describe_polar-bigrams

February 6, 2025

# Describe PBR (ALL+ Superset) by Frequencies & Polarity

```
[ ]: from math import log1p, log2, log10, sqrt
     from pathlib import Path
     from sys import exit as sys_exit

     # import dataframe_image as dfi
     import matplotlib as mpl
     import pandas as pd
     from am_notebooks import *
     from source.utils import HIT_TABLES_DIR, SANPI_HOME, timestamp_today
     from source.utils.dataframes import NEG_REGEX, REGNOT
     from source.utils.LexicalCategories import EXACTLY_RELEVANT_ADJ, SPECIAL_ADV

     mpl.pyplot.rcParams['font.family'] = 'serif'
     mpl.pyplot.style.use('seaborn-v0_8-paper')

     RECOUNT_NEG = False

     K = 20
     BIGRAM_MIN = 100
     ADV_MIN = 600
     ADJ_MIN = 300
     VERS_RESULTS_DIR = RESULT_DIR/'versatility'
     confirm_dir(VERS_RESULTS_DIR)
     FREQ_OUT_IMAGES = TEX_ASSETS.joinpath('images/freq_out')
     confirm_dir(FREQ_OUT_IMAGES)
     IMAGE_TYPE = 'pgf'
```

## Collect Word and Bigram Counts

```
[ ]: def set_outpath(dir_name, unit_name):
         return SANPI_HOME.joinpath(
             f'results/freq_out/{dir_name}/{unit_name}-counts_{dir_name}.
       ↪{timestamp_today()}.csv')


     def count_and_describe(values, name: str, dir_name: str = 'RBdirect'):
```

```python
    counts = values.value_counts()
    outpath = set_outpath(dir_name, name)
    # x_neg.adv_form_lower.value_counts()
    counts.to_csv(outpath)
    print(f'  Saved {outpath.relative_to(SANPI_HOME)}')
    freq_stats = counts.to_frame(
        f'{name}_counts').describe().T.assign(
            unique=values.nunique()).round(4).convert_dtypes()
    # print(freq_stats.to_markdown(floatfmt=',.2f', intfmt=','))
    freq_stats.to_csv(outpath.with_name(
        outpath.name.replace('counts', 'freq-stats')))
    return counts, freq_stats


def seek_prior_counting(dir_name: str,
                        polarity: str) -> dict[pd.DataFrame]:
    adv_out = set_outpath(dir_name, f'{polarity[:3]}_adverb')
    adj_out = set_outpath(dir_name, f'{polarity[:3]}_adject')
    big_out = set_outpath(dir_name, f'{polarity[:3]}_bigram')
    outpath_dict = {'adv': adv_out, 'adj': adj_out, 'bigram': big_out}
    existing = {u: tuple(o.parent.glob(f'{Path(o.stem).stem}*csv'))
                for u, o in outpath_dict.items()}

    counts_dict = {}
    if all(existing.values()):
        for unit, path_tup in existing.items():
            col = f'{unit}_form_lower'.replace('bigram_form', 'bigram')
            loaded_counts = pd.read_csv(
                path_tup[0], engine='c', low_memory=True,
                index_col=col,
                dtype={col: 'string', 'count': 'int'})
            print(f'Reading {unit.upper()} Counts from:\n  "{path_tup[0]}"')
            # ! Needed to deal with how pandas.read_csv treats the string "null"
            loaded_counts.index = loaded_counts.index.fillna('null')
            counts_dict[unit] = loaded_counts
    # neg_adj_counts = pd.read_csv(
    #     neg_adj_out, engine='c', low_memory=True, index_col='adj_form_lower')
    # neg_big_counts = pd.read_csv(
    #     neg_big_out, engine='c', low_memory=True, index_col='bigram_lower')
    return counts_dict


def count_hits(redo_neg=False):

    neg_ids = HIT_TABLES_DIR.joinpath('RBdirect/ALL_RBdirect_final-index.txt'
                                      ).read_text(encoding='utf8').splitlines()
    pos_ids = HIT_TABLES_DIR.joinpath('not-RBdirect/
↪ALL_not-RBdirect_final-index.txt'
                                      ).read_text(encoding='utf8').splitlines()
    x_neg = pd.read_parquet(
        '/share/compling/data/sanpi/info/ALL_final-hits_basic.24-08-03.parq/
↪category=RBdirect',
        engine='pyarrow',
        filters=[('hit_id', 'in', neg_ids)]
    )
    if 'hit_id' in x_neg.columns:
        x_neg = x_neg.set_index('hit_id')
    x_neg = x_neg.join(x_neg.all_forms_lower.str.extract(
        r'^(?P<trigger_lower>[^_]+)_(?P<adv_form_lower>[^_]+)_(?
↪P<adj_form_lower>[^_]+)$')).convert_dtypes()
    adv_counts, neg_adv_stats = count_and_describe(
        x_neg.adv_form_lower, 'neg_adverb', 'RBdirect')
    adj_counts, neg_adj_stats = count_and_describe(
        x_neg.adj_form_lower, 'neg_adject', 'RBdirect')
    bigram_counts, neg_bigram_stats = count_and_describe(
        x_neg.bigram_lower, 'neg_bigram', 'RBdirect')

    trigger_counts, trigger_stats = count_and_describe(
        x_neg.trigger_lemma, 'trigger_lemma')
    trigger_form_counts, trigger_form_stats = count_and_describe(
        x_neg.trigger_lower, 'trigger_lower')

    print(pd.concat([neg_adv_stats, neg_adj_stats, neg_bigram_stats,␣
↪trigger_stats,
                     trigger_form_stats]).convert_dtypes().
↪to_markdown(floatfmt=',.2f', intfmt=','))
    if redo_neg:
        return
    # // x_neg = x_neg.join(x_neg.bigram_lower.str.extract(r'^(?
↪P<adv_form_lower>[^_]+)_(?P<adj_form_lower>[^_]+)$')
    # //                     ).assign(polarity='neg').convert_dtypes()

    # // x_pos = catify(pd.read_parquet('',
    # //                                 engine='pyarrow',
    # //                                 columns=['adv_form_lower',␣
↪'adj_form_lower', 'hit_id']).set_index('hit_id').assign(polarity='pos'),
    # //                 reverse=True)

    # // x_pos['bigram_lower'] = x_pos.adv_form_lower + '_' + x_pos.
↪adj_form_lower
    pos_chunks = (
        pd.read_parquet(chunk,
                         engine='pyarrow',
                         columns=['bigram_lower', 'adv_form_lower',
                                  'adj_form_lower', 'token_str'])
        for chunk in Path(
            '/share/compling/data/sanpi/2_hit_tables/not-RBdirect/
↪ALL_not-RBdirect_final.parq'
        ).rglob('group*.parquet'))
    x_pos = pd.concat(pos_chunks)

    pos_adv_counts, pos_adv_stats = count_and_describe(
        x_pos.adv_form_lower, 'pos_adverb', 'not-RBdirect')
    pos_adj_counts, pos_adj_stats = count_and_describe(
        x_pos.adj_form_lower, 'pos_adject', 'not-RBdirect')
    pos_bigram_counts, pos_bigram_stats = count_and_describe(
        x_pos.bigram_lower, 'pos_bigram', 'not-RBdirect')
    print(pd.concat([pos_adv_stats, pos_adj_stats, pos_bigram_stats,
                     ]).convert_dtypes().to_markdown(floatfmt=',.2f',␣
↪intfmt=','))

    all_adv_counts, all_adv_stats = count_and_describe(
        pd.concat((x.adv_form_lower for x in [x_pos, x_neg])),
        'all_adverb', 'ANYdirect')
    all_adj_counts, all_adj_stats = count_and_describe(
        pd.concat((x.adj_form_lower for x in [x_pos, x_neg])),
        'all_adject', 'ANYdirect')
    all_bigram_counts, all_bigram_stats = count_and_describe(
        pd.concat((x.bigram_lower for x in [x_pos, x_neg])),
        'all_bigram', 'ANYdirect')

    print(pd.concat([all_adv_stats, all_adj_stats, all_bigram_stats,
                     ]).convert_dtypes().to_markdown(floatfmt=',.2f',␣
↪intfmt=','))
    print(
        f'{pd.concat((x.token_str for x in [x_pos, x_neg])).nunique():,} total␣
↪unique sentences in Polar Bigrams')


def combine_polarities(pos_counts, neg_counts, unit):
    pos_unit = pos_counts[unit]
    neg_unit = neg_counts[unit]
    unit_name = pos_unit.index.name
    all_unit = (
        pd.Series(pos_unit.index.tolist()+neg_unit.index.tolist()
                  ).drop_duplicates().to_frame(unit_name).set_index(unit_name)
        .join(pos_unit.rename(columns={'count': 'PosTokens'}))
        .join(neg_unit.rename(columns={'count': 'NegTokens'}))
        .fillna(0)
    )
    all_unit['AllTokens'] = (all_unit.PosTokens + all_unit.NegTokens)
    all_unit = all_unit.astype('int').sort_values('AllTokens', ascending=False)[
        ['AllTokens', 'PosTokens', 'NegTokens']]
    all_unit['%Neg'] = ((all_unit.NegTokens / all_unit.AllTokens)
                        * 100).astype('float64').round(3)
    all_unit['%Pos'] = ((all_unit.PosTokens / all_unit.AllTokens)
                        * 100).astype('float64').round(3)
    return all_unit


if RECOUNT_NEG:
    count_hits(redo_neg=True)

neg_counts = seek_prior_counting('RBdirect', 'neg')
pos_counts = seek_prior_counting('not-RBdirect', 'pos')

if not bool(neg_counts) and bool(pos_counts):
    count_hits()
    neg_counts = seek_prior_counting('RBdirect', 'neg')
    pos_counts = seek_prior_counting('not-RBdirect', 'pos')
```

```
Reading ADV Counts from:
  "/share/compling/projects/sanpi/results/freq_out/RBdirect/neg_adverb-
counts_RBdirect.2024-09-14.csv"
Reading ADJ Counts from:
  "/share/compling/projects/sanpi/results/freq_out/RBdirect/neg_adject-
counts_RBdirect.2024-09-14.csv"
Reading BIGRAM Counts from:
  "/share/compling/projects/sanpi/results/freq_out/RBdirect/neg_bigram-
counts_RBdirect.2024-09-14.csv"
Reading ADV Counts from:
  "/share/compling/projects/sanpi/results/freq_out/not-RBdirect/pos_adverb-
counts_not-RBdirect.2024-09-09.csv"
Reading ADJ Counts from:
  "/share/compling/projects/sanpi/results/freq_out/not-RBdirect/pos_adject-
counts_not-RBdirect.2024-09-09.csv"
Reading BIGRAM Counts from:
  "/share/compling/projects/sanpi/results/freq_out/not-RBdirect/pos_bigram-
counts_not-RBdirect.2024-09-09.csv"
```

### Adverb Counts

```
[ ]: all_adv = combine_polarities(pos_counts, neg_counts, 'adv')
     all_adv.index.name = 'adv'
     print(f'> {len(all_adv):,} total unique adverbs')
     nb_display(set_my_style(all_adv.filter(['null'], axis=0),
                             caption='Adverb, "null"'))
```

```
nb_display(set_my_style(all_adv.describe(),
                        caption='Stats for All Adverbs'))
```

```
> 56,449 total unique adverbs
```

```
<pandas.io.formats.style.Styler at 0x7ff457572f50>
```

```
<pandas.io.formats.style.Styler at 0x7ff45758d720>
```

### Adjective Counts

```
[ ]: all_adj = combine_polarities(pos_counts, neg_counts, 'adj')
     all_adj.index.name = 'adj'
     print(f'> {len(all_adj):,} total unique adjectives')
     nb_display(set_my_style(all_adj.filter(['null'], axis=0),
                             caption='Adjective, "null"'))
     nb_display(set_my_style(all_adv.describe(),
                             caption='Stats for All Adjectives'))
```

```
> 241,550 total unique adjectives
```

```
<pandas.io.formats.style.Styler at 0x7ff457571ed0>
```

```
<pandas.io.formats.style.Styler at 0x7ff4575731f0>
```

### Bigram Counts

```
[ ]: all_bigram = combine_polarities(pos_counts, neg_counts, 'bigram')
     all_bigram.index = all_bigram.index.str.replace('_', ' ')
     nb_display(set_my_style(all_bigram.describe(),
                 caption='Stats for All Bigrams'))
```

```
<pandas.io.formats.style.Styler at 0x7ff4575733a0>
```

## Plot `AllTokens` for each of the 3 units

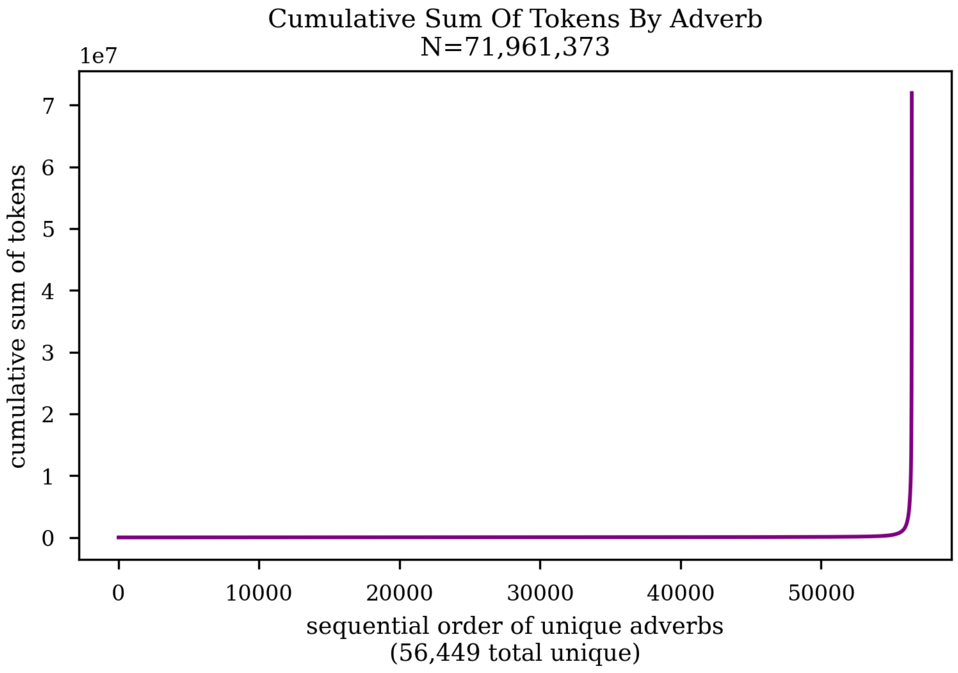
```
[ ]: def choose_cmap(unit_name):
         return ('petrol_wine_r' if unit_name.startswith('adj') else (
             'purple_teal' if unit_name.startswith('adv') else 'petrol_wine'))


     def plot_totals(_unit_counts=all_adj,
                     unit_name='adjective',
                     image_file_type=IMAGE_TYPE,
                     cmap=None,
                     size=(5, 3.5),
                     pad_inches=0.05):
         _N = _unit_counts.AllTokens.sum()
         unique_vals = len(_unit_counts)
         cmap = cmap or choose_cmap(unit_name)
         unit_name = unit_name.lower()
```

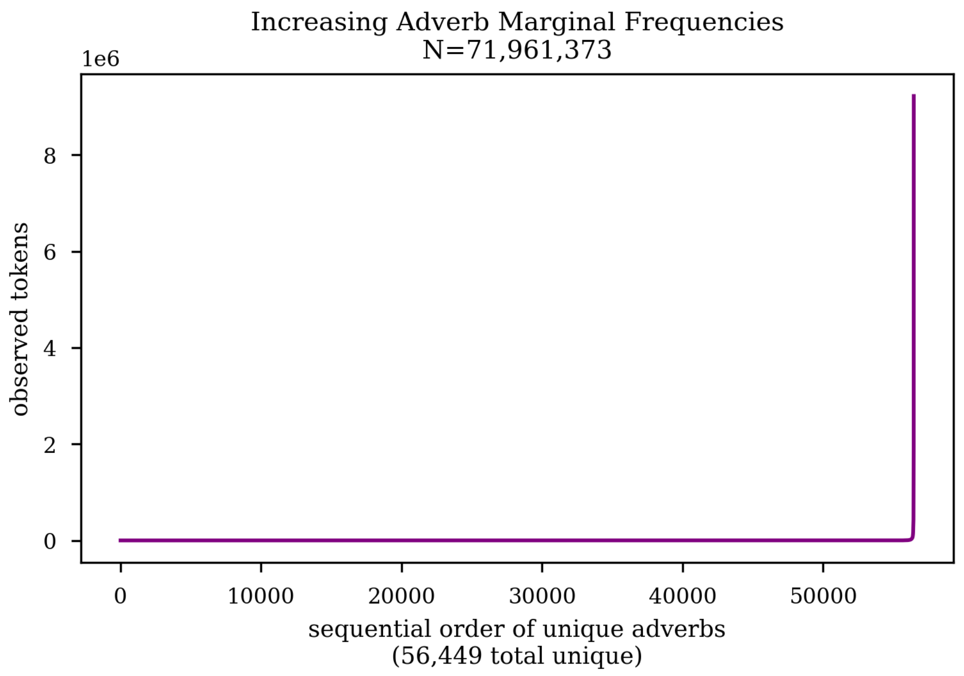
```
   _unit_totals = pd.to_numeric(_unit_counts.sort_values(
       ['AllTokens']
   ).reset_index().filter(like='All').squeeze())
   _unit_totals.index = _unit_totals.index + \
       (1 if _unit_totals.index[0] == 0 else 0)

   # cumulative sum of marginals
   _fig = plt.figure(layout='constrained', figsize=size, dpi=300)
   _fig = _unit_totals.cumsum().plot(layout='constrained',
                                     figsize=size, cmap=cmap,
                                     title=f'Cumulative Sum of Tokens by␣
↪{unit_name}\nN={_N:,}'.title(
                                     ), ylabel='cumulative sum of tokens',
                                     xlabel=f'sequential order of unique␣
↪{unit_name}s\n({unique_vals:,} total unique)',
                                     legend=False
                                     )

   plt.show()
   plt.savefig(
       FREQ_OUT_IMAGES.joinpath(
           f'{unit_name[:(3 if unit_name.lower().startswith("a") else 4)]}'
           f'-cumsum_PBR_{timestamp_today()}.{image_file_type}'),
       dpi=300, bbox_inches='tight', pad_inches=pad_inches)
   plt.close()

   # new fig
   _fig = plt.figure(layout='constrained', figsize=size, dpi=300)
   _fig = _unit_totals.plot(layout='constrained',
                            kind='line', cmap=cmap, legend=False, figsize=size,
                            xlabel=f'sequential order of unique␣
↪{unit_name}s\n({unique_vals:,} total unique)',
                            ylabel='observed tokens', logy=False,
                            title=f'Increasing {unit_name} Marginal␣
↪Frequencies\nN={_N:,}'.title(
                            )
                            )

   plt.show()
   plt.savefig(
       FREQ_OUT_IMAGES.joinpath(
           unit_name[:(3 if unit_name.lower().startswith("a") else 4)] +
           f'-sequential-f-raw_PBR_{timestamp_today()}.{image_file_type}'),
       dpi=300, bbox_inches='tight', pad_inches=pad_inches)

   plt.close()
```

```
    # new fig
    _fig = plt.figure(layout='constrained', figsize=size, dpi=300)
    _fig = _unit_totals.plot(
        layout='constrained',
        kind='line', cmap=cmap, legend=False, figsize=size,
        xlabel=f'sequential order of unique {unit_name}s\n({unique_vals:,}␣
↪total unique)',
        ylabel='observed tokens (log)', logy=True,
        title=(f'Increasing {unit_name} Marginal Frequencies\n'
               f'(log transformed) N={_N:,}'.title()))

    plt.show()
    plt.savefig(
        FREQ_OUT_IMAGES.joinpath(
            unit_name[:(3 if unit_name.lower().startswith("a") else 4)] +
            f'-sequential-f-log_PBR_{timestamp_today()}.{image_file_type}'),
        dpi=300, bbox_inches='tight', pad_inches=pad_inches)

    # * Histograms
    plt.close()

    # > log counts
    # new fig
    _fig = plt.figure(layout='constrained', figsize=size, dpi=300)
    _fig = _unit_totals.plot(layout='constrained',
                             kind='hist', cmap=cmap, legend=False, figsize=size,
                             ylabel=f'\# unique {unit_name}s␣
↪(log)\n({unique_vals:,} total unique)',
                             xlabel='marginal frequency',
                             log=True,
                             # logx=True,
                             # bins=20,
                             title=f'Distribution of {unit_name} Marginal␣
↪Frequencies\n(log transformed) N={_N:,}'.title())

    plt.show()
    plt.savefig(
        FREQ_OUT_IMAGES.joinpath(
            unit_name[:(3 if unit_name.lower().startswith("a") else 4)] +
            f'-hist-logY_PBR_{timestamp_today()}.{image_file_type}'),
        dpi=300, bbox_inches='tight', pad_inches=pad_inches)
    plt.close()

    # new fig
    # > log unit counts -&- log frequencies
    _fig = plt.figure(layout='constrained', figsize=size, dpi=300)
    _fig = _unit_totals.apply(log2).plot(layout='constrained',
                                         kind='hist', cmap=cmap, legend=False,␣
↪figsize=size,
                                         ylabel=f'\# unique {unit_name}s␣
↪(log)\n({unique_vals:,} total unique)',
                                         xlabel='marginal frequency ($\log_2$)',
                                         log=True,
                                         # logx=True,
                                         # bins=20,
                                         title=f'Distribution of {unit_name}␣
↪Marginal Frequencies\n(log transformed) N={_N:,}'.title())

    plt.show()
    plt.savefig(
        FREQ_OUT_IMAGES.joinpath(
            unit_name[:(3 if unit_name.lower().startswith("a") else 4)] +
            f'-hist-logXY_PBR_{timestamp_today()}.{image_file_type}'),
        dpi=300, bbox_inches='tight', pad_inches=pad_inches)

    plt.close()

    # new fig
    # > raw values (no log scaling)
    _fig = plt.figure(layout='constrained', figsize=size, dpi=300)
    _fig = _unit_totals.plot(layout='constrained',
                             kind='hist', cmap=cmap, legend=False,␣
↪figsize=size,  # bins=20,
                             ylabel=f'unique {unit_name}s\n({unique_vals:,}␣
↪total unique)',
                             xlabel='observed tokens',
                             title=f'Distribution of {unit_name} Marginal␣
↪Frequencies\nN={_N:,}'.title())

    plt.show()
    plt.savefig(
        FREQ_OUT_IMAGES.joinpath(
            f'{unit_name[:(3 if unit_name.lower().startswith("a") else 4)]}'
            f'-hist_PBR_{timestamp_today()}.{image_file_type}'),
        dpi=300, bbox_inches='tight', pad_inches=pad_inches)

    # _fig = _unit_totals.plot(
    #     kind='box', cmap=cmap, legend=False, figsize=size,
    #     ylabel=f'unique {unit_name}s\n({unique_vals:,} total unique)',
    #     xlabel='observed tokens',
    #     loglog=False,
    #     title=f'Distribution of {unit_name} Marginal Frequencies\nN={_N:,}'.
↪title())
    # plt.savefig(
    #     FREQ_OUT_IMAGES.joinpath(
    #         f'{unit_name[:(3 if unit_name.lower().startswith("a") else 4)]}'
    #         f'-box_PBR_{timestamp_today()}.{image_file_type}'),
    #     dpi=300, bbox_inches='tight', pad_inches=pad_inches)
```

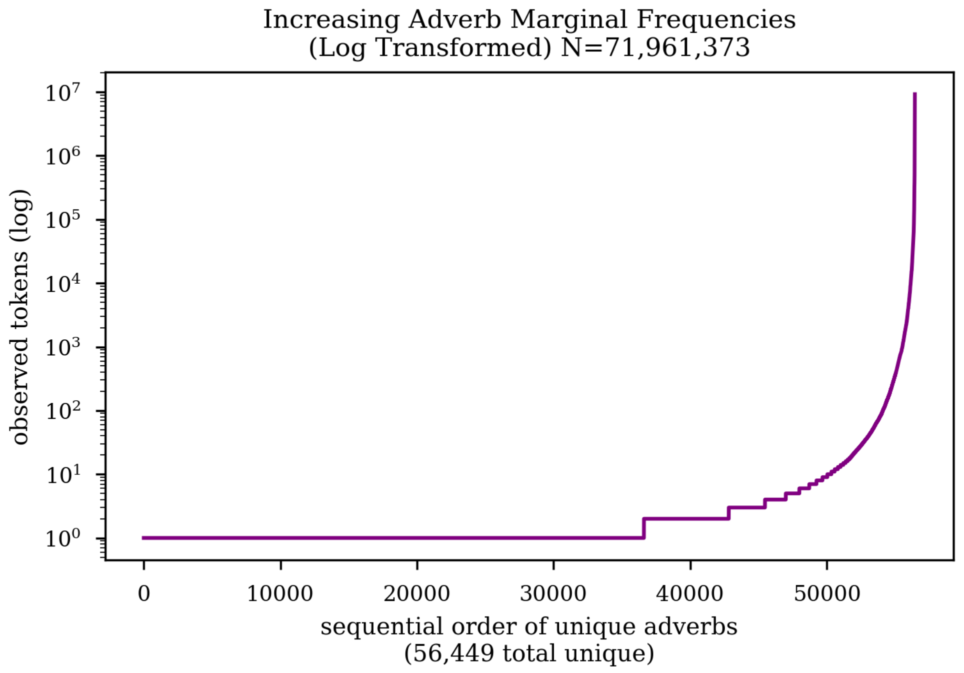
### Adverb Totals

```
[ ]: plot_totals(all_adv, 'adverb')
```

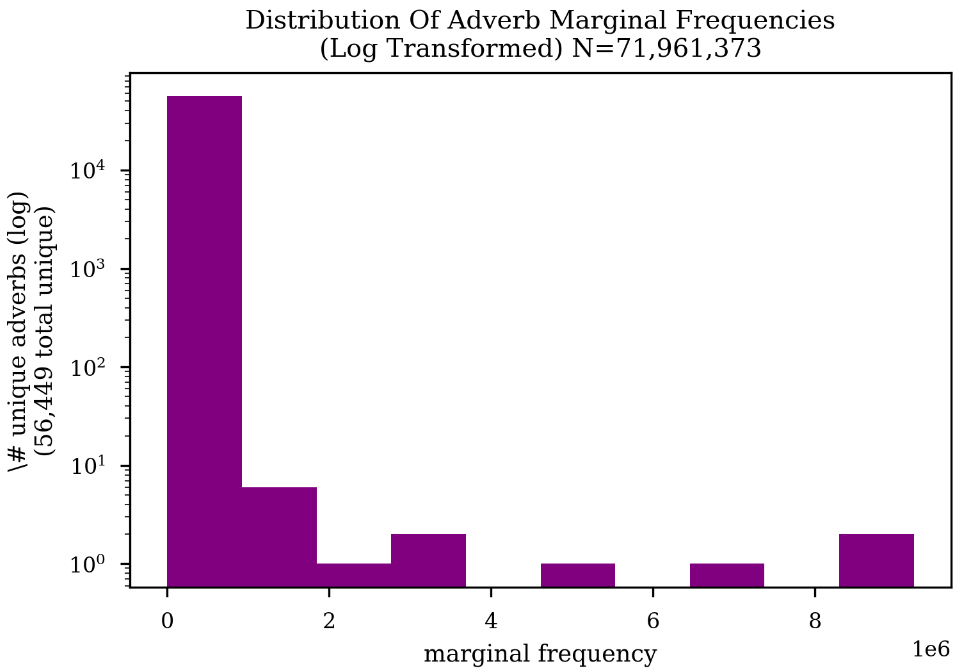


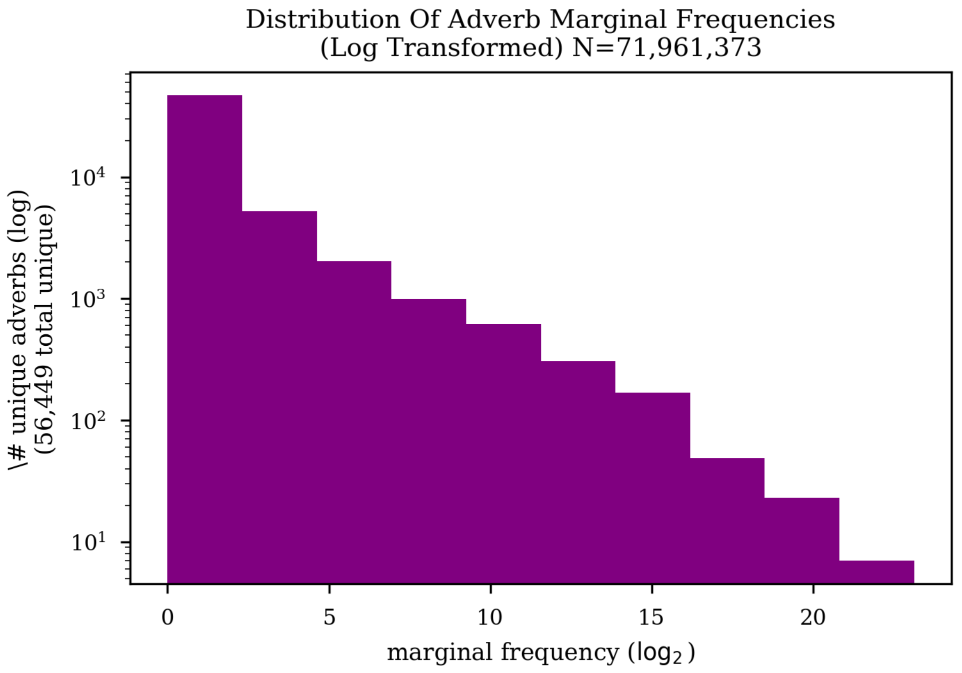


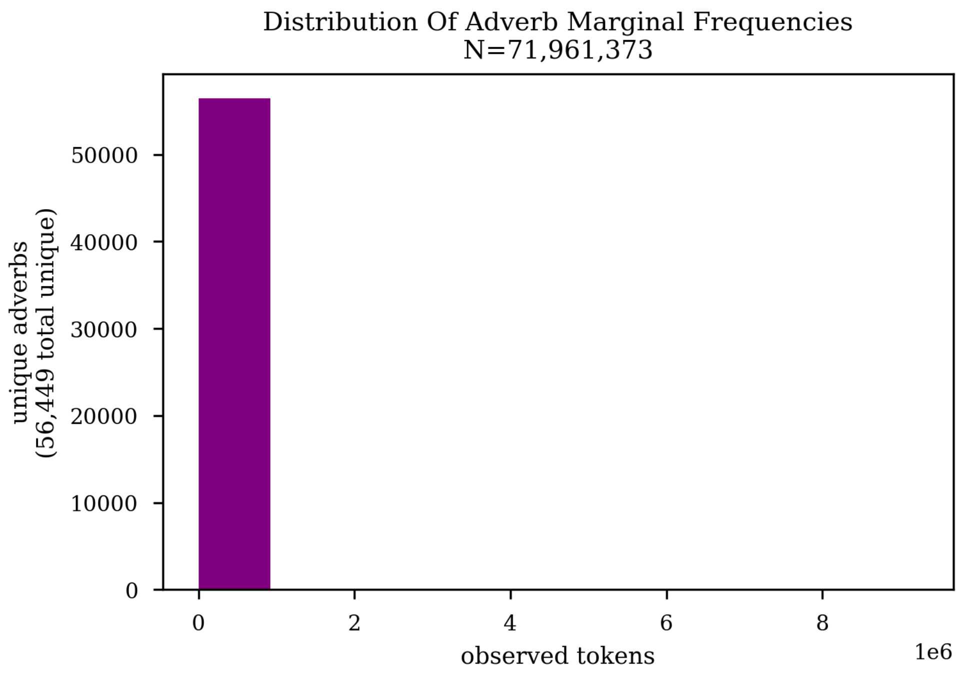
Increasing Adverb Marginal Frequencies
N=71,961,373
1e6
8
6
4
2
0
observed tokens
0
10000
20000
30000
40000
50000
sequential order of unique adverbs
(56,449 total unique)



Increasing Adverb Marginal Frequencies
(Log Transformed) N=71,961,373
10^7
10^6
10^5
10^4
10^3
10^2
10^1
10^0
observed tokens (log)
0
10000
20000
30000
40000
50000
sequential order of unique adverbs
(56,449 total unique)


Distribution Of Adverb Marginal Frequencies
(Log Transformed) N=71,961,373
# unique adverbs (log)
(56,449 total unique)
10^0
10^1
10^2
10^3
10^4
0
2
4
6
8
1e6
marginal frequency

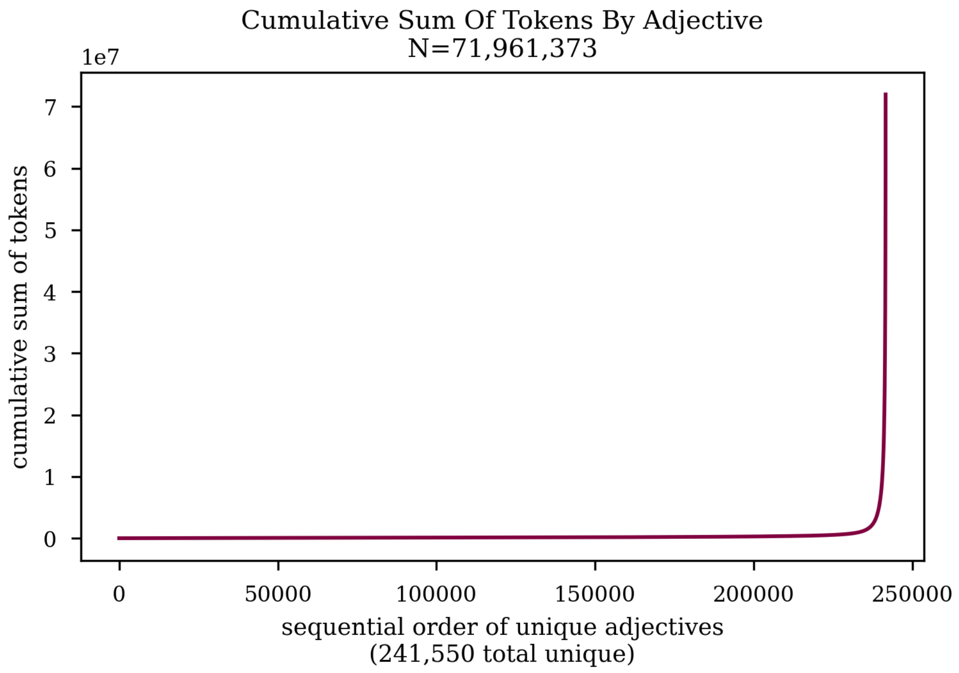

Distribution Of Adverb Marginal Frequencies
(Log Transformed) N=71,961,373
# unique adverbs (log)
(56,449 total unique)
10^1
10^2
10^3
10^4
0
5
10
15
20
marginal frequency ($\log_2$)

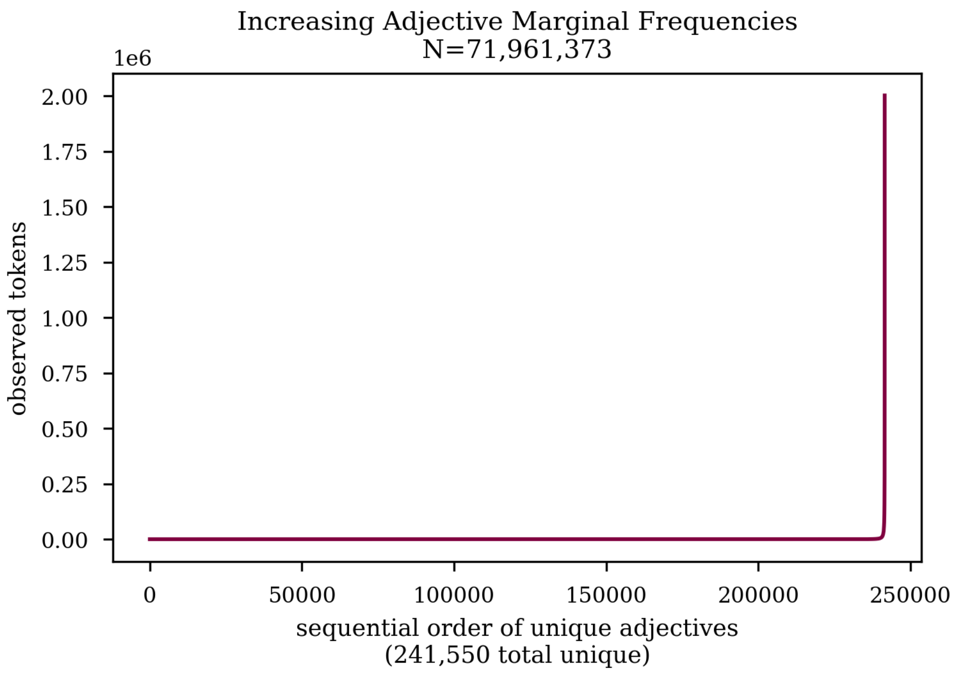


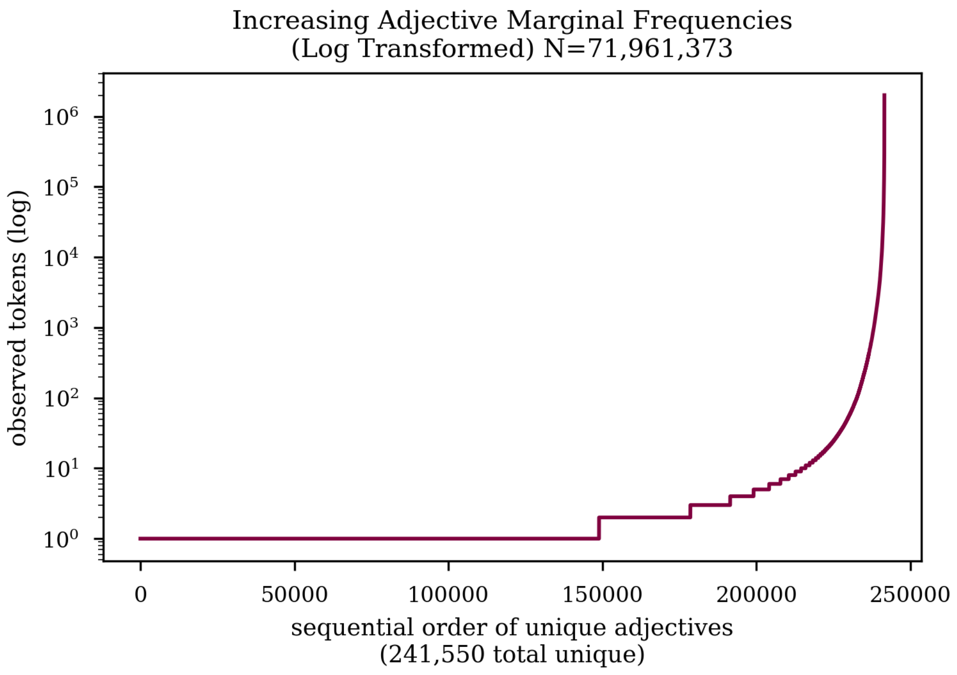
```
<Figure size 640x440 with 0 Axes>
```

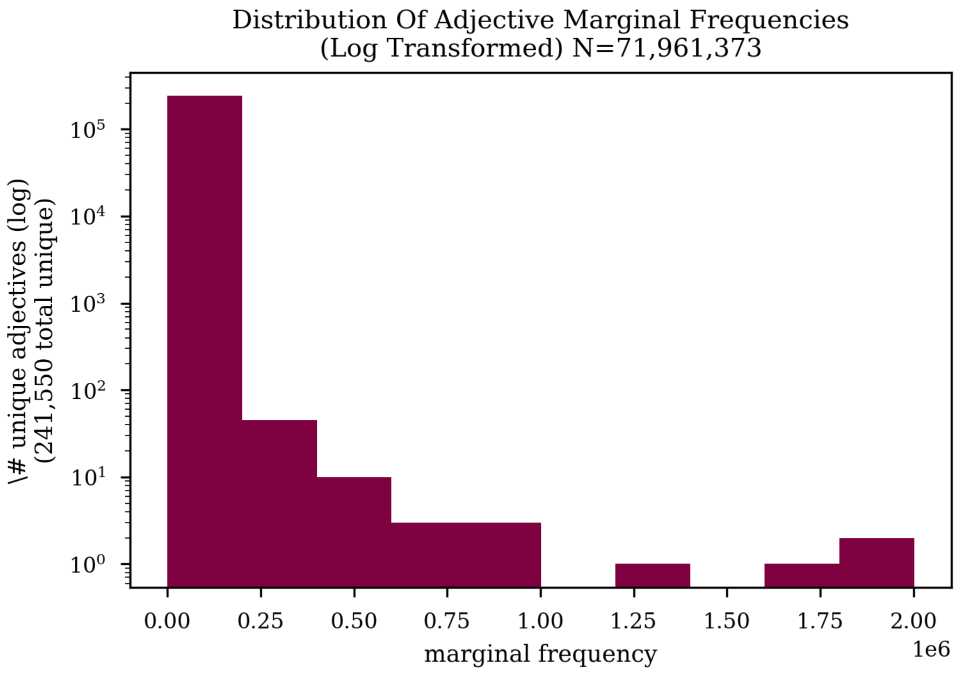
### Adjective Totals

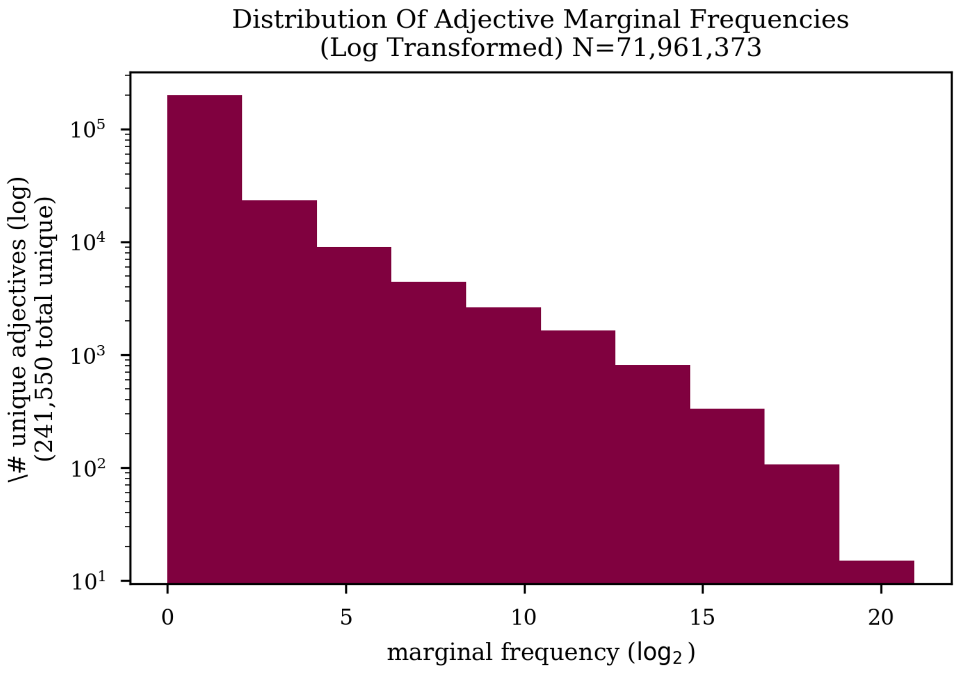
```
[ ]: plot_totals(all_adj, 'adjective')
```

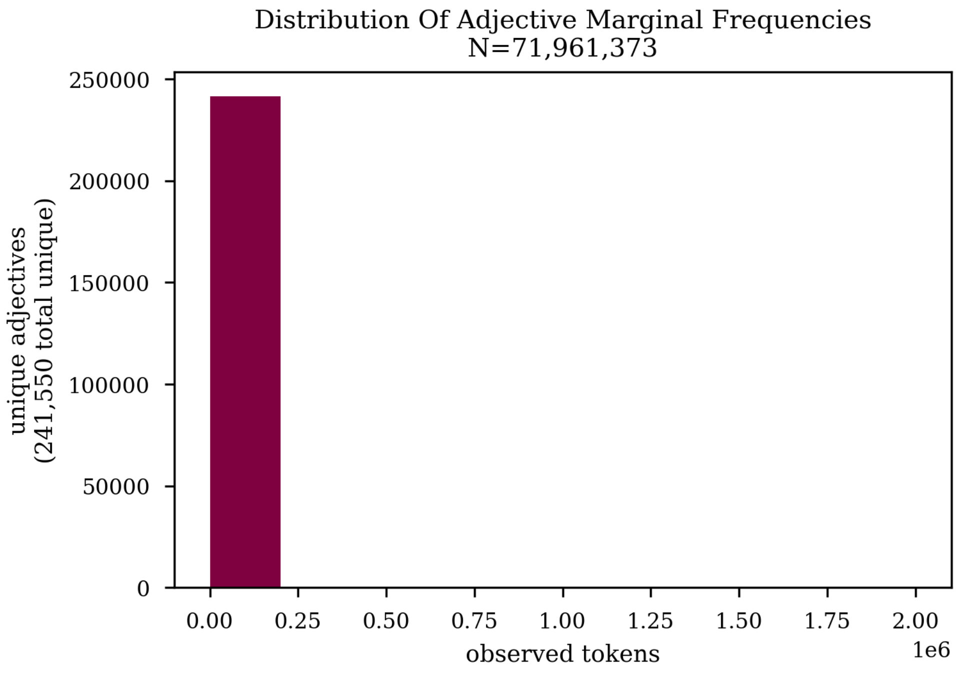



Increasing Adjective Marginal Frequencies
N=71,961,373
1e6
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
observed tokens
0
50000
100000
150000
200000
250000
sequential order of unique adjectives
(241,550 total unique)


Increasing Adjective Marginal Frequencies
(Log Transformed) N=71,961,373
10^6
10^5
10^4
10^3
10^2
10^1
10^0
observed tokens (log)
0
50000
100000
150000
200000
250000
sequential order of unique adjectives
(241,550 total unique)


Distribution Of Adjective Marginal Frequencies
(Log Transformed) N=71,961,373
# unique adjectives (log)
(241,550 total unique)
10^5
10^4
10^3
10^2
10^1
10^0
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
1e6
marginal frequency

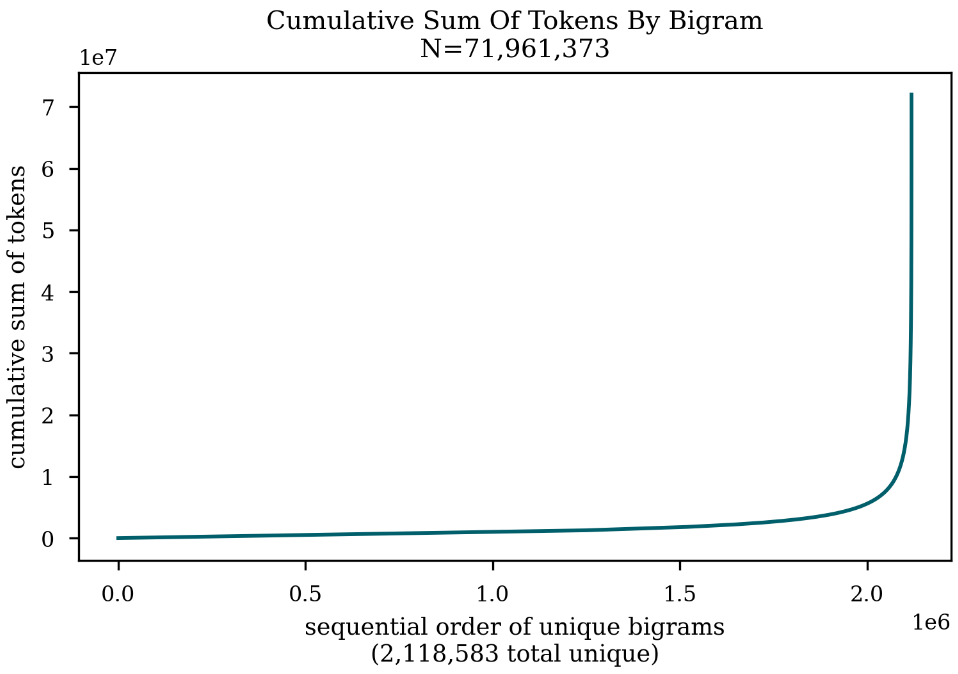

Distribution Of Adjective Marginal Frequencies
(Log Transformed) N=71,961,373
# unique adjectives (log)
(241,550 total unique)
10^5
10^4
10^3
10^2
10^1
0
5
10
15
20
marginal frequency ($\log_2$)

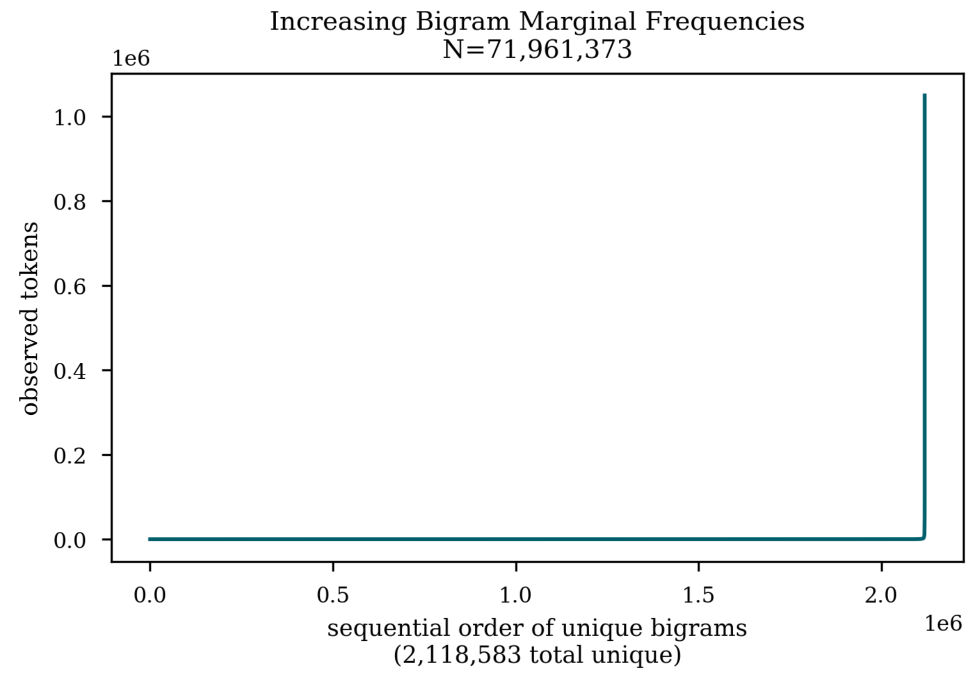


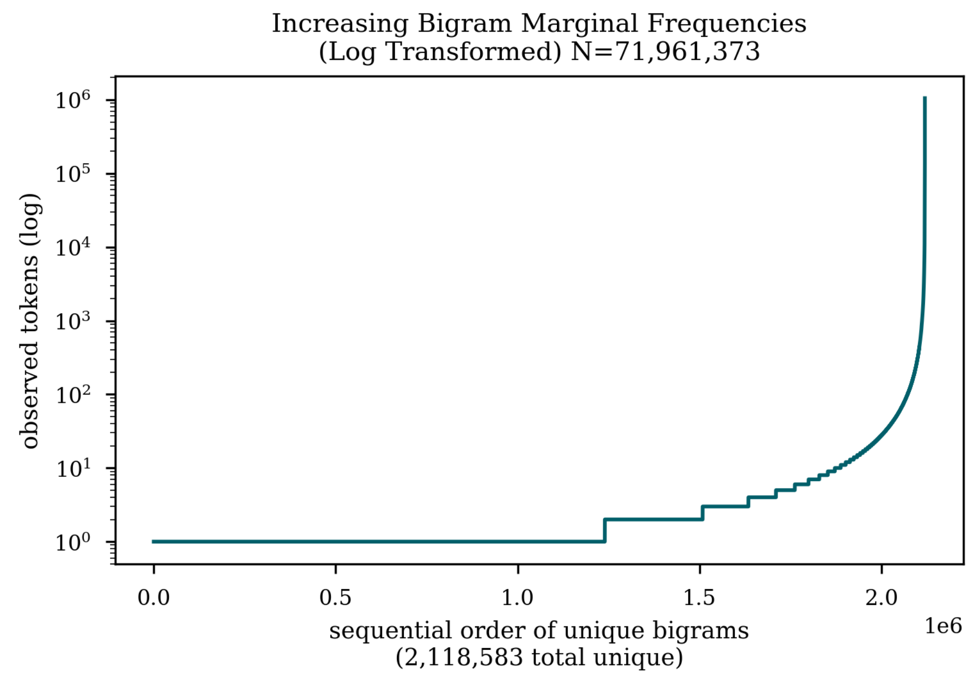
```
<Figure size 640x440 with 0 Axes>
```

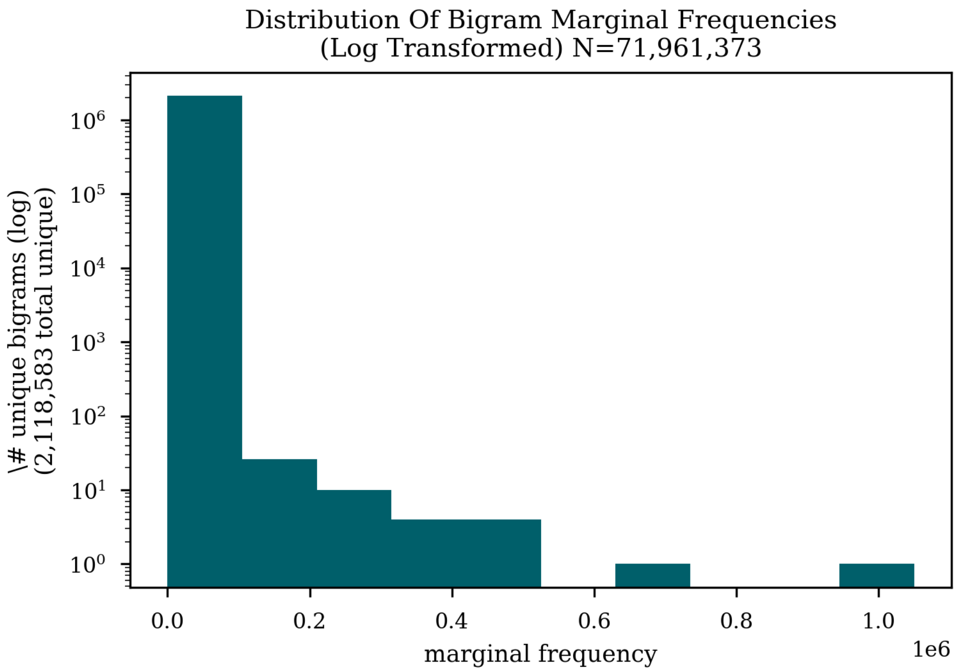
### Bigram Totals

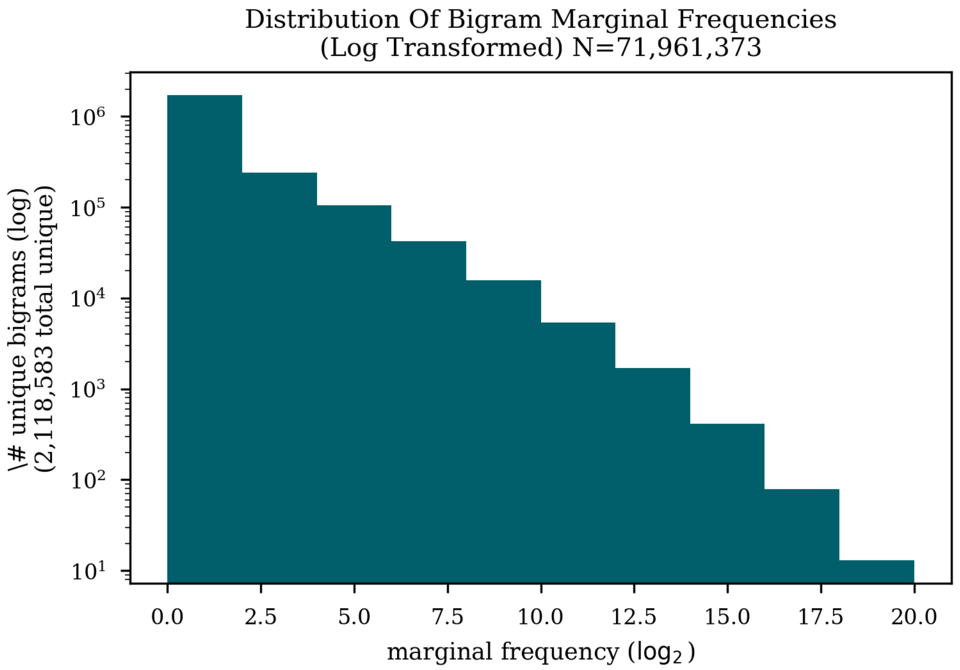
```
[ ]: plot_totals(all_bigram, 'bigram')
```

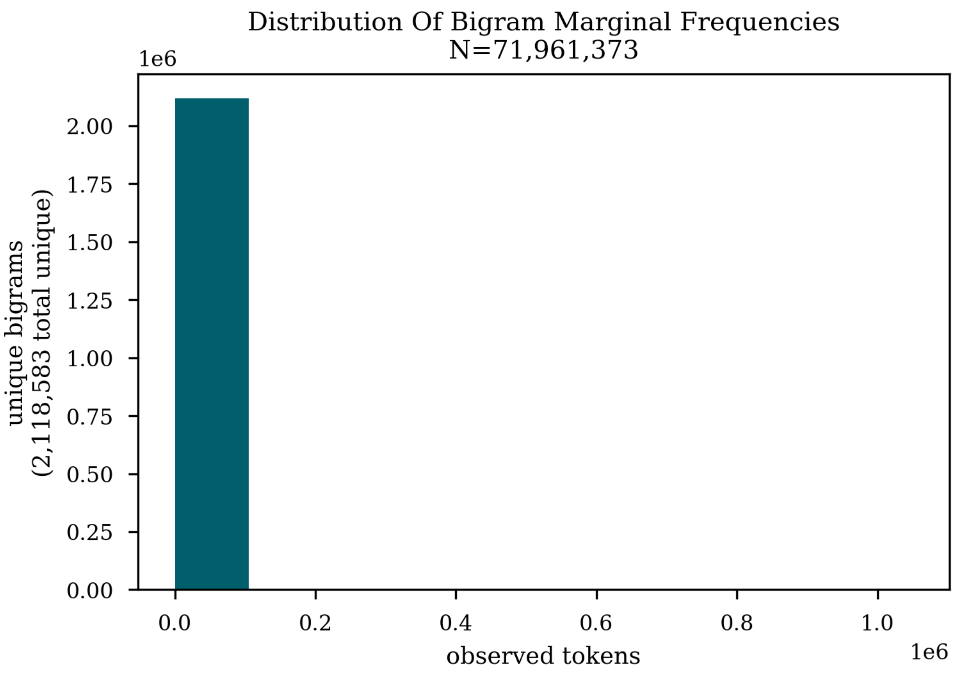



Increasing Bigram Marginal Frequencies
N=71,961,373
1e6
1.0
0.8
0.6
0.4
0.2
0.0
observed tokens
0.0
0.5
1.0
1.5
2.0
1e6
sequential order of unique bigrams
(2,118,583 total unique)


Increasing Bigram Marginal Frequencies
(Log Transformed) N=71,961,373
10^6
10^5
10^4
10^3
10^2
10^1
10^0
observed tokens (log)
0.0
0.5
1.0
1.5
2.0
1e6
sequential order of unique bigrams
(2,118,583 total unique)


Distribution Of Bigram Marginal Frequencies
(Log Transformed) N=71,961,373
# unique bigrams (log)
(2,118,583 total unique)
10^6
10^5
10^4
10^3
10^2
10^1
10^0
0.0
0.2
0.4
0.6
0.8
1.0
1e6
marginal frequency


Distribution Of Bigram Marginal Frequencies
(Log Transformed) N=71,961,373
# unique bigrams (log)
(2,118,583 total unique)
10^6
10^5
10^4
10^3
10^2
10^1
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
marginal frequency ($\log_2$)



```
<Figure size 640x440 with 0 Axes>
```

Violin? python plt.violinplot([transform_counts(unit_freqs_df, method = 'log').AllTokens.reset_index(drop=True).squeeze() for unit_freqs_df in [all_adj, all_adv, all_bigram]], showmeans=True, showextrema=True, showmedians=True) plt.xticks(ticks=[1,2,3], labels=[f'{unit}s' for unit in ['adjective', 'adverb', 'bigram']])

### Box Plot of all 3

[ ]:
```
unit_totals_dict = {'adverb': all_adv,
                    'adjective': all_adj,
                    'bigram': all_bigram}



def freq_box_plots(unit_f_dict):
    _fig = plt.figure(figsize=(3, 5), layout='constrained',
                      dpi=300, facecolor=None)
    box_data = [unit_freqs_df.AllTokens.squeeze()
                for unit_freqs_df in unit_f_dict.values()]
    plt.boxplot(
        box_data,
        tick_labels=[f'{unit}s'for unit in unit_f_dict.keys()],
        showmeans=True,
        meanprops={'marker': '^',
                    'markerfacecolor': 'Gold',
                    'markeredgecolor': 'black',
                    'markersize': 3},
        medianprops={'color': 'Teal', 'markerfacecolor': 'Teal'},
        flierprops={'marker': 'o',
                     'markerfacecolor': 'black',
                     'markeredgecolor': 'black',
                     'markersize': 2}

        # meanprops={'color': 'Salmon', 'markerfacecolor': 'Salmon', },␣
↪medianprops={'color': 'SlateBlue'},
        # showbox=True, showfliers=True
    )
    # means = [np.mean(d) for d in box_data]
    # medians = [np.median(d) for d in box_data]
    # maxs = [np.max(d) for d in box_data]

    # Add annotations
    for i, freqs in enumerate(box_data):
        f_info = freqs.describe()
        # > Annotate mean
        plt.text(i+1.045, f_info['mean']*1.5, f'mean: {round(f_info["mean"]):,.
↪0f}',
                 fontsize=6,
                 ha='center', va='bottom',
                 backgroundcolor='Gold',
                 color='Black',
                 fontstyle='italic',
                 fontweight='normal')
        # > Annotate median
        # this_med = freqs.median()
        plt.text(i+1, f_info['50%'] * 0.6, f'median: {round(f_info["50%"]):.
↪0f}',
                 fontsize=6, ha='center',
                 fontweight=400,
                 fontstyle='italic',
                 color='Teal',
                 #  backgroundcolor= 'Teal',
                 #  color='White',
                 va='bottom')
        # > Annotate max
        # this_max = freqs.max()
        most_freq = freqs[freqs == f_info['max']].index[0]
        break_str = "\n" if len(most_freq) > 5 else " "
        plt.text(i+1.1, f_info['max'] * 1.15, f'{f_info["max"]:,.0f}:
↪{break_str}{most_freq}',
                 fontsize=6, ha='center',
                fontweight=400,
                fontstyle='italic',
                color='DarkSlateBlue',
                #  backgroundcolor= 'Teal',
                #  color='White',
                va='bottom')
    plt.yscale('log')
    plt.ylabel('marginal frequency (log)')

    plt.show()
    plt.savefig(
        FREQ_OUT_IMAGES.joinpath(
            f'AllTokens-x3-box-log_PBR_{timestamp_today()}.png'),
        dpi=300, bbox_inches='tight', pad_inches=0.05)
    plt.savefig(
        FREQ_OUT_IMAGES.joinpath(
            f'AllTokens-x3-box-log_PBR_{timestamp_today()}.pdf'),
        dpi=300, bbox_inches='tight', pad_inches=0.05)
    # ! This one was too complex to save as .pgf or .svg! It was massive.
    # plt.savefig(
    #     FREQ_OUT_IMAGES.joinpath(
    #             f'AllTokens-x3-box-log_PBR_{timestamp_today()}.svg'),
    #         dpi=300, bbox_inches='tight', pad_inches=0.05)
# freq_box_plots(unit_totals_dict)
```

## Apply Color Gradient to Top Polar Values for each unit

```
[ ]: def get_top_dict(all_x_common, k=K):
         top_dict = dict.fromkeys(['neg', 'pos'])
         for pol in top_dict:
             top_w = all_x_common.nlargest(
                 k, [f'%{pol.capitalize()}', 'AllTokens']).convert_dtypes().
       ↪reset_index()
             top_w['#'] = range(1, k+1)
             top_dict[pol] = top_w.set_index(['#', all_x_common.index.name])
         return top_dict


     def save_polar_tops(tops_dict, unit_name, f_min,
                         neg_cmap='PuBu',
                         pos_cmap='BuPu',
                         combined_cmap='PuBuGn'):
         for pole in ('neg', 'pos'):
             if pole == 'neg':
                 longer = 'negative'
                 cmap = neg_cmap
             else:
```

```
            longer = 'positive'
            cmap = pos_cmap
        save_latex_table(
            format_zeros(tops_dict[pole].style.background_gradient(cmap)),
            verbose=True,
            caption=(f'Top {K} {unit_name.capitalize()}s with '
                     + f'Highest <u>{longer.capitalize()} Polarity</u>␣
↪Percentage ({f_min:,}+ tokens)'
                     + (f'<br/><i>Note: Explicitly negative {unit_name}s␣
↪excluded</i>'
                        if pole == 'neg' else '')),
            latex_subdir=f'PBR_summary/{longer}',
            latex_stem=f'top{K}-{unit_name}-{pole}-pct:{f_min}+',
            label=f'tab:top-{unit_name}-{pole}-pct')

    # > save combined table
    save_latex_table(
        format_zeros(pd.concat(tops_dict.values()
                               ).style.background_gradient(combined_cmap)),
        verbose=True,
        caption=(f'Top {K} {unit_name.capitalize()}s with '
                 + f'Highest <u>Negative & Positive Polarity</u> Percentage␣
↪({f_min:,}+ tokens)'
                 + f'<br/><i>Note: Explicitly negative {unit_name}s excluded</
↪i>'),
        latex_subdir='PBR_summary',
        latex_stem=f'top{K}-{unit_name}-BOTH-pct:{f_min}+',
        label=f'tab:top-{unit_name}-both-pct')
```

### Top Polar Relative *Bigram* Frequencies

[ ]:
```
all_bigram_common = all_bigram.loc[
    (all_bigram.AllTokens >= BIGRAM_MIN)
    & ~(all_bigram.index.str.startswith(("not", "no ", "never", "n't"))), :]
bigram_tops = get_top_dict(all_bigram_common)
save_polar_tops(bigram_tops, 'bigram', BIGRAM_MIN)
```

```
Caption: Top 20 Bigrams with Highest <u>Negative Polarity</u> Percentage (100+
tokens)<br/><i>Note: Explicitly negative bigrams excluded</i>

<pandas.io.formats.style.Styler at 0x7ff43788f460>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/negative/top20-bigram-neg-
pct:100+.2025-02-05.tex


Caption: Top 20 Bigrams with Highest <u>Positive Polarity</u> Percentage (100+
tokens)
```

```
<pandas.io.formats.style.Styler at 0x7ff437a920b0>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/positive/top20-bigram-pos-
pct:100+.2025-02-05.tex


Caption: Top 20 Bigrams with Highest <u>Negative & Positive Polarity</u>
Percentage (100+ tokens)<br/><i>Note: Explicitly negative bigrams excluded</i>

<pandas.io.formats.style.Styler at 0x7ff437a920b0>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/top20-bigram-BOTH-
pct:100+.2025-02-05.tex
```

### Top Polar Relative *Adverb* Frequencies

```
[ ]: all_adv_common = all_adv.loc[
         (all_adv.AllTokens >= ADV_MIN)
         & ~(all_adv.index.str.startswith(
             ("not", "never", "n't")))
         & (all_adv.index != 'no'), :]

     adv_tops = get_top_dict(all_adv_common)
     save_polar_tops(adv_tops, 'adverb', ADV_MIN,
                     neg_cmap='GnBu', pos_cmap='BuGn', combined_cmap='YlGnBu')
```

```
Caption: Top 20 Adverbs with Highest <u>Negative Polarity</u> Percentage (600+
tokens)<br/><i>Note: Explicitly negative adverbs excluded</i>

<pandas.io.formats.style.Styler at 0x7ff43c15cb50>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/negative/top20-adverb-neg-
pct:600+.2025-02-05.tex


Caption: Top 20 Adverbs with Highest <u>Positive Polarity</u> Percentage (600+
tokens)

<pandas.io.formats.style.Styler at 0x7ff43c15cb50>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/positive/top20-adverb-pos-
pct:600+.2025-02-05.tex


Caption: Top 20 Adverbs with Highest <u>Negative & Positive Polarity</u>
Percentage (600+ tokens)<br/><i>Note: Explicitly negative adverbs excluded</i>

<pandas.io.formats.style.Styler at 0x7ff45730e170>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/top20-adverb-BOTH-
```

```
pct:600+.2025-02-05.tex
```

### Top Polar Relative *Adjective* Frequencies

```
[ ]: all_adj_common = all_adj.loc[all_adj.AllTokens >= ADJ_MIN, :]

     adj_tops = get_top_dict(all_adj_common)
     save_polar_tops(adj_tops, 'adjective', ADJ_MIN,
                     neg_cmap='PuRd', pos_cmap='RdPu', combined_cmap='RdPu')
```

```
Caption: Top 20 Adjectives with Highest <u>Negative Polarity</u> Percentage
(300+ tokens)<br/><i>Note: Explicitly negative adjectives excluded</i>

<pandas.io.formats.style.Styler at 0x7ff437a90790>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/negative/top20-adjective-neg-
pct:300+.2025-02-05.tex

Caption: Top 20 Adjectives with Highest <u>Positive Polarity</u> Percentage
(300+ tokens)

<pandas.io.formats.style.Styler at 0x7ff437a90790>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/positive/top20-adjective-pos-
pct:300+.2025-02-05.tex

Caption: Top 20 Adjectives with Highest <u>Negative & Positive Polarity</u>
Percentage (300+ tokens)<br/><i>Note: Explicitly negative adjectives
excluded</i>

<pandas.io.formats.style.Styler at 0x7ff437a929b0>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/top20-adjective-BOTH-
pct:300+.2025-02-05.tex
```

## Calculate Versatility

### Split bigrams to calculate versatility

```
[ ]: def _split_bigrams(bigram_counts: pd.DataFrame,
                        strict: bool = False,
                        floor: int = 1):
         _bigram_counts = bigram_counts.copy()
         if strict:
             floor = floor if floor > 1 else 5
         if floor > 1:
```

```
        _bigram_counts = _bigram_counts.loc[_bigram_counts.AllTokens >= floor, :
↪]
    # > This will catch both 'exactly_sure' and 'exactly sure' formatting of␣
↪bigram strings
    adv_adj_str_df = _bigram_counts.index.str.extract(
        r'^(?P<adv>\S+)[ _](?P<adj>\S+)$')
    adv_adj_str_df.index.name = 'bigram'
    nunique_df = adv_adj_str_df.reset_index().nunique().to_frame(floor)
    nunique_df.columns.name = 'bigram f floor'
    return adv_adj_str_df, nunique_df
```

#### trivial = 1+

```
[ ]: bigram_split_any, trivial_bigram_unique_adx = _split_bigrams(all_bigram)
     bigram_nunique_adx_df = trivial_bigram_unique_adx
     nb_display(set_my_style(bigram_nunique_adx_df,
                             caption='Total Unique ADx appearing in <i>any</i>␣
     ↪bigram (Trivial Unique)'
                             ).text_gradient('deep_waters', axis=None))
```

```
<pandas.io.formats.style.Styler at 0x7ff43c15dc60>
```

#### strict = 5+

```
[ ]: bigram_split_5, bigram_nunique_adx_5 = _split_bigrams(all_bigram, strict=True)
     # bigram_split_5 = all_bigram.loc[all_bigram.AllTokens >= 5, :].index.str.
     ↪extract(
     #     r'^(?P<adv>[^_]+)_(?P<adj>[^_]+)$')
     # // bigram_unique_adx_5 = bigram_split_5.nunique()
     strict_bigram_nunique_adx = bigram_nunique_adx_5
     bigram_nunique_adx_df = bigram_nunique_adx_df.join(
         strict_bigram_nunique_adx)
     nb_display(set_my_style(strict_bigram_nunique_adx,
                             caption='Total Unique ADx appearing in bigrams with 5+␣
     ↪tokens (Strict Unique)'
                             ).text_gradient('deep_waters', axis=None))
```

```
<pandas.io.formats.style.Styler at 0x7ff43c15d150>
```

#### Trivial and Strict together

```
[ ]: sty = (set_my_style(
         bigram_nunique_adx_df.copy().T.sort_index(),
         caption='Total Unique ADx appearing in Bigram Sets, Strict(5) and Trivial␣
     ↪(1)'
     )
         # .bar(axis=None)
         # #.text_gradient('inferno', axis=None, high=0.25)
```

```
    .bar(
        align='left',
        cmap="blue_black_pink",
        height=50, width=50,
        props=(
            "width: 120px; border-right: 1px solid black;"
            " border-left: 1px solid black;")
))
nb_display(sty)
```

```
<pandas.io.formats.style.Styler at 0x7ff43c15d660>
```

#### Comparison of Unique ADx Set Cardinality for different bigram *f* floors

```
[ ]: for bfmin in [2, 3, 4, 10]:
         __, bigram_nunique_adx_y = _split_bigrams(all_bigram, floor=bfmin)
         bigram_nunique_adx_df = bigram_nunique_adx_df.join(bigram_nunique_adx_y)

     bigram_nunique_adx_df = bigram_nunique_adx_df.sort_index(axis=1)
     nb_display(bigram_nunique_adx_df)
```

```
<pandas.io.formats.style.Styler at 0x7ff43c15ead0>
```

```
[ ]: sty = (set_my_style(
         bigram_nunique_adx_df.copy().T.sort_index(),
         caption='Comparison of Unique ADx Set Cardinality for different bigram␣
      ↪frequency floors'
     )
         # .bar(axis=None)
         # #.text_gradient('inferno', axis=None, high=0.25)
         .bar(
             align='left',
             cmap="blue_black_pink",
             height=50, width=50,
             props=(
                 "width: 120px; border-right: 1px solid black;"
                 " border-left: 1px solid black;")
     ))
     nb_display(sty)
     sty.to_html(LATEX_TABLES.joinpath(
         'PBR_summary/versatility/uniqueADx_by_f-thresh.html'))
     print(f"--> table with databars saved as html:\n"
           + f" {LATEX_TABLES.joinpath('PBR_summary/versatility/
      ↪uniqueADx_by_f-thresh.html')}")

     # ! #BUG can't find required excel writer module
     # sty.to_excel(str(LATEX_TABLES.joinpath('PBR_summary/versatility/
      ↪uniqueADx_by_f-thresh.xlsx')),
     #               engine='openpyxl')
     # print(f"--> table with databars saved as excel spreadsheet:\n"
     #       +f" {LATEX_TABLES.joinpath('PBR_summary/versatility/
      ↪uniqueADx_by_f-thresh.xlsx')}")
```

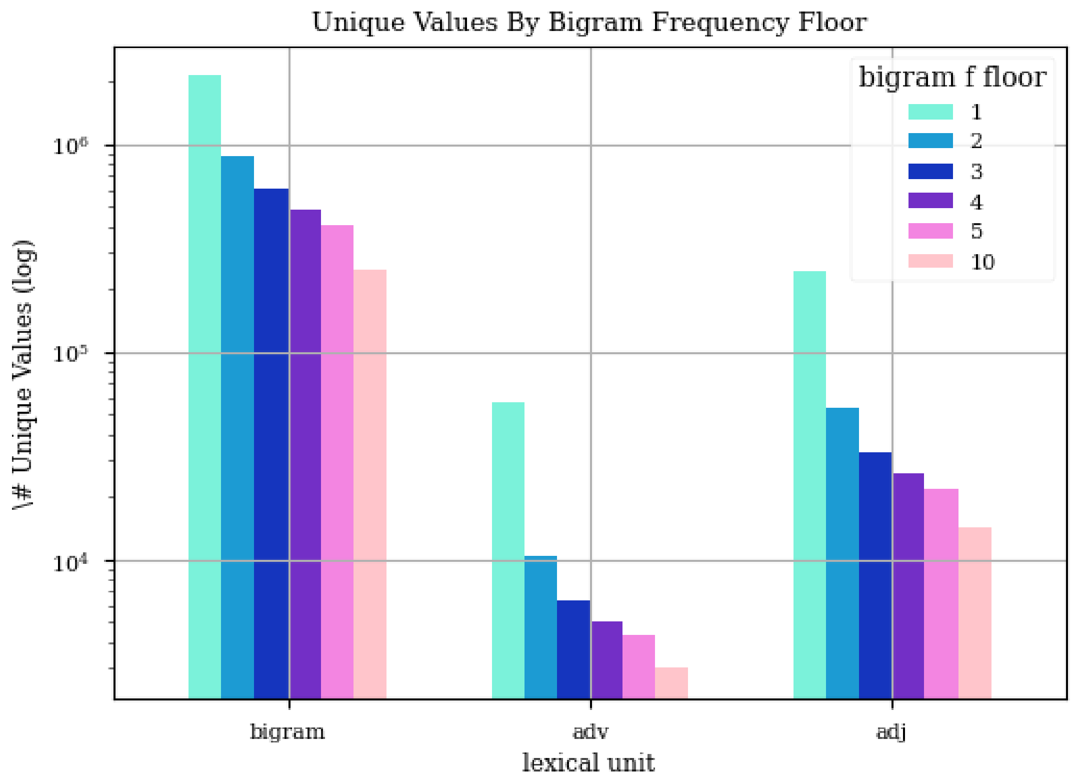
```
<pandas.io.formats.style.Styler at 0x7ff43c15eb60>

--> table with databars saved as html:
 /share/compling/projects/arh234/OverleafDissertex/assets/tables/PBR_summary/ver
satility/uniqueADx_by_f-thresh.html
```

[ ]:
```
cm = 'gist_stern_r'
save_latex_table(
    bigram_nunique_adx_df.style
    .text_gradient(cm, subset=bigram_nunique_adx_df.columns[1:], axis=1,
                   low=0.2, high=0.05, vmin=0),

    verbose=True,
    caption='Unique Values by Minimum Frequency Floor',
    label='tab:pbr-adx-unique-by-f-floor',
    latex_path=TEX_ASSETS.joinpath(
        'tables/PBR_summary/versatility/uniqueADx_by_f-thresh'))
```

```
Caption: Unique Values by Minimum Frequency Floor

<pandas.io.formats.style.Styler at 0x7ff43c15c5b0>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/versatility/uniqueADx_by_f-thresh
```

[ ]:
```
PosixPath('/share/compling/projects/arh234/OverleafDissertex/assets/tables/PBR_s
ummary/versatility/uniqueADx_by_f-thresh')
```

[ ]:
```
_fig = bigram_nunique_adx_df.plot(grid=True,
                                  kind='bar', cmap='lisa_frank', logy=True,␣
 ↪ylabel='\# Unique Values (log)',
                                  title='Unique Values By Bigram Frequency␣
 ↪Floor',
                                  width=0.65, layout='constrained',
                                  xlabel='lexical unit')
plt.xticks(rotation=0)

plt.savefig(
    FREQ_OUT_IMAGES.joinpath(
        f'nunique-ADx-by-freq-floor_PBR_{timestamp_today()}.{IMAGE_TYPE}'),
    dpi=300, bbox_inches='tight', pad_inches=0.01)
plt.show()
plt.close()
```



### Counting Unique "Partners"

```
[ ]: def count_unique_partners(split_bigrams: pd.DataFrame,
                              unit: str,
                              nunique_df: int,
                              strict: bool = False):
         swap_adx = {'adv': 'adj', 'adj': 'adv'}
         kind_tag = "strict" if strict else "trivial"
         vers = split_bigrams.value_counts(unit).to_frame(
             f'{kind_tag}_{unit}_versatility')
         npossible = nunique_df.at[swap_adx[unit], 5 if strict else 1]
         print(f'{npossible:,}')
         vers[f'{kind_tag}_%of_{swap_adx[unit]}_forms'
              ] = (vers.squeeze()
                   / npossible) * 100
         return vers  # .assign(unit=unit)[['unit'] + vers.columns.to_list()]
```

#### *Trivial* Versatility

```
[ ]: trivial_vers_adv = count_unique_partners(
         bigram_split_any, 'adv',  bigram_nunique_adx_df)
     print(trivial_vers_adv.head().to_markdown(
         tablefmt='simple_outline', floatfmt='.2f', intfmt=','))

     trivial_vers_adj = count_unique_partners(
         bigram_split_any, 'adj',  bigram_nunique_adx_df)
     print(trivial_vers_adj.head().to_markdown(
         tablefmt='simple_outline', floatfmt='.2f', intfmt=','))

     save_latex_table(pd.concat((trivial_vers_adv.describe().T,
                                 trivial_vers_adj.describe().T)).convert_dtypes().
      ↪style,
                      latex_subdir='PBR_summary/versatility',␣
      ↪latex_stem='trivial_vers_adv',
                      label='tab:trivial-vers-adv', verbose=True)
```

```
241,550

 adv      trivial_adv_versatility    trivial_%of_adj_forms

 more                    61082.00                    25.29
 most                    39681.00                    16.43
 very                    38305.00                    15.86
 so                      24205.00                    10.02
 as                      18300.00                     7.58

56,449

 adj          trivial_adj_versatility    trivial_%of_adv_forms

 good                         3425.00                     6.07
 more                         2457.00                     4.35
 high                         2454.00                     4.35
 beautiful                    2254.00                     3.99
 different                    2081.00                     3.69

Caption: \draft{REPLACE WITH TABLE NAME}

<pandas.io.formats.style.Styler at 0x7ff43ff21450>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/versatility/trivial_vers_adv.2025-
02-05.tex
```

```
[ ]: PosixPath('/share/compling/projects/arh234/OverleafDissertex/assets/tables/PBR_s
     ummary/versatility/trivial_vers_adv.2025-02-05.tex')
```

#### *Strict* Versatility

```
[ ]: strict_vers_adv = count_unique_partners(
         bigram_split_5, 'adv',
         nunique_df=bigram_nunique_adx_df,
         strict=True)
     print(strict_vers_adv.head().to_markdown(
         tablefmt='simple_outline', floatfmt='.2f', intfmt=','))

     strict_vers_adj = count_unique_partners(
         bigram_split_5, 'adj',
         nunique_df=bigram_nunique_adx_df,
         strict=True)
     print(strict_vers_adj.head().to_markdown(
         tablefmt='simple_outline', floatfmt='.2f', intfmt=','))

     nb_show_table(pd.concat((strict_vers_adv.describe().T,
                   strict_vers_adj.describe().T)).convert_dtypes())
     save_latex_table(pd.concat((strict_vers_adv.describe().T,
                                 strict_vers_adv.describe().T)).convert_dtypes().
      ↪style,
                      latex_subdir='PBR_summary/versatility',␣
      ↪latex_stem='strict_vers_adv',
                      label='tab:strict-vers-adv')
```

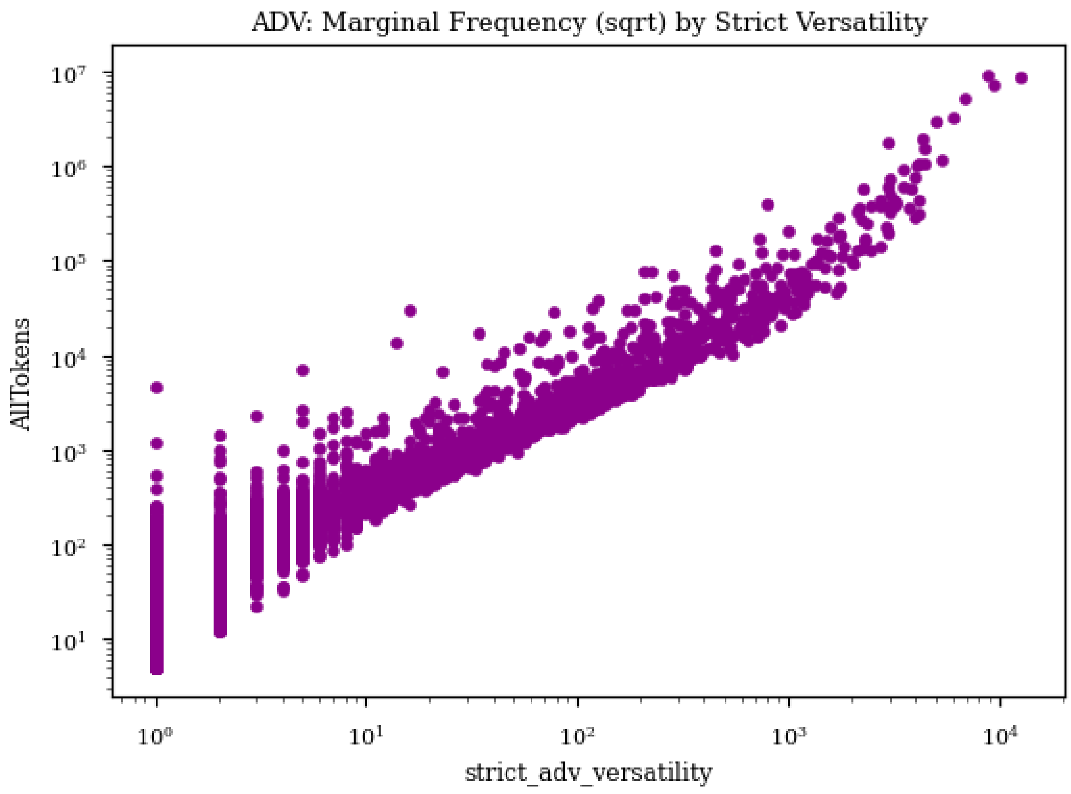
```
21,704

 adv       strict_adv_versatility    strict_%of_adj_forms

 more                    12707.00                   58.55
 most                     9433.00                   43.46
 very                     8828.00                   40.67
 so                       6909.00                   31.83
 as                       6049.00                   27.87

4,307

 adj            strict_adj_versatility    strict_%of_adv_forms

 good                           865.00                   20.08
 high                           750.00                   17.41
 beautiful                      701.00                   16.28
 different                      684.00                   15.88
 bad                            604.00                   14.02


|                            |   `count` |    `mean` |    `std` |    `min` |
`25%` |    `50%` |    `75%` |      `max` |
|:---------------------------|----------:|---------:|---------:|---------:|-------
```

```
-:|--------:|--------:|----------:|
| **strict_adv_versatility** |     4,307 |    95.02 |  477.38 |     1.00 |
1.00 |     3.00 |    20.00 | 12,707.00 |
| **strict_%of_adj_forms**   |     4,307 |     0.44 |    2.20 |     0.00 |
0.00 |     0.01 |     0.09 |     58.55 |
| **strict_adj_versatility** |    21,704 |    18.86 |   47.26 |     1.00 |
1.00 |     3.00 |    13.00 |    865.00 |
| **strict_%of_adv_forms**   |    21,704 |     0.44 |    1.10 |     0.02 |
0.02 |     0.07 |     0.30 |     20.08 |

Caption: \draft{REPLACE WITH TABLE NAME}
Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/versatility/strict_vers_adv.2025-
02-05.tex
```

```
[ ]: PosixPath('/share/compling/projects/arh234/OverleafDissertex/assets/tables/PBR_s
     ummary/versatility/strict_vers_adv.2025-02-05.tex')
```

```
[ ]: strict_vers_adv.sort_index().join(all_adv.sort_index().filter(['AllTokens'])  #␣
      ↪.apply(sqrt).to_frame('AllTokens_sqrt')
                                          ).plot(kind='scatter', loglog=True,␣
      ↪color='DarkMagenta',
                                                  x='strict_adv_versatility',␣
      ↪y='AllTokens',
                                                  title='ADV: Marginal Frequency (sqrt)␣
      ↪by Strict Versatility')
```

```
[ ]: <Axes: title={'center': 'ADV: Marginal Frequency (sqrt) by Strict Versatility'},
     xlabel='strict_adv_versatility', ylabel='AllTokens'>
```



#### Combined Descriptive Stats

```
[ ]: combined_vers_stats = pd.concat(
         (d.describe().T
          for d in [strict_vers_adv,
                    trivial_vers_adv,
                    strict_vers_adj,
                    trivial_vers_adj]
          )
     ).round(1).convert_dtypes()
     save_latex_table(combined_vers_stats.filter(like='vers', axis=0).T.
       ↪convert_dtypes().style,
                      latex_subdir='PBR_summary/versatility',␣
       ↪latex_stem='combined-vers-stats_values')
     save_latex_table(combined_vers_stats.filter(like='%', axis=0).T.
       ↪convert_dtypes().style,
                      latex_subdir='PBR_summary/versatility',␣
       ↪latex_stem='combined-vers-stats_percents')
```

```
Caption: \draft{REPLACE WITH TABLE NAME}
Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/versatility/combined-vers-
```

```
stats_values.2025-02-05.tex

Caption: \draft{REPLACE WITH TABLE NAME}
Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/versatility/combined-vers-
stats_percents.2025-02-05.tex
```

```
[ ]: PosixPath('/share/compling/projects/arh234/OverleafDissertex/assets/tables/PBR_s
     ummary/versatility/combined-vers-stats_percents.2025-02-05.tex')
```

### *Adverbs*: Most Versatile

```
[ ]: adv_vers = strict_vers_adv.join(trivial_vers_adv).fillna(
         0).convert_dtypes().join(all_adv.filter(like='All'))
     # adv_vers.to_csv(VERS_RESULTS_DIR / 'adverb_versatility.csv') #! already saved
     nb_show_table(adv_vers.nlargest(30, strict_vers_adv.columns[0]))
     save_latex_table(adv_vers.nlargest(30, strict_vers_adv.columns[0])
                      .style.background_gradient('BuPu'),
                      latex_stem='most-vers-adv',
                      label='tab:most-vers-adv',
                      latex_subdir='PBR_summary/versatility')
     save_latex_table(adv_vers.filter(SPECIAL_ADV, axis=0)
                      .sort_values('strict_%of_adj_forms', ascending=False)
                      .style.background_gradient('BuPu'),
                      latex_stem='adv-of-interest-vers',
                      label='tab:adv-of-interest-vers',
                      latex_subdir='PBR_summary/versatility')
```

```
|                  |   `strict_adv_versatility` |   `strict_%of_adj_forms` |
`trivial_adv_versatility` |   `trivial_%of_adj_forms` |   `AllTokens` |
|:-----------------|---------------------------:|-------------------------:|----
------------------------:|--------------------------:|--------------:|
| **more**         |                     12,707 |                    58.55 |
61,082 |                     25.29 |     8,659,678 |
| **most**         |                      9,433 |                    43.46 |
39,681 |                     16.43 |     7,120,428 |
| **very**         |                      8,828 |                    40.67 |
38,305 |                     15.86 |     9,220,012 |
| **so**           |                      6,909 |                    31.83 |
24,205 |                     10.02 |     5,173,538 |
| **as**           |                      6,049 |                    27.87 |
18,300 |                      7.58 |     3,231,640 |
| **less**         |                      5,308 |                    24.46 |
18,150 |                      7.51 |     1,138,786 |
| **too**          |                      4,958 |                    22.84 |
15,528 |                      6.43 |     2,976,740 |
```

also	4,444	20.48	16,916	7.00	1,064,426
pretty	4,443	20.47	13,838	5.73	1,507,900
really	4,287	19.75	14,789	6.12	1,945,388
almost	4,141	19.08	15,013	6.22	433,607
often	4,129	19.02	13,386	5.54	312,584
even	4,125	19.01	14,639	6.06	1,040,332
quite	4,043	18.63	10,961	4.54	988,755
somewhat	3,945	18.18	11,077	4.59	286,573
still	3,939	18.15	13,651	5.65	767,897
completely	3,852	17.75	13,182	5.46	580,752
rather	3,767	17.36	10,026	4.15	362,090
just	3,542	16.32	14,299	5.92	597,938
extremely	3,496	16.11	10,197	4.22	914,395
truly	3,197	14.73	10,338	4.28	386,904
all	3,195	14.72	12,141	5.03	407,269
only	3,186	14.68	12,695	5.26	432,612
slightly	3,160	14.56	10,046	4.16	374,449
totally	3,060	14.10	10,597	4.39	324,129
particularly	3,033	13.97	9,303	3.85	511,734
highly	3,026	13.94	9,429	3.90	732,924
mostly	2,985	13.75	12,438	5.15	199,676
much	2,967	13.67	10,190	4.22	1,760,618
always	2,959	13.63	9,749	4.04	604,097

Caption: \draft{REPLACE WITH TABLE NAME}

```
Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/versatility/most-vers-
adv.2025-02-05.tex

Caption: \draft{REPLACE WITH TABLE NAME}
Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/versatility/adv-of-interest-
vers.2025-02-05.tex
```

```
[ ]: PosixPath('/share/compling/projects/arh234/OverleafDissertex/assets/tables/PBR_s
     ummary/versatility/adv-of-interest-vers.2025-02-05.tex')
```

### *Adjectives*: Most Versatile

```
[ ]: adj_vers = strict_vers_adj.join(trivial_vers_adj).fillna(
         0).convert_dtypes().join(all_adj.filter(like='All'))
     # adv_vers.to_csv(VERS_RESULTS_DIR / 'adjective_versatility.csv') #! already␣
      ↪saved
     nb_show_table(adj_vers.nlargest(10, strict_vers_adj.columns[0])
                   )
     save_latex_table(adj_vers.nlargest(30, strict_vers_adj.columns[0])
                      .style.background_gradient('BuGn'),
                      latex_stem='most-vers-adj',
                      label='tab:most-vers-adj',
                      latex_subdir='PBR_summary/versatility')
```

```
|               |   `strict_adj_versatility` |   `strict_%of_adv_forms` |
`trivial_adj_versatility` |   `trivial_%of_adv_forms` |   `AllTokens` |
|:--------------|---------------------------:|-------------------------:|-------
---------------------:|--------------------------:|--------------:|
| **good**      |                        865 |                    20.08 |
3,425 |                      6.07 |     1,670,122 |
| **high**      |                        750 |                    17.41 |
2,454 |                      4.35 |       518,631 |
| **beautiful** |                        701 |                    16.28 |
2,254 |                      3.99 |       292,172 |
| **different** |                        684 |                    15.88 |
2,081 |                      3.69 |       802,192 |
| **bad**       |                        604 |                    14.02 |
2,043 |                      3.62 |       425,797 |
| **funny**     |                        582 |                    13.51 |
1,814 |                      3.21 |       122,146 |
| **important** |                        576 |                    13.37 |
1,813 |                      3.21 |     2,001,942 |
| **low**       |                        574 |                    13.33 |
1,701 |                      3.01 |       277,389 |
| **difficult** |                          567 |                     13.16 |
1,679 |                    2.97 |       729,385 |
| **close**     |                          563 |                     13.07 |
1,653 |                    2.93 |       407,539 |

Caption: \draft{REPLACE WITH TABLE NAME}
Stylized latex table saved as:
  OverleafDissertex/assets/tables/PBR_summary/versatility/most-vers-
adj.2025-02-05.tex
```

[ ]:
```
PosixPath('/share/compling/projects/arh234/OverleafDissertex/assets/tables/PBR_s
ummary/versatility/most-vers-adj.2025-02-05.tex')
```

[ ]:
```python
def _get_versatile(all_pairs: pd.DataFrame,
                   substantial_pairs: pd.DataFrame,
                   k: int = None):
    if k == 0:
        k = len(substantial_pairs)
    k = k or K
    if all_pairs.filter(like='Vers').empty:
        all_pairs.columns = all_pairs.columns.to_series().apply(snake_to_camel).
↪to_list()
        substantial_pairs.columns = substantial_pairs.columns.to_series().apply(
            snake_to_camel).to_list()
    most_versatile = substantial_pairs.copy().nlargest(
        k, substantial_pairs.columns[0])
    trivial_vers = all_pairs.filter(most_versatile.index, axis=0).squeeze()
    # most_versatile.loc[:, 'VersFacade'] = trivial_vers.filter(like='Vers').
↪squeeze()
    vers_diff = trivial_vers.filter(like='Vers').squeeze(
    ) - most_versatile.filter(like='Vers').squeeze()
    perc_diff = trivial_vers.filter(like='%').squeeze(
    ) - most_versatile.filter(like='%').squeeze()
    most_versatile = most_versatile.join(trivial_vers)
    most_versatile.loc[:, 'VersDiff'] = vers_diff
    most_versatile.loc[:, 'PercDiff'] = perc_diff
    # nb_show_table(most_versatile.reset_index())
    return most_versatile


versatile_adj_K = _get_versatile(trivial_vers_adj, strict_vers_adj)
```

[ ]:
```python
versatile_adj_10 = _get_versatile(
    trivial_vers_adj, strict_vers_adj, 10)
vers_of_all_adj = _get_versatile(
    trivial_vers_adj, strict_vers_adj, 0)
```

```
[ ]: versatile_adv_K = _get_versatile(
         trivial_vers_adv, strict_vers_adv)
     versatile_adv_10 = _get_versatile(
         trivial_vers_adv, strict_vers_adv, 10)
     vers_of_all_adv = _get_versatile(
         trivial_vers_adv, strict_vers_adv, 0)
```

```
[ ]: TARGET_ADV = tuple(pd.Series(
         [
             #   top superALL Negatively associated
             'necessarily', 'that', 'exactly', 'any', 'remotely', 'longer', 'ever',
             'immediately', 'yet', 'particularly', 'terribly',
             #   top superNEQ Positively associated
             'increasingly', 'relatively', 'almost', 'mostly', 'seemingly',␣
      ↪'fairly', 'pretty',
             'largely', 'rather', 'sometimes', 'also', 'now', 'probably',␣
      ↪'somewhat', 'potentially',

             'utterly', 'definitely', 'marginally', 'approximately', 'nearly',
             'albeit', 'quite', 'downright', 'absolutely',
             'kinda', 'sorta', 'entirely', 'especially', 'before',
             'only', 'just', 'extremely', 'slightly', 'precisely', 'accurately',
         ]
         + [
             'as', 'so', 'more', 'too', 'very', 'really',
             'always',  'completely', 'even', 'overly', 'less', 'most', 'all',␣
      ↪'totally', 'much',
             'actually', 'super', 'fully', 'merely',
             'also', 'often', 'still',
             'truly', 'highly', 'equally'
         ]  # + (
         # all_adv.loc[(all_adv.AllTokens > 500) & ~(all_adv.index.str.contains(
         #     NEG_REGEX)), :].nlargest(10, '%Neg').index.to_list()
         # + all_adv[all_adv.AllTokens > 500].nlargest(10, '%Pos').index.to_list())
         + sorted(SPECIAL_ADV)
     ).drop_duplicates().to_list())

     print(f'"Adverbs of Interest" ({len(TARGET_ADV)})')
     print(textwrap.wrap(repr(TARGET_ADV), 80))
     # all_adv.filter(TARGET_ADV, axis=0)
```

```
"Adverbs of Interest" (80)
["('necessarily', 'that', 'exactly', 'any', 'remotely', 'longer', 'ever',",
"'immediately', 'yet', 'particularly', 'terribly', 'increasingly',
'relatively',", "'almost', 'mostly', 'seemingly', 'fairly', 'pretty', 'largely',
'rather',", "'sometimes', 'also', 'now', 'probably', 'somewhat', 'potentially',
'utterly',", "'definitely', 'marginally', 'approximately', 'nearly', 'albeit',
'quite',", "'downright', 'absolutely', 'kinda', 'sorta', 'entirely',
'especially', 'before',", "'only', 'just', 'extremely', 'slightly', 'precisely',
'accurately', 'as', 'so',", "'more', 'too', 'very', 'really', 'always',
'completely', 'even', 'overly',", "'less', 'most', 'all', 'totally', 'much',
'actually', 'super', 'fully',", "'merely', 'often', 'still', 'truly', 'highly',
'equally', 'absurdly',", "'allegedly', 'anymore', 'anyway', 'insanely',
'minimally', 'moderately',", "'perfectly', 'ridiculously', 'supposedly')"]
```

```
[ ]: nb_display(set_my_style(format_zeros(
         all_bigram[~all_bigram.index.str.startswith(
             ("n't", 'not', 'no ', 'never'))]
         .filter(regex=r''.join(
             [f'|{a} ' for a in TARGET_ADV]), axis=0)
         .nlargest(K, ['%Neg', 'AllTokens']).style.background_gradient('PuBu'))
     ))
```

```
<pandas.io.formats.style.Styler at 0x7ff4375706d0>
```

```
[ ]: nb_display(all_bigram.filter(regex=r''.join(
         [f'| {a}' for a in EXACTLY_RELEVANT_ADJ]), axis=0).nlargest(K, ['%Neg',␣
      ↪'AllTokens']).style.background_gradient('lavender_teal'))
```

```
<pandas.io.formats.style.Styler at 0x7ff43746e560>
```

```
[ ]: nb_display(all_bigram.filter(regex=r''.join(
         [f'|{a} ' for a in TARGET_ADV]), axis=0).nlargest(K, ['%Pos', 'AllTokens']).
      ↪style.background_gradient())
```

```
<pandas.io.formats.style.Styler at 0x7ff43c21afe0>
```

```
[ ]: target_adv_vers = vers_of_all_adv.filter(TARGET_ADV, axis=0)
     target_adv_vers.columns = target_adv_vers.columns.to_series().apply(
         snake_to_camel).to_list()
     save_latex_table(format_zeros(target_adv_vers.nlargest(K,␣
      ↪'strictAdvVersatility')
                                   # pd.concat(target_adv_vers.nlargest(15, '%Pos'),
                                   #           target_adv_vers.nlargest(15, '%Neg'))
                                   .style.background_gradient('pink_r')),
                      latex_subdir='adv-of-interest', verbose=True,
                      latex_stem='target-adv-most-vers',
                      label='tab:target-adv-most-vers'
                      )
```

```
Caption: \draft{REPLACE WITH TABLE NAME}

<pandas.io.formats.style.Styler at 0x7ff4377f58d0>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/adv-of-interest/target-adv-most-
```

```
vers.2025-02-05.tex
```

[ ]:
```
PosixPath('/share/compling/projects/arh234/OverleafDissertex/assets/tables/adv-
of-interest/target-adv-most-vers.2025-02-05.tex')
```

## Calculate Polarity-Relative Versatility

[ ]:
```python
def show_most_versatile_by_pole(adx, _neg_counts, _pos_counts,
                                n_unique_df=bigram_nunique_adx_df,
                                unlimited: bool = False,
                                k=None):
    k = k or max(K, 30)
    target_adv_versatility = pd.DataFrame(index=TARGET_ADV)
    _vers_dict = {}
    for pole, polar_counts in [('Neg', _neg_counts), ('Pos', _pos_counts)]:
        print('\n### Processing', pole)
        pol_bigram_counts = polar_counts['bigram'].rename(
            columns={'count': 'AllTokens'})
        # pol_bigrams_5 = pol_bigram_counts.copy()[
        #     pol_bigram_counts.squeeze() >= 5]
        trivial_split, __ = _split_bigrams(pol_bigram_counts)
        strict_split, __ = _split_bigrams(pol_bigram_counts, strict=True)

        # neg_adv_unique_partners_5 = count_unique_partners(pol_bigrams_5,␣
↪'adv')
        # neg_adj_unique_partners_5 = count_unique_partners(pol_bigrams_5,␣
↪'adj')
        if adx == 'adv' and not unlimited:
            polar_target_adv_vers = count_unique_partners(
                strict_split, adx,
                n_unique_df, strict=True
            ).filter(TARGET_ADV, axis=0)

            polar_target_adv_vers.columns = [
                f'{pole}StrictVers', f'{pole}%ofStrict']

            target_adv_versatility = target_adv_versatility.join(
                polar_target_adv_vers)

        all_pairs = (count_unique_partners(
            trivial_split, adx,
            n_unique_df))
        all_pairs.columns = [f'{pole}TrivialVers', f'{pole}%ofTrivial']

        substantial_pairs = (count_unique_partners(
            strict_split, adx,
            n_unique_df, strict=True))
        substantial_pairs.columns = [f'{pole}StrictVers', f'{pole}%ofStrict']

        if unlimited:
            _vers_dict[pole] = _get_versatile(
                all_pairs=all_pairs,
                substantial_pairs=substantial_pairs,
                k=0)
        else:
            _vers_dict[pole] = _get_versatile(
                all_pairs=all_pairs,
                substantial_pairs=substantial_pairs,
                k=k)

        nb_display(set_my_style(_vers_dict[pole].head(8))
                   .background_gradient('PuBu' if pole == 'Pos' else 'PuRd'))

    pos_vers = _vers_dict['Pos']
    neg_vers = _vers_dict['Neg']

    if adx == 'adv' and not target_adv_versatility.empty:
        # nb_show_table(target_adv_versatility)
        return target_adv_versatility.fillna(0), pos_vers, neg_vers
    return None, pos_vers, neg_vers


def adjust_polar_vers(pol_vers_df=target_adv_vers,
                      overall_vers_for_unit=adv_vers):
    pol_vers_df.columns = pol_vers_df.columns.str.replace(
        'ofStrict', 'ofPossible').str.replace('Strict', '')
    pol_vers_df = pol_vers_df.assign(
        NegVersOdds=pol_vers_df.NegVers / pol_vers_df.PosVers,
        # PosMinusNegVers=pol_vers_df.PosVers - pol_vers_df.NegVers,
        # PosVersOdds=pol_vers_df.PosVers / pol_vers_df.NegVers,# > this is␣
 ↪just the inverse of NegVersOdds and there are "inf" values
        AllVers=pol_vers_df.index.to_series().map(
            overall_vers_for_unit.filter(regex=r'tric.+ersatility').squeeze())
    )
    pol_vers_df = pol_vers_df.assign(
        # > this one *does* differ from the inverse of NegVersProb
        PosVersRatioAll=(pol_vers_df.PosVers / pol_vers_df.AllVers),
        NegVersRatioAll=(pol_vers_df.NegVers / pol_vers_df.AllVers),
    ).sort_values('NegVersOdds', ascending=False)

    return pol_vers_df


def save_colored_vers_tex(vers_df, category='adv-of-interest',
                        includes_f: bool = False,
                        label=None):
    label = label or f'PolarCompare-{category}-vers'
    _sty = (vers_df.convert_dtypes().style
            .background_gradient('bone_r', subset=vers_df.filter(like='All').
↪columns)
            .background_gradient('PuRd', subset=vers_df.filter(like='Neg').
↪columns)
            .background_gradient('PuBu', subset=vers_df.filter(like='Pos').
↪columns)
            # ! Has to come last to overwrite the broader pattern
            .background_gradient('RdPuBu_r', subset=['NegVersOdds'])
            )
    if includes_f:
        label = label + '+f'
        # _sty = (_sty.
        #         .background_gradient('PuRd', subset=_neg_v_cols)
        #         .background_gradient('PuBu', subset=_pos_v_cols)
        #         .background_gradient('RdPuBu_r', subset=['NegVersOdds',␣
↪'NegVersProb'])
        #         .background_gradient('RdPuBu', subset=['PosVersOdds',␣
↪'PosVersProb']))
    save_latex_table(
        format_negatives(format_zeros(_sty)),
        verbose=True,
        latex_subdir=f'{category}/versatility',
        latex_stem=label,
        label=label
    )


def vers_freq_juxtaposition(pol_vers_df, freq_df):
    pol_vers_freq_info = (
        pol_vers_df
        .join(freq_df.filter(pol_vers_df.index, axis=0).filter(like='Tokens')))
    pol_vers_freq_info['Token%Neg'] = pol_vers_freq_info.index.to_series().map(
        freq_df['%Neg'])
    pol_vers_freq_info = pol_vers_freq_info.filter(
        ['AllVers',
         'PosVers', 'NegVers',
         'PosVersOdds', 'NegVersOdds',  # 'PosMinusNegVers',
         'PosVersRatioAll', 'NegVersRatioAll',
         #  'PosVersProb', 'NegVersProb',
         'AllTokens', 'PosTokens', 'NegTokens',  # '%Pos',
         'Token%Neg'])
    return pol_vers_freq_info
```

### Polarity Relative Adverb Versatility

```
[ ]: target_adv_vers, pos_adv_vers_top, neg_adv_vers_top =␣
      ↪show_most_versatile_by_pole(
         'adv', neg_counts, pos_counts)

     target_adv_vers = adjust_polar_vers(target_adv_vers, adv_vers)
```

```
### Processing Neg
21,704
241,550
21,704

<pandas.io.formats.style.Styler at 0x7ff43c1f19f0>


### Processing Pos
21,704
241,550
21,704

<pandas.io.formats.style.Styler at 0x7ff43c1f3130>
```

#### Retrieve *all* versatility values

```
[ ]: __, pos_adv_vers_all, neg_adv_vers_all = show_most_versatile_by_pole(
         'adv', neg_counts, pos_counts, unlimited=True)
```

```
### Processing Neg
241,550
21,704

<pandas.io.formats.style.Styler at 0x7ff43c24e080>


### Processing Pos
241,550
21,704

<pandas.io.formats.style.Styler at 0x7ff43c1f3ac0>
```

#### Save polarity-relative versatility values

```
[ ]: print('Polarity Relative Versatility Info saved as...')
     for stem, adv_polar_vers_df in zip(
         ('target_adv_vers_info',
          'pos_adv_vers_info-all',
          'pos_adv_vers_info-top',
          'neg_adv_vers_info-all',
          'neg_adv_vers_info-top'),
         (target_adv_vers,
          pos_adv_vers_all,
          pos_adv_vers_top,
          neg_adv_vers_all,
          neg_adv_vers_top)
     ):
         _pol_vers_out_path = VERS_RESULTS_DIR.joinpath(stem).with_suffix('.csv')
         print(f'  {_pol_vers_out_path}')
         adv_polar_vers_df.to_csv(_pol_vers_out_path)
```

```
Polarity Relative Versatility Info saved as…
  /share/compling/projects/sanpi/results/versatility/target_adv_vers_info.csv
  /share/compling/projects/sanpi/results/versatility/pos_adv_vers_info-all.csv
  /share/compling/projects/sanpi/results/versatility/pos_adv_vers_info-top.csv
  /share/compling/projects/sanpi/results/versatility/neg_adv_vers_info-all.csv
  /share/compling/projects/sanpi/results/versatility/neg_adv_vers_info-top.csv
```

Colored LaTeX tables

```
[ ]: save_colored_vers_tex(target_adv_vers)
     target_adv_info = vers_freq_juxtaposition(target_adv_vers, all_adv)
     save_colored_vers_tex(target_adv_info, includes_f=True)
```

```
Caption: \draft{REPLACE WITH TABLE NAME}

<pandas.io.formats.style.Styler at 0x7ff43741f2e0>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/adv-of-interest/versatility/PolarCompare-adv-
of-interest-vers.2025-02-05.tex

Caption: \draft{REPLACE WITH TABLE NAME}

<pandas.io.formats.style.Styler at 0x7ff43c24efe0>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/adv-of-interest/versatility/PolarCompare-adv-
of-interest-vers+f.2025-02-05.tex
```

### Adjective Polarity Relative Verstatility

```
[ ]: __, pos_adj_vers, neg_adj_vers = show_most_versatile_by_pole(
         'adj', neg_counts, pos_counts, unlimited=True)

     print('Polarity Relative Versatility Info saved as...')
     for stem, _adj_polar_vers_df in zip(
         (
             'pos_adj_vers_info-all',
             'neg_adj_vers_info-all'),
         (
             pos_adj_vers,
             neg_adj_vers),
     ):
         _pol_vers_out_path = VERS_RESULTS_DIR.joinpath(stem).with_suffix('.csv')
         print(f'  {_pol_vers_out_path}')
         _adj_polar_vers_df.to_csv(_pol_vers_out_path)
```

```
### Processing Neg
56,449
4,307

<pandas.io.formats.style.Styler at 0x7ff4572d9270>


### Processing Pos
56,449
4,307

<pandas.io.formats.style.Styler at 0x7ff4378c1f00>

Polarity Relative Versatility Info saved as…
  /share/compling/projects/sanpi/results/versatility/pos_adj_vers_info-all.csv
  /share/compling/projects/sanpi/results/versatility/neg_adj_vers_info-all.csv
```

[ ]:
```
combined_adj_polar_vers = pos_adj_vers.join(neg_adj_vers,
                                            lsuffix='Pos', rsuffix='Neg')
combined_adj_polar_vers.count()
```

[ ]:
```
PosStrictVers     21492
Pos%ofStrict      21492
PosTrivialVers    21492
Pos%ofTrivial     21492
VersDiffPos       21492
PercDiffPos       21492
NegStrictVers      4481
Neg%ofStrict       4481
NegTrivialVers     4481
Neg%ofTrivial      4481
VersDiffNeg        4481
PercDiffNeg        4481
dtype: int64
```

[ ]:
```
combined_adj_polar_vers = combined_adj_polar_vers.dropna()
combined_adj_polar_vers = adjust_polar_vers(combined_adj_polar_vers,
                                            adj_vers)
_pol_adj_vers_out_path = VERS_RESULTS_DIR.
 ↪joinpath('combined-polar-adj_versatility.csv')
print(f'  {_pol_adj_vers_out_path}')
```

```
combined_adj_polar_vers.to_csv(_pol_adj_vers_out_path)
```

```
  /share/compling/projects/sanpi/results/versatility/combined-polar-
adj_versatility.csv
```

[ ]:
```
adv_vers_freq_juxta = vers_freq_juxtaposition(combined_adj_polar_vers, all_adj,␣
 ↪)
adv_vers_freq_juxta = adv_vers_freq_juxta.loc[adv_vers_freq_juxta.
 ↪AllTokens>=ADJ_MIN, :]
```

[ ]:
```
adv_vfjuxta_top = pd.concat([adv_vers_freq_juxta.nlargest(K, 'NegVersOdds'),
                             adv_vers_freq_juxta.nsmallest(K, 'NegVersOdds')]).
 ↪drop_duplicates()
save_colored_vers_tex(adv_vfjuxta_top,
                      'ADJ-Combined-tops', includes_f=True)
```

```
Caption: \draft{REPLACE WITH TABLE NAME}

<pandas.io.formats.style.Styler at 0x7ff43c24f820>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/ADJ-Combined-tops/versatility/PolarCompare-
ADJ-Combined-tops-vers+f.2025-02-05.tex
```

[ ]:
```
immediately_bigrams = all_bigram.filter(like='immediately', axis=0)
immediately_margin = all_adv.loc['immediately', :].squeeze()
immediately_bigrams = immediately_bigrams.T.assign(
    immediately_MARGIN=immediately_margin).T
immediately_bigrams['%All_immediately'] = immediately_bigrams.AllTokens / \
    immediately_margin['AllTokens'] * 100
immediately_bigrams['%Neg_immediately'] = immediately_bigrams.NegTokens / \
    immediately_margin['NegTokens'] * 100
immediately_bigrams['%Pos_immediately'] = immediately_bigrams.PosTokens / \
    immediately_margin['PosTokens'] * 100
save_latex_table((immediately_bigrams
                 .loc[~immediately_bigrams.index.str.endswith('MARGIN'), :]
                 .nlargest(10, '%Neg_immediately')
                 .style.background_gradient('RdPuBu_r')),
                 latex_subdir='adv-of-interest',␣
 ↪latex_stem='immediatly-nonversatile-ex_without-margin',
                 verbose=True
                 )
```

```
Caption: \draft{REPLACE WITH TABLE NAME}

<pandas.io.formats.style.Styler at 0x7ff43feb1ff0>

Stylized latex table saved as:
  OverleafDissertex/assets/tables/adv-of-interest/immediatly-nonversatile-
ex_without-margin.2025-02-05.tex
```

[ ]:
```
PosixPath('/share/compling/projects/arh234/OverleafDissertex/assets/tables/adv-
of-interest/immediatly-nonversatile-ex_without-margin.2025-02-05.tex')
```

[ ]:
```
nb_show_table(immediately_bigrams.nlargest(10, '%Neg'))



# # %%
# # super_adgrams['bigram_lower'] = (super_adgrams.adv_form_lower.
 ↪astype('string') + '_' + super_adgrams.adj_form_lower).astype('string')
# print(f'{super_adgrams.bigram_lower.nunique():,} total unique bigram types␣
 ↪(case-normalized forms)---attested combinations of',
#       f'{super_adgrams.adv_form_lower.nunique():,} adverb types and',
#       f'{super_adgrams.adj_form_lower.nunique():,} adjective types.')

# nb_show_table(super_adgrams.bigram_lower.value_counts().nlargest(
#     10).to_frame().reset_index())

# # %% [markdown]
# # _How many unique sentences?_

# # %%
# super_adgrams['sent_id'] = super_adgrams.index.str.split(':').str.get(0)

# # %%
# print(f'There are {super_adgrams.sent_id.nunique():,} total unique sentences')
# nb_show_table(super_adgrams.describe().T.convert_dtypes())
```

```
|                                 |   `AllTokens` |   `PosTokens` |
`NegTokens` |   `%Neg` |   `%Pos` |   `%All_immediately` |   `%Neg_immediately`
|   `%Pos_immediately` |
|:--------------------------------|--------------:|--------------:|-------------
-:|---------:|---------:|--------------------:|--------------------:|---------
------------:|
| **immediately authenticated**   |             9 |             0 |
9 |      100 |        0 |                0.01 |                0.02 |
0 |
| **immediately prepared**        |             9 |             0 |
9 |      100 |        0 |                0.01 |                0.02 |
0 |
| **immediately reconcilable**    |             4 |             0 |
4 |      100 |        0 |                0.00 |                0.01 |
0 |
| **immediately cost-effective**  |             4 |             0 |
4 |      100 |        0 |                 0.00 |                 0.01 |
0 |
| **immediately explainable**     |             3 |             0 |
3 |      100 |        0 |                 0.00 |                 0.01 |
0 |
| **immediately refutable**       |             3 |             0 |
3 |      100 |        0 |                 0.00 |                 0.01 |
0 |
| **immediately avaiable**        |             3 |             0 |
3 |      100 |        0 |                 0.00 |                 0.01 |
0 |
| **immediately straightforward** |             2 |             0 |
2 |      100 |        0 |                 0.00 |                 0.00 |
0 |
| **immediately accessable**      |             2 |             0 |
2 |      100 |        0 |                 0.00 |                 0.00 |
0 |
| **immediately perspicuous**     |             2 |             0 |
2 |      100 |        0 |                 0.00 |                 0.00 |
0 |
```