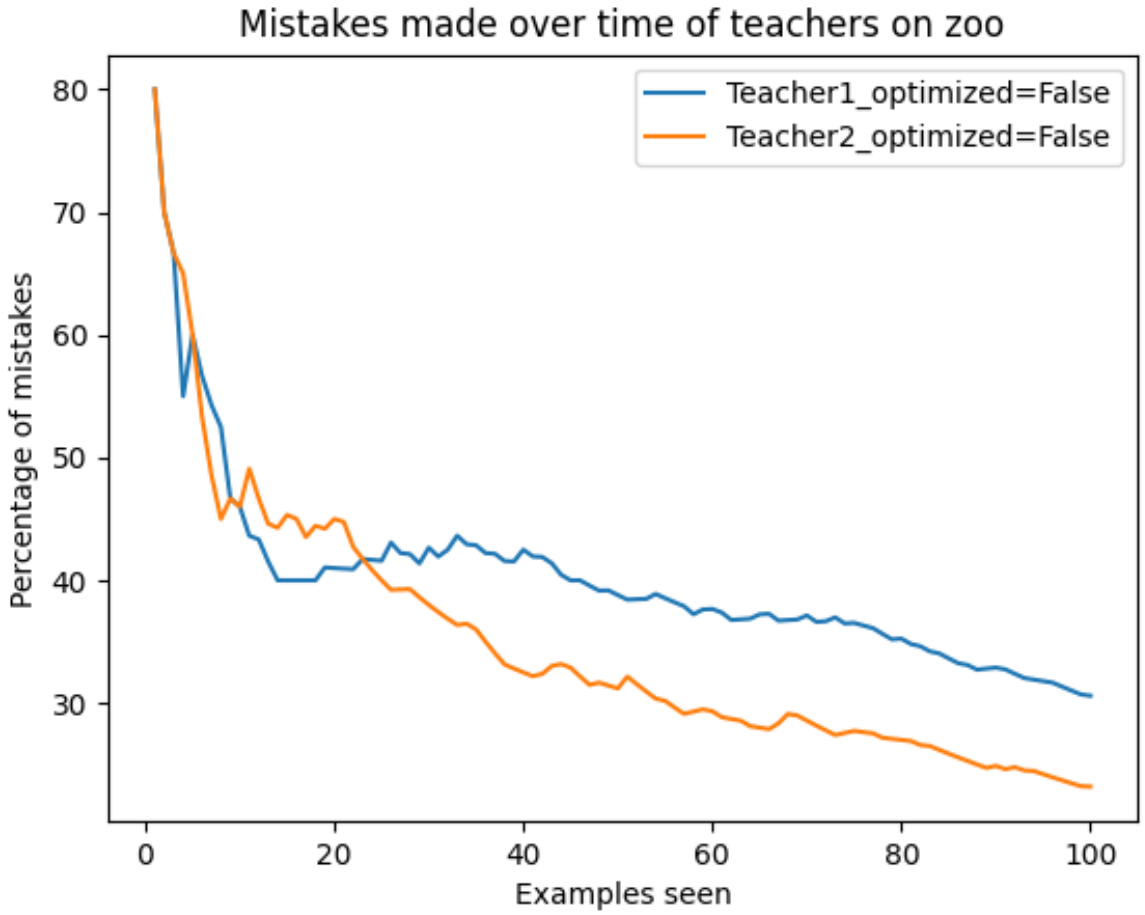
Learning with explanations

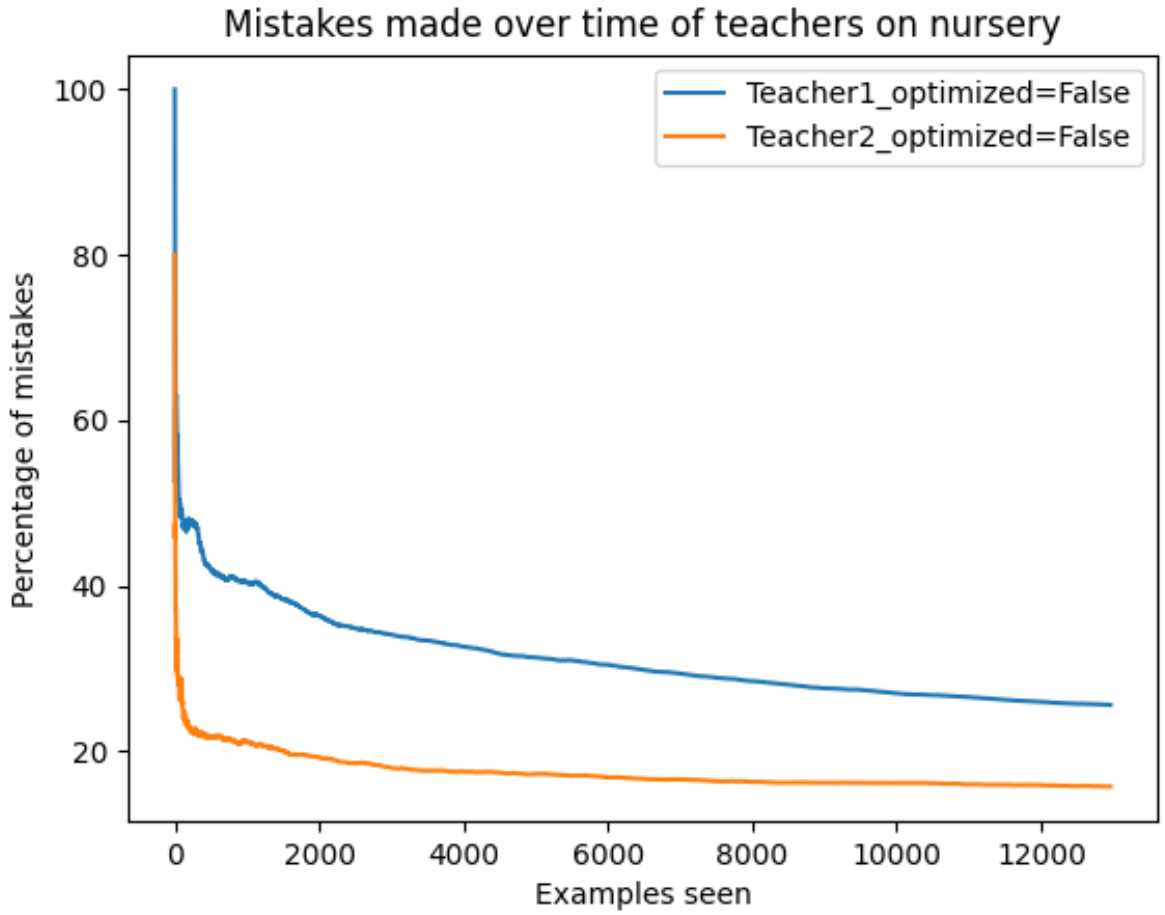
PART A

OVERVIEW


FeedbackModel
default_label
default_explanation
laws
teacher
teacher
laws
0…*
Teacher (abstract)
X
features_labels_dict
Law
explanation
label
discriminative_feature
Teacher1
Teacher4
Teacher2
teachers
0…*
Teacher3
num_of_teachers
sample_percentage
teachers

RESULTS OF TEACHERS 1,2 ON ZOO AND NURSERY DATASETS





DECISION LISTS OF TEACHERS 1,2 ON ZOO AND NURSERY DATASETS

- **Zoo:**
  - **Teacher1**:
    - Run1, Run2, Run3, Run4, Run5
  - **Teacher2**:
    - Run1, Run2, Run3, Run4, Run5
- **Nursery:**
  - **Teacher1**:
    - Run1, Run2, Run3, Run4, Run5
  - **Teacher2**:
    - Run1, Run2, Run3, Run4, Run5

CONCLUSION:

TEACHER2 PERFORMS CONSISTENTLY BETTER THAN TEACHER1

PART B

THE NEW DATASET

- **The dataset:** wifi_localization
- **Explanation:** predicts the location of a smartphone (1 of 4 rooms) based on the strength of 7 different wifi signals
- **Number of instances:** 2000
- **Number of attributes per instance:** 7
- **Labels:** 1 - 4

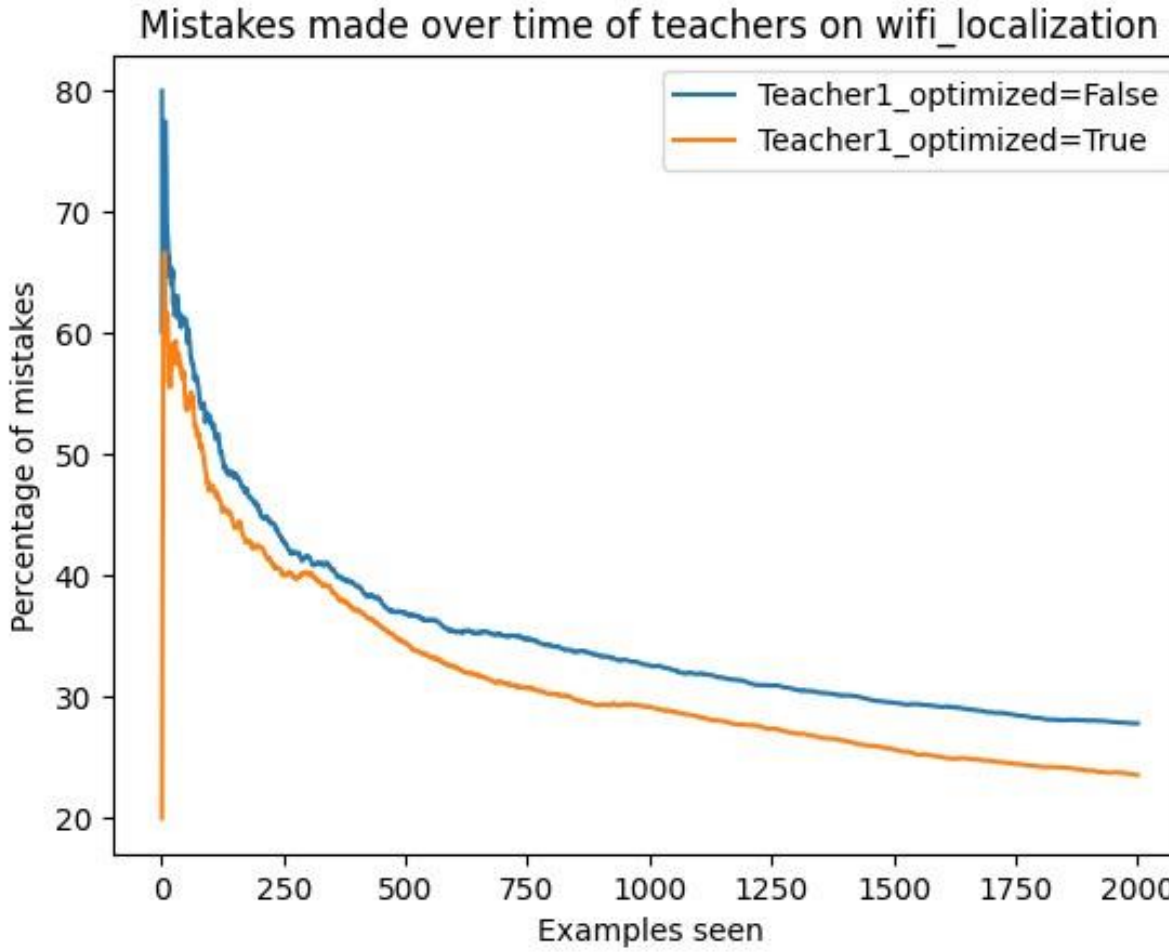
IMPROVEMENTS TO THE ALGORITHM

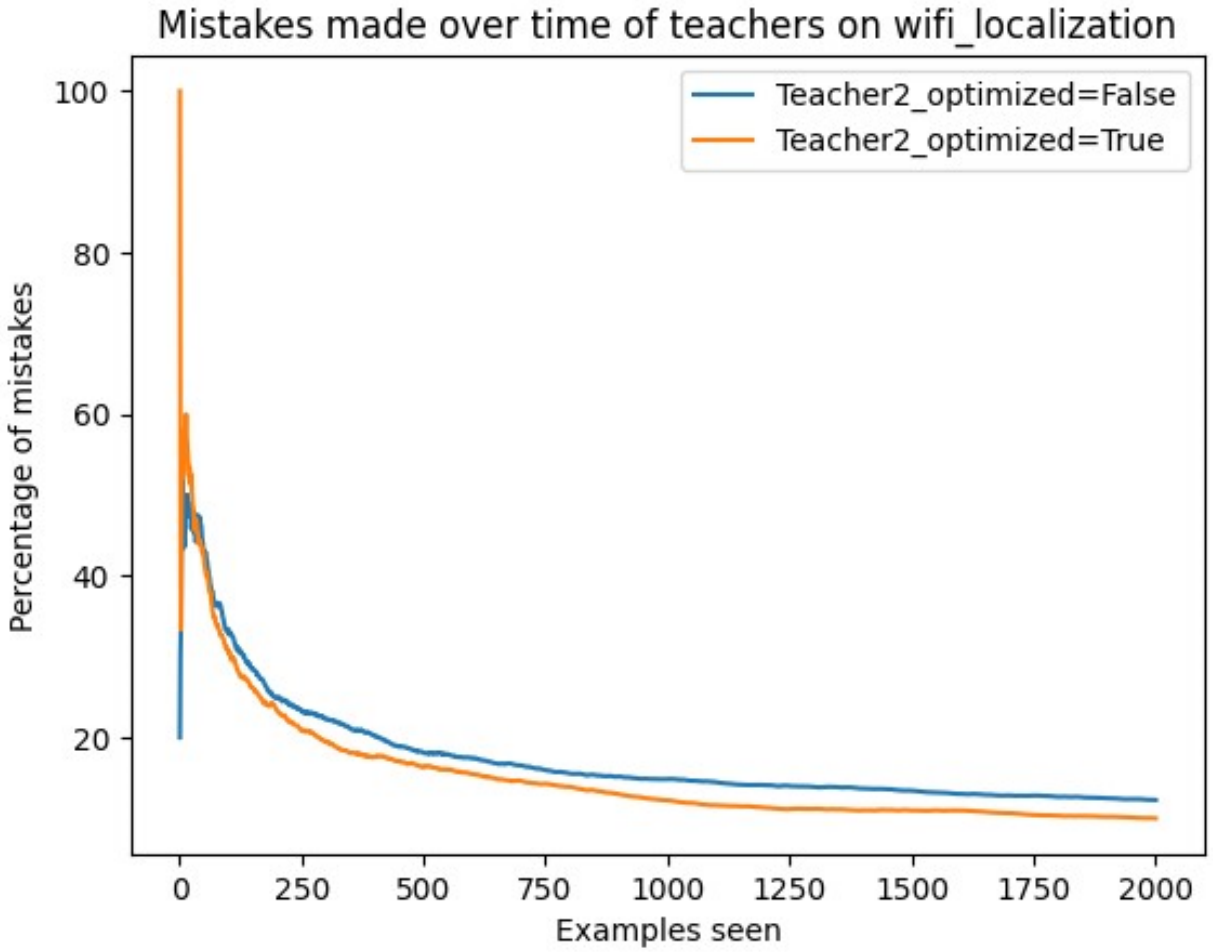
- **feedbackModel.predict2():** If an example doesn't fit any law – guess the **best fitting law** instead of the default label. **- improves performance**
- **Teacher3:**
  - Array of Teacher2s.
  - Each teacher gets a random subset of the dataset.
  - Each Teacher2 gives a "discriminative score" to the discriminative feature it suggests.
  - Teacher3 returns the feature that had the max sum of "discriminative scores" .

IMPROVEMENTS TO THE ALGORITHM

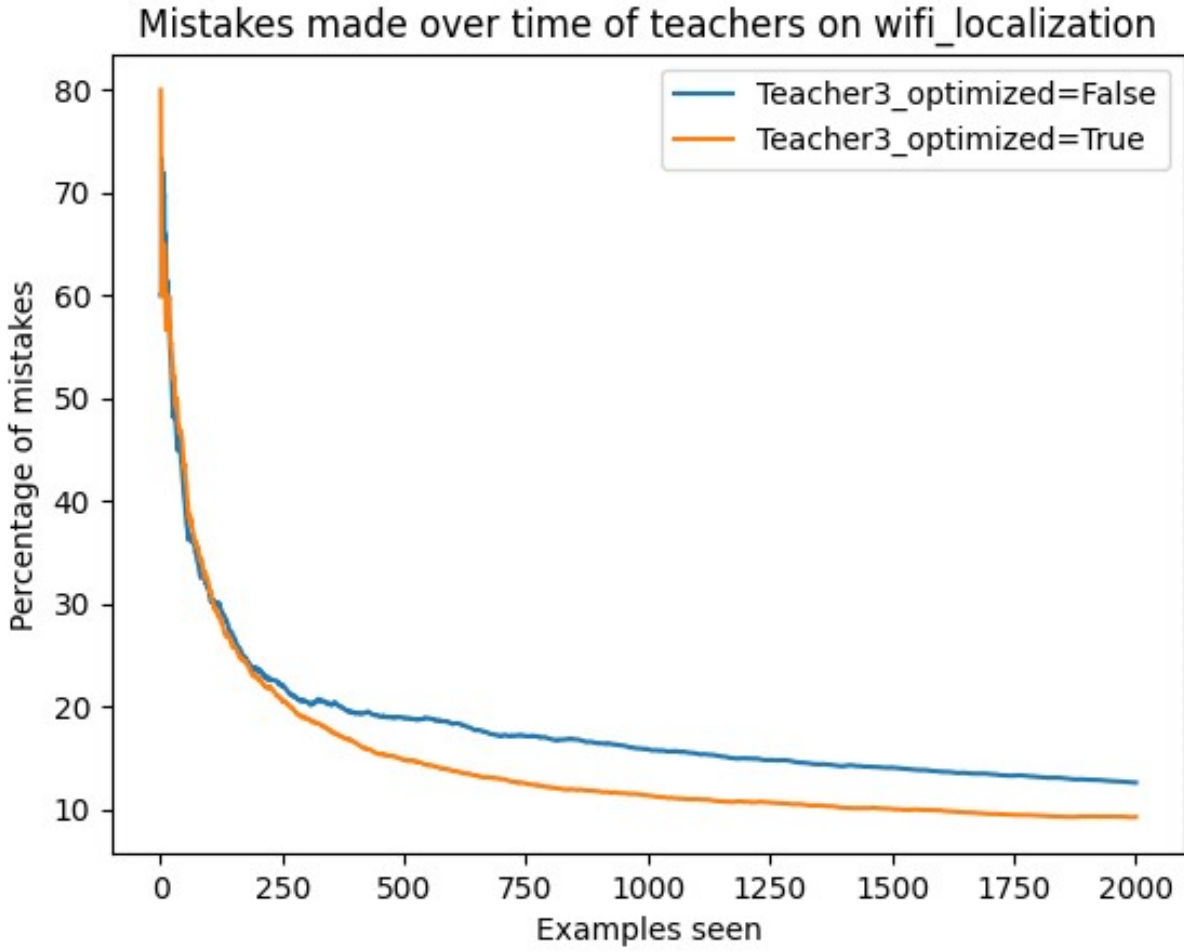
- **Teacher4:**
  - Instead of returning one most discriminative feature (like Teacher2), randomly chooses a number **n** and returns the **n most discriminative features.**
  - $1 \leq n \leq number\ of\ different\ features\ between\ example\ and\ explanation$
  - This **n** is not chosen uniformly, there is a much higher chance of choosing a lower number (closer to 1).

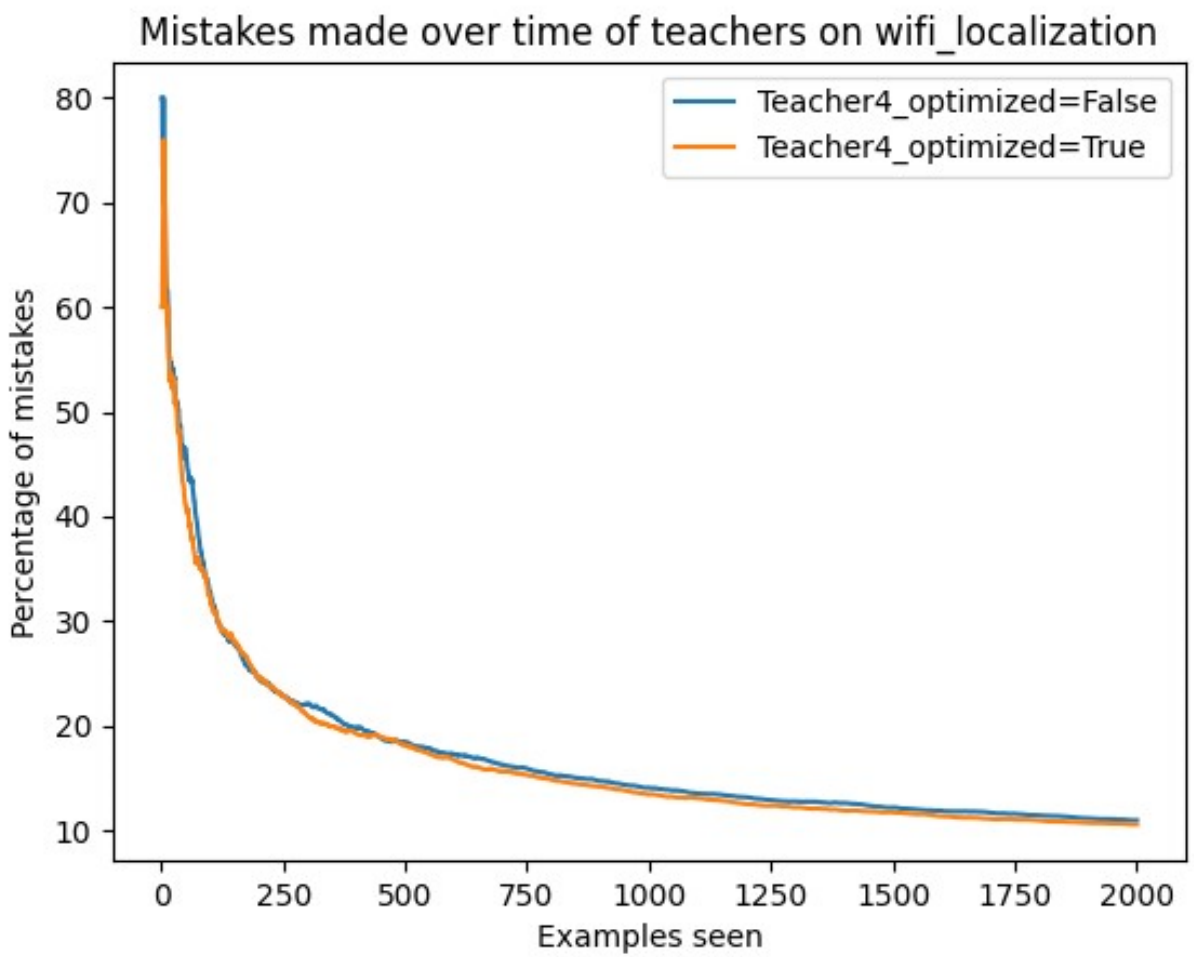
AVERAGE RESULTS OF TEACHERS 1, 2 ON WIFI_LOCALIZATION DATASET



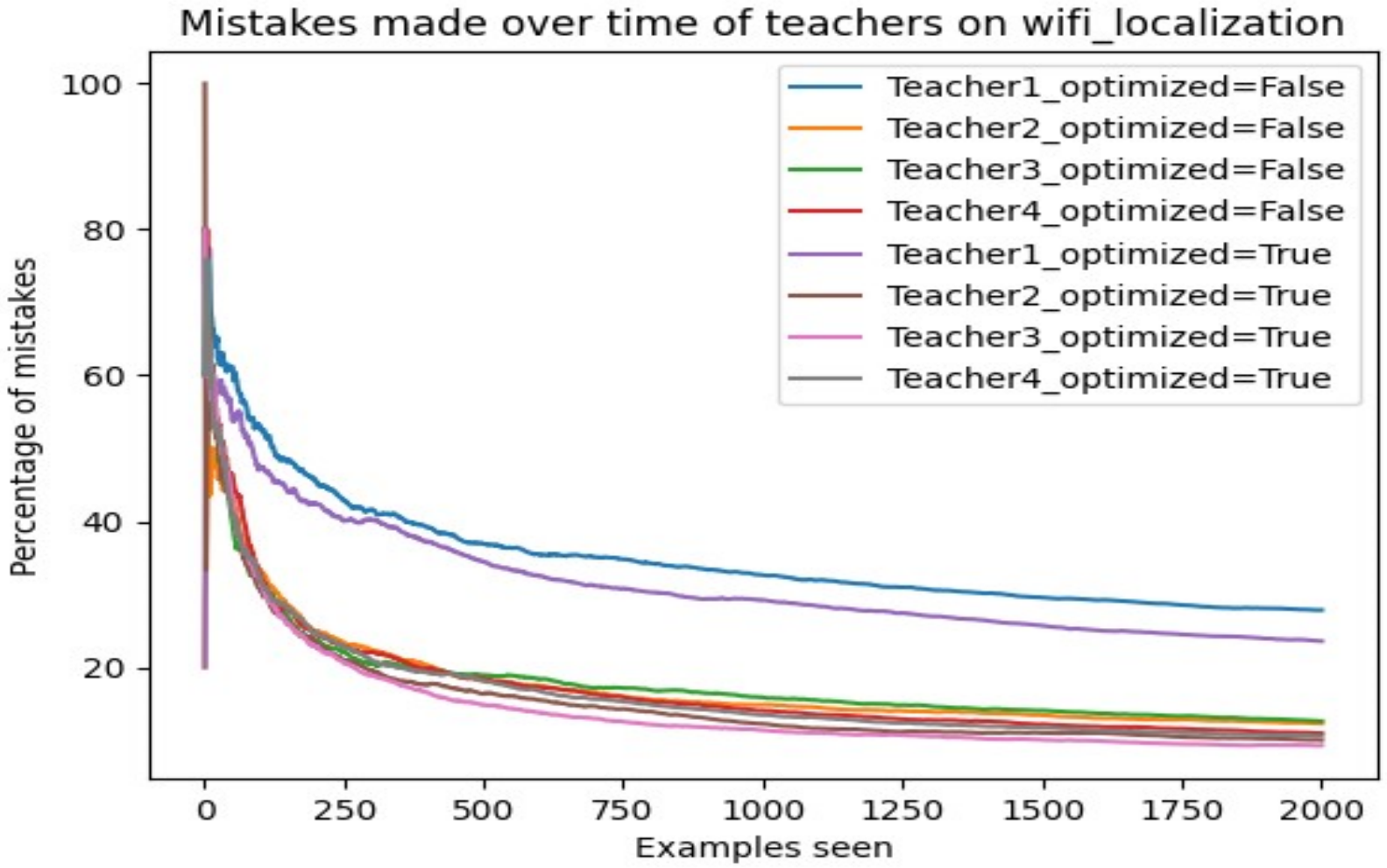


AVERAGE RESULTS OF TEACHERS 3, 4 ON WIFI_LOCALIZATION DATASET





AVERAGE RESULTS OF ALL TEACHERS ON WIFI_LOCALIZATION DATASET



CONCLUSION

- The **predict** optimization improved the performance of the model, no matter which teacher was used.
- Teacher3 and Teacher4 did not improve the performance consistently enough to be noticeable.
- The best performing variation is **Teacher3 with the predict optimization.**
  - If we don't consider runtime.
  - Compared to Teacher2 with the predict optimization, the improvement is marginal, but the runtime is considerably longer for Teacher3 (~3x longer).
  - If runtime is a factor, **Teacher2 with the predict optimization** will be a better choice.