TEXNet Project

Alex and Blake

The `im2latex` problem

- Math Image to Math Code

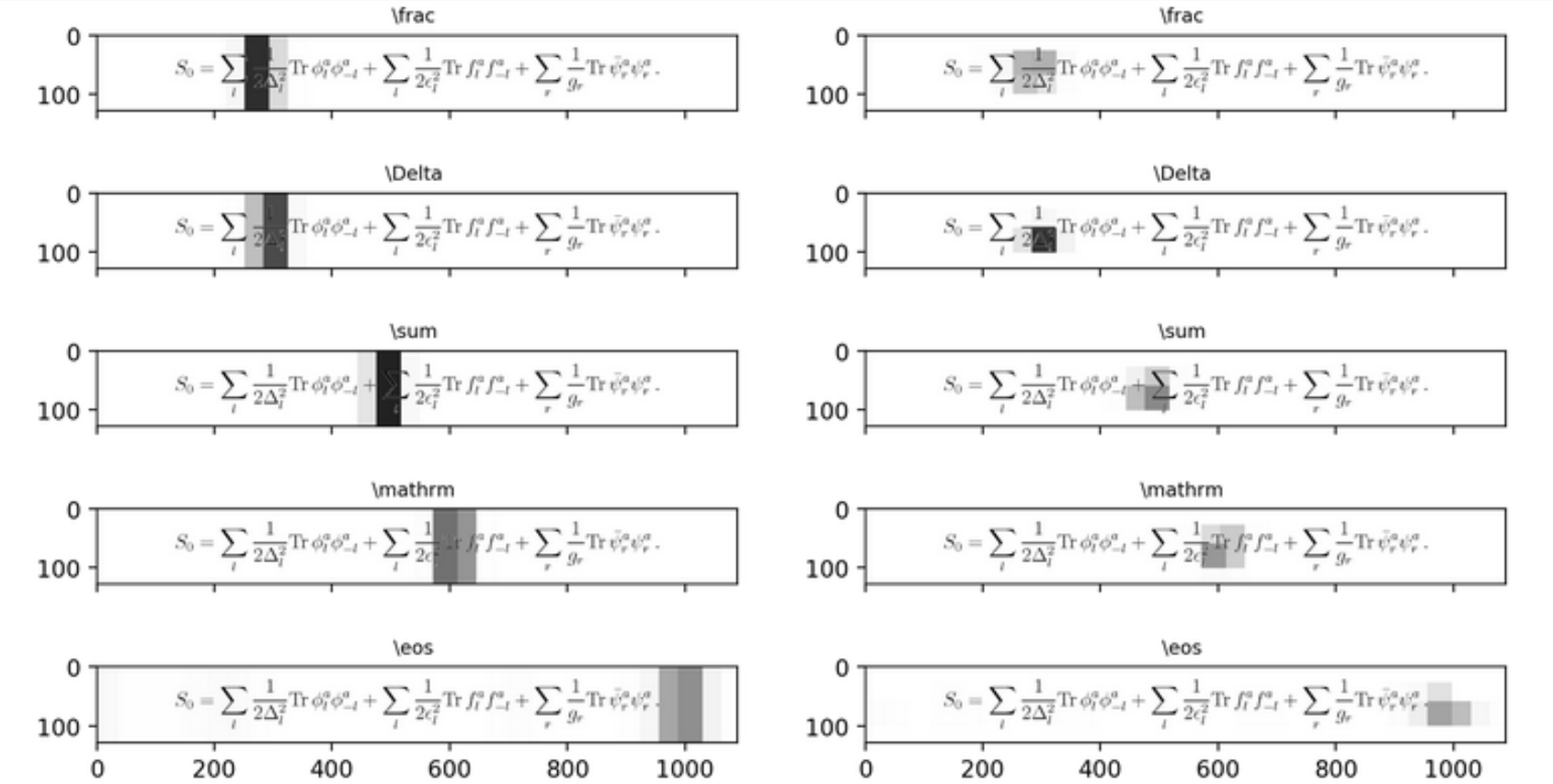

Figure 1: Attention Model: Prediction over time-steps. Credit: Bender

Accomplishments

- Synthesized Dataset from Scratch

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    - Deng used 100k and Singh 140k
- 2 Models Trained and Ready for Inference!

State of the art in `im2latex`

Researchers	BLEU Score (%)	Training Time
Deng et al 2017	87.73	20 hours
Genthial 2017	88.00	-
Wang, Sun & Wang 2018	88.25	-
Singh 2018	89.00	60 hours
Taradachuk & Vente	88.48	75 hours
Wang & Liu 2019	90.28	75 hours

Our Data Processing Pipeline

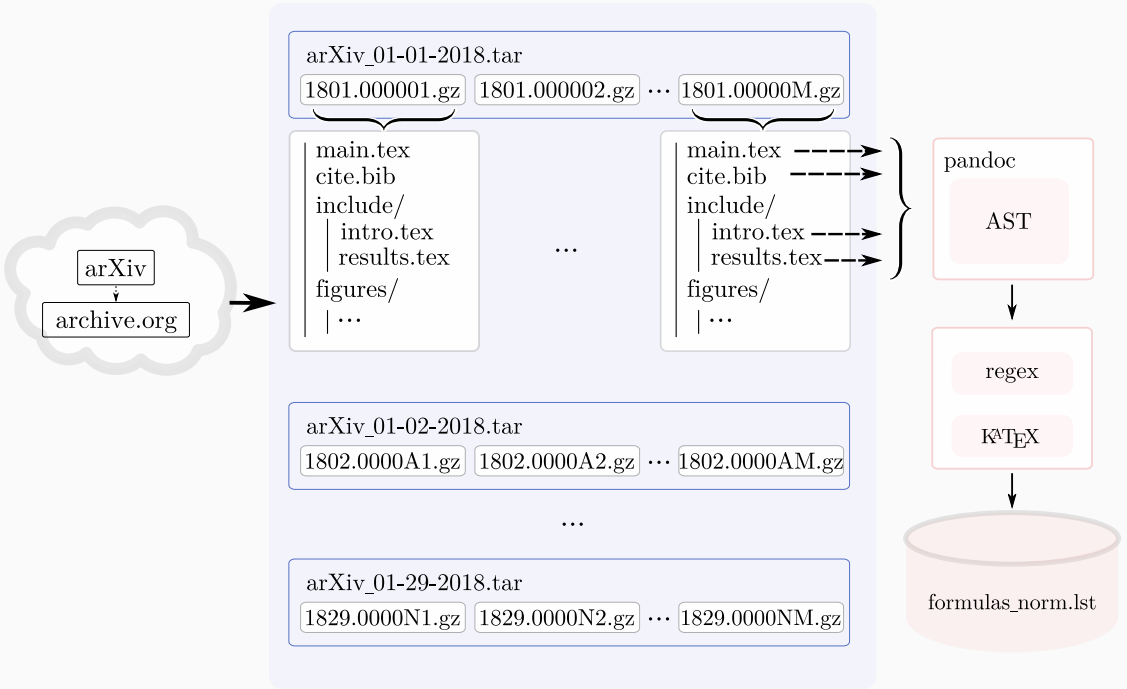

Figure 2: Preprocessing Steps

Interpreting BLEU Score

- Let p_i be geometric mean of n-gram precisions

Brevity Pentalty

$$\text{BP} = \begin{cases} 1 & \text{if } c > r \\ e^{1-r/c} & \text{otherwise} \end{cases}. \tag{1}$$

Calculation

$$\textsc{Bleu} = \text{BP} \exp\left(\sum_{i=1}^{n} w_i \log p_i\right) \tag{2}$$

1

[1] The following are simplified contrived examples, using 4-gram BLEU score. For a more complete picture see Papineni, Roukos, Ward, et al.

Example 1

```
reference = [
  ['the', 'quick', 'brown', 'fox',
  'jumped', 'over', 'the', 'lazy', 'dog']
]
candidate =
  ['the', 'quick', 'brown', 'fox',
  'jumped', 'over', 'the', 'lazy', 'dog']
print(sentence_bleu(reference, candidate))
```

- 1.0

Example 2

```
reference = [
  ['the', 'quick', 'brown', 'fox',
  'jumped', 'over', 'the', 'lazy', 'dog']
]
candidate =
  ['the', 'FAST', 'brown', 'fox',
  'jumped', 'over', 'the', 'lazy', 'dog']
print(sentence_bleu(reference, candidate))
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- 1 wrong token at length 9

Example 2

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reference = [
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- 0.7506...

Notes and Take-Aways

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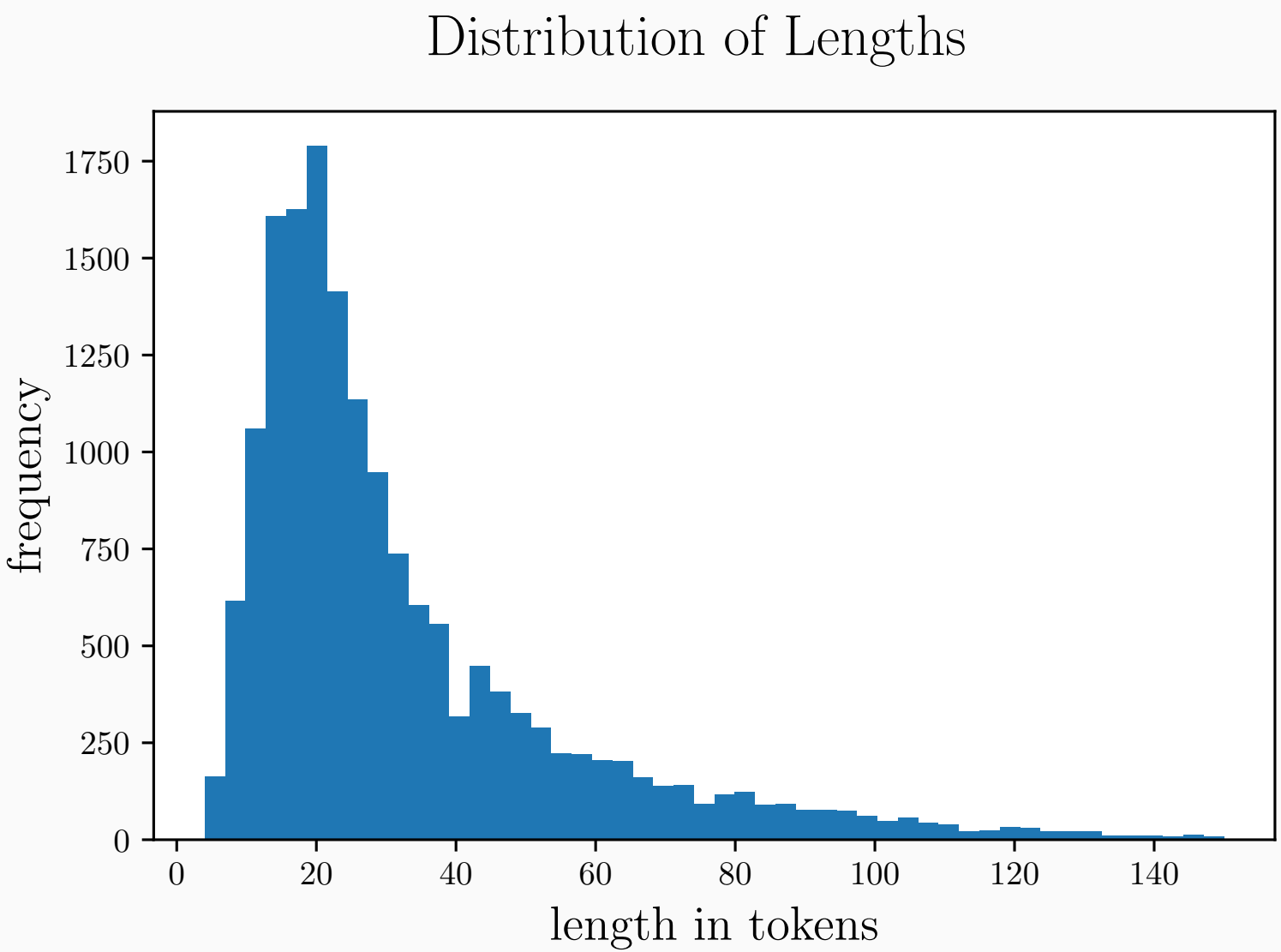
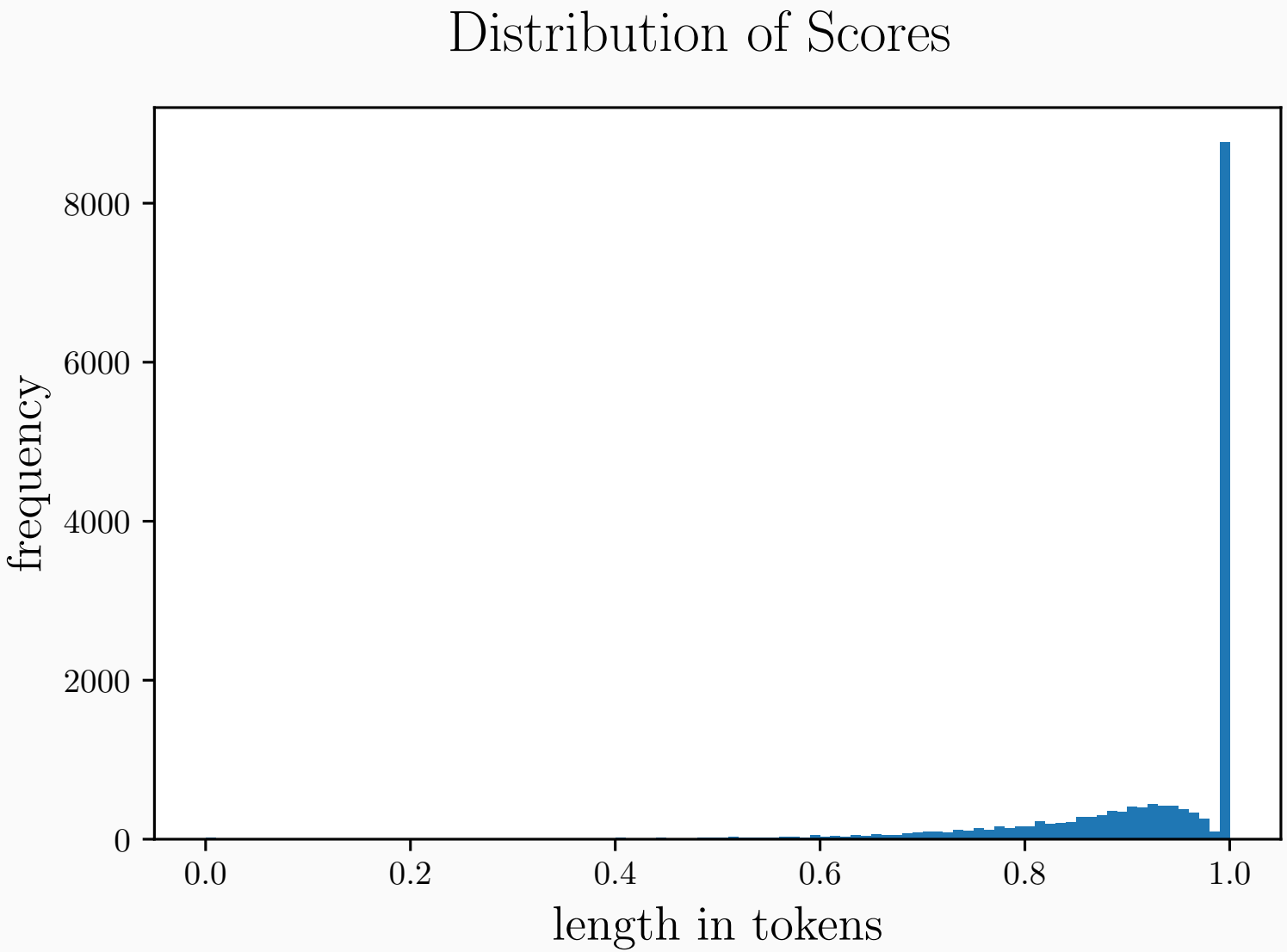
- to (really) simplify missing words and extra words “count as incorrect”

Distribution of Input Length



Distribution of Scores



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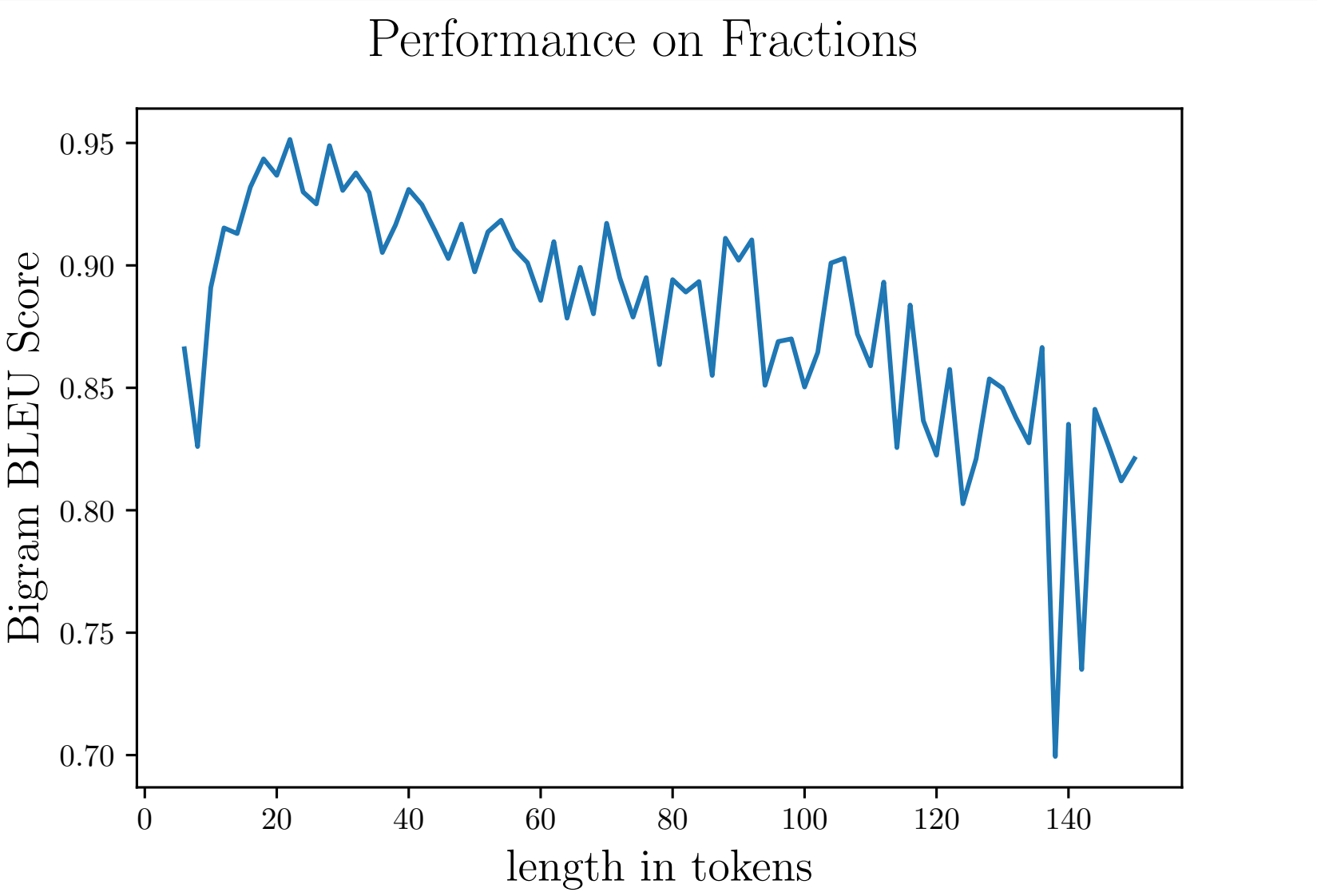

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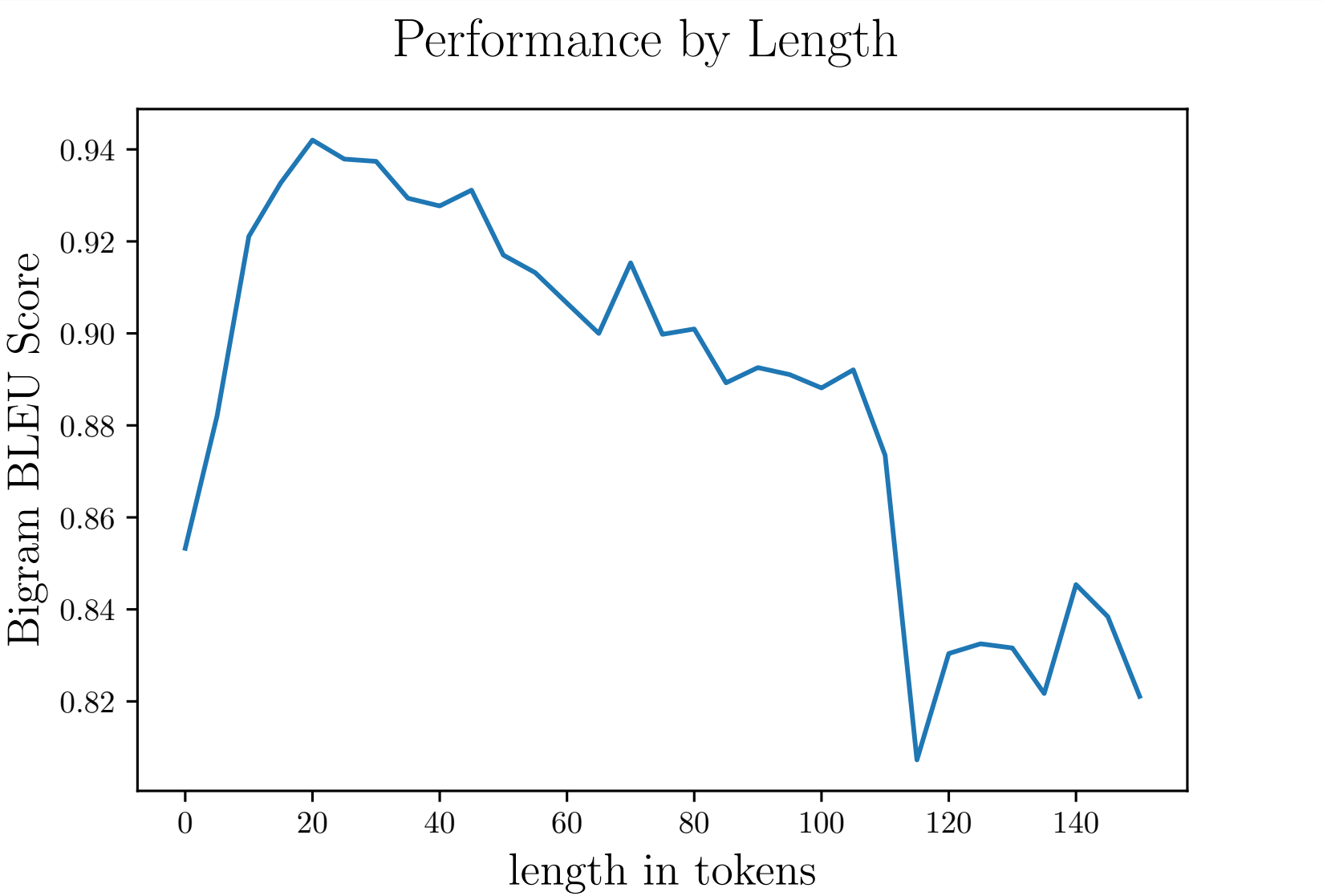

Distribution of Scores

Demo Time

- Sample Images from the class!

Special Thanks

- Brian Newbold (archivist)

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- Sumeet S. Singh (works at Turnitin (Gradescope) now)

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- Tensorflow 2.0 differences made translation prohibitive
  - Kept to the last stable release on the 1.0 branch

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