NLP Course Report

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1 Week 1

(a) Basic statistics:

- the data is quite evenly distributed across the 3 languages.
- We note that there are more answerable than unanswerable by a factor of 10-1.
- train_set: 15326
- val_set: 3028

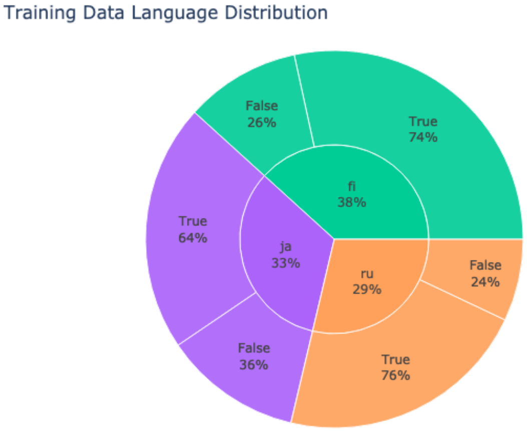


Figure 1: Distribution of labels in the dataset

(b)

```
import MeCab
def get_top_words(df: pd.DataFrame, lang: str,
    n=5):
    df_lang = df[df['lang'] == lang].copy()
```

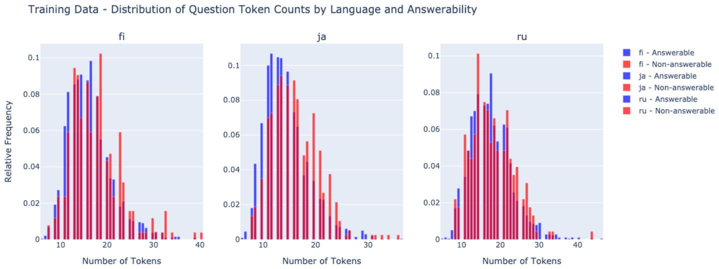


Figure 2: normalized Histogram for token count(using llama3 tokenizer) of answerable/unanswerable questions in the dataset

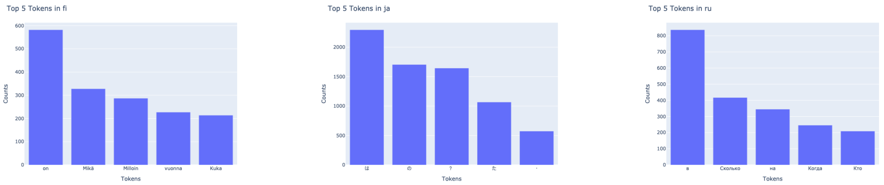
```
if lang == ’ja’:
    mecab = MeCab.Tagger("-Owakati")  #
        Initialize MeCab tokenizer
    df_lang.loc[:, ’words_question_tokens’
       ] = df_lang[’question’].apply(
       lambda x: mecab.parse(x).split())
else:
    df_lang.loc[:, ’words_question_tokens’
       ] = df_lang[’question’].apply(
       lambda x: x.split(’␣’))

all_tokens = np.concatenate(df_lang[’
   words_question_tokens’].values)
unique, counts = np.unique(all_tokens,
   return_counts=True)
sorted_indices = np.argsort(counts)[::-1]
top_unique_tokens = unique[sorted_indices
   ][:n]
top_tokens_dict = {token: int(count) for
   token, count in zip(top_unique_tokens,
   counts[sorted_indices][:n])}
return top_tokens_dict
```

we get the following results:

qualitative analysis:

- Finnish:
  - mitä (1021) - what
  - on (774) - is
  - mikä (441) - what/which



(a) Finnish

(b) Japanese

(c) Russian

Figure 3: Top 5 tokens in Finnish, Japanese, and Russian

  - miten (293) - how
  - kuinka (214) - how
- Japanese:
  - (3402) - of/in
  - (2896) - topic marker
  - (1827) - to/at
  - (1604) - object marker
  - (1328) - subject marker
- Russian:
  - (1889) - in
  - (812) - which
  - (744) - what
  - (628) - how
  - (454) - on

From this analysis, we can observe:

- Finnish top words include question words (mitä, mikä, miten, kuinka) and a common verb (on).
- Japanese top words are primarily particles, which are essential for sentence structure but don't carry much meaning alone.
- Russian top words include both question words (, ,) and prepositions (,).

This reflects differences in language structure and how questions are typically formed in each language.

(c)

2 Week 37 (9–15 September)

3 Week 38 (16–22 September)

4 Week 39 (23–29 September)

5 Week 40 (30 September–6 October)

6 Week 41+ (from 7 October)