Predictors of faculty sentiment on their transition to online teaching

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Abstract

In the spring and summer of 2020, we collected data on faculty experiences during their transition to online teaching as a result of the COVID-19 pandemic. Data on the participants' institutions, job security and position, and preparation time were collected, as well as a free text response to add anything the participants felt was relevant. In total 364 text responses were collected. Using natural language processing tools, sentiment scores were calculated for each response. The sentiment was found to be overall positive. Then, a machine learning model was created using Keras, which was trained on various data for 75% of the responses. The remaining 25% were used for predicting sentiment scores, to identify which data from the survey, if any, were potential predictors of participant sentiment. The score predictions were used to determine if any data on participants' institutions, positions, or transition time were correlated with positive or negative experiences.

Research Questions

1. **What is the overall sentiment of participants' experiences during their transition to online teaching?**
- Perform sentiment analysis

2. **Do participants' answers to survey questions predict the sentiment of their experiences?**
- Train a machine learning model to generate sentiment score predictions using participants' answers to other survey questions

Data

Data collected from national survey of physics faculty – 662 participants, 364 who answered an open-ended response question.

Answers to 15 survey questions used as data, covering a range of topics:
- Participants' institution, department, and teaching loads (5)
- Prior experience with online instruction (1)
- Preparation and transition to online instruction (4)
- Comfort in teaching (4)
- Open-ended response (1)

Predictions

- Data split into train/test sets 75%/25% (273/91 participants), using same random state each time the model was run
- Keras sequential model then trained and used to generate score predictions
- 99 predictions for 91 participants for 14 survey questions
- Medians of predictions for each participant found
- Correlation values found for predictions and original sentiment scores

Sentiment Scores of Original, Training, and Test Data

Results so far

Median score of overall sentiment found to be 0.1, positive.

Notable correlations for median score predictions:
Question 7 (size of largest class taught): 0.147664881
Question 41 (perceived job security): −0.179852068

Question 7 Predicted Medians vs Original Sentiment Scores

Question 41 Predicted Medians vs Original Sentiment Scores
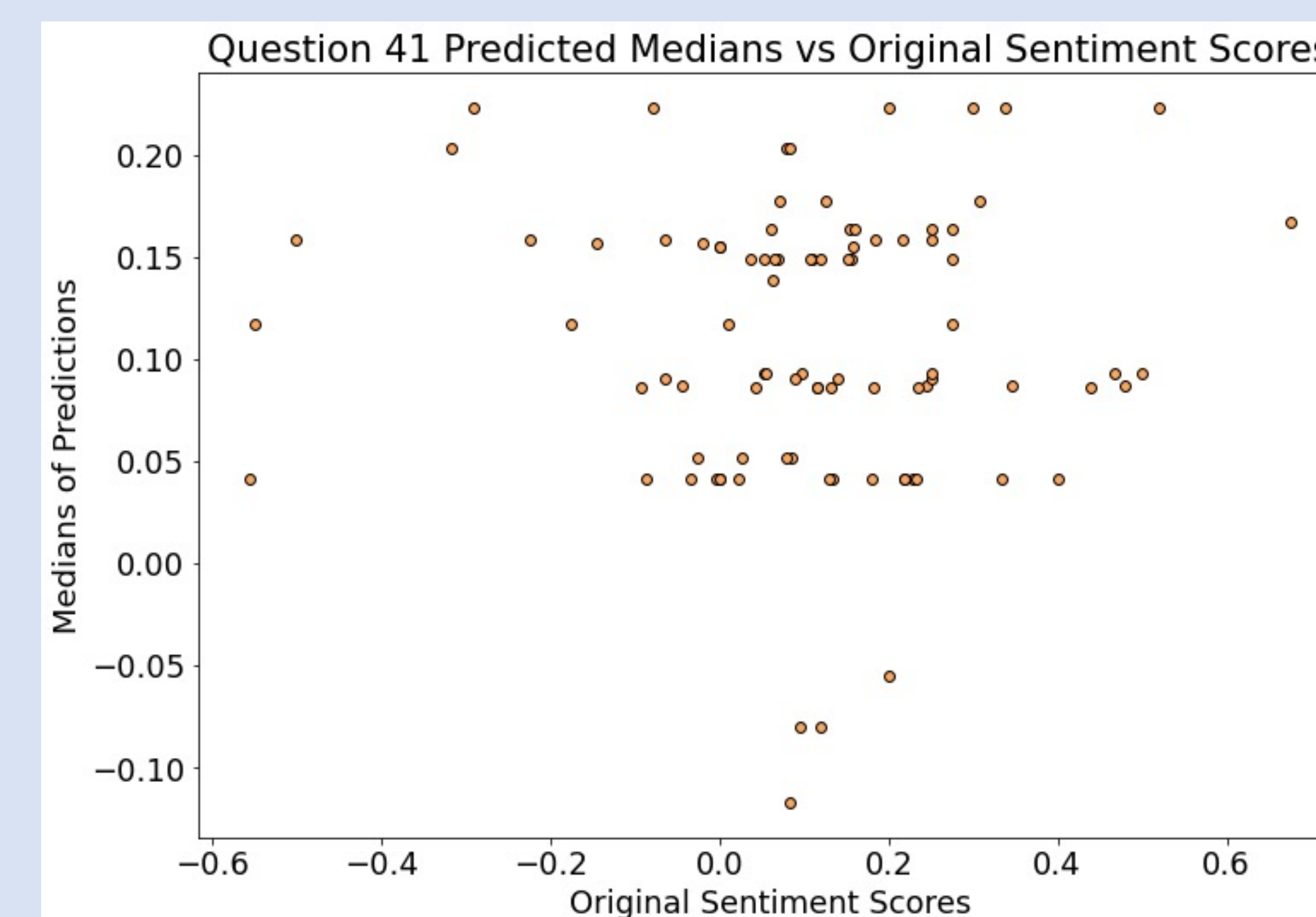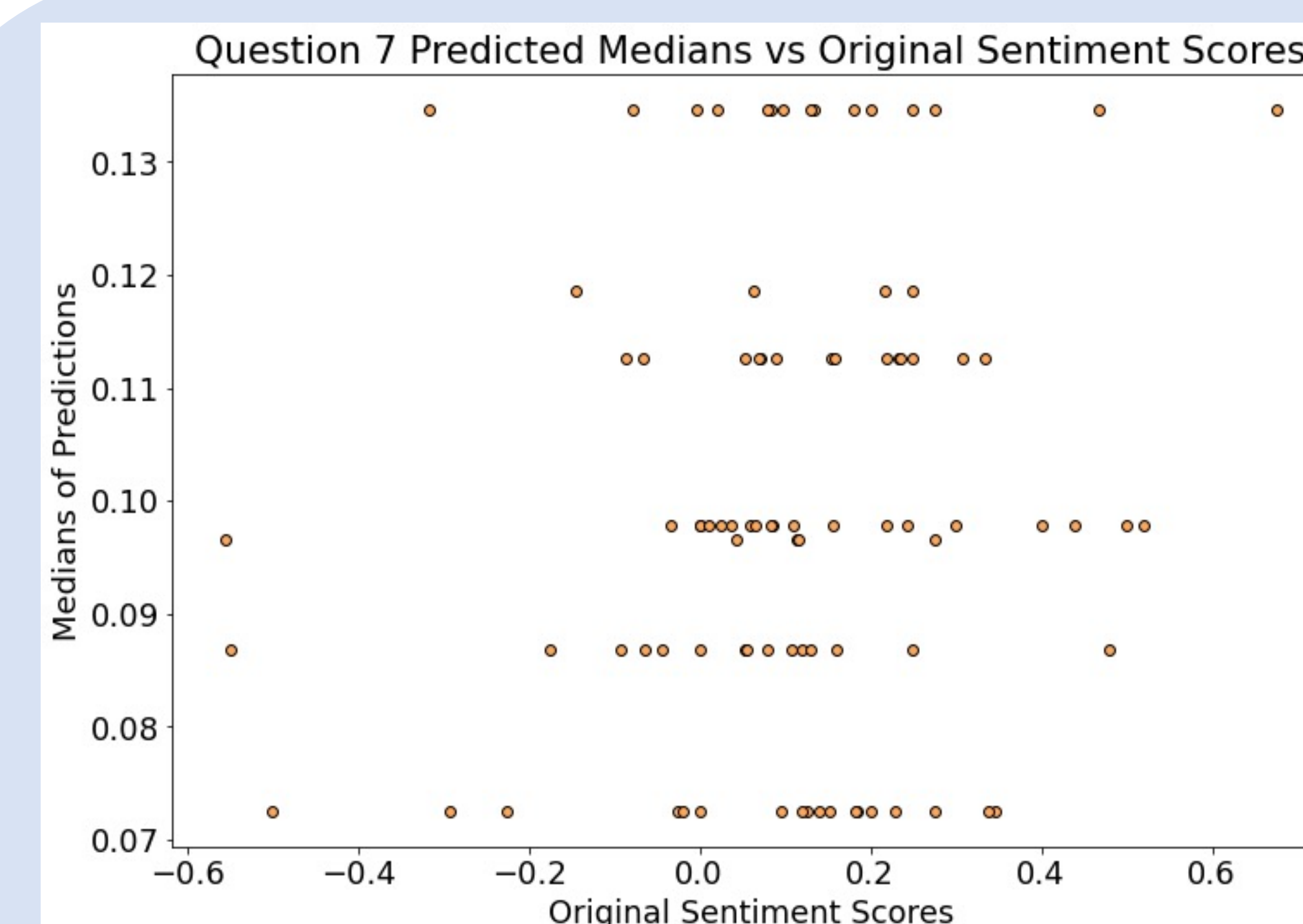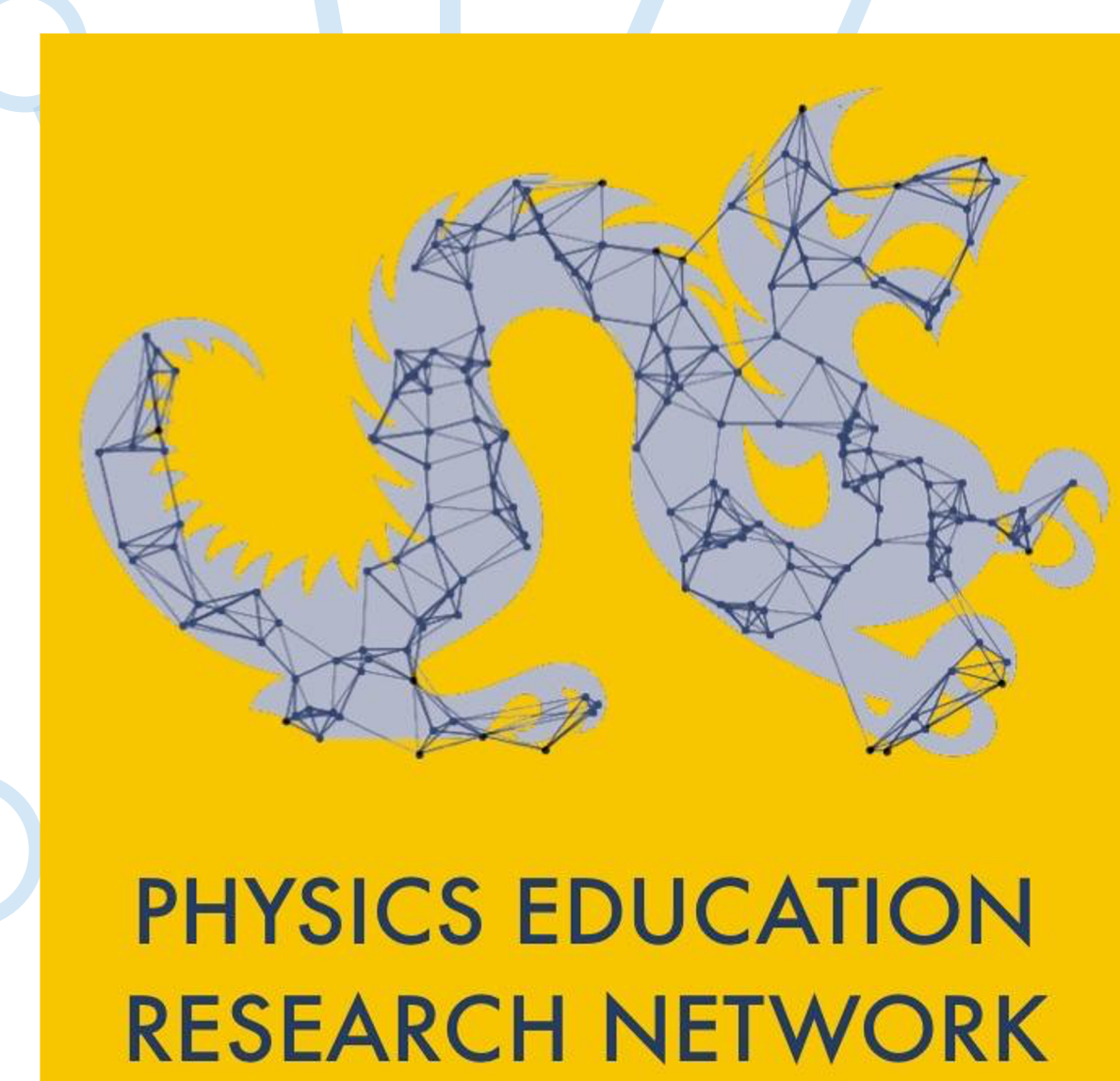
Limitations

- Data size
- Small lexicon
- No physics corpus for training
- The "black box" nature of machine learning
- Lack of accessible sentiment analysis model alternatives

Acknowledgements

Future Work

Look at model accuracy
First step: model evaluation using linear regression

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