Mental Health Conversations - Exploratory Data Analysis

This notebook explores:

- Dataset characteristics and quality
- Text patterns in patient messages and therapist responses
- Response type distributions
- Next steps for ML pipeline

Dataset: Conversations between users and experienced psychologists

In [134…

```
# Import libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from collections import Counter
import re
import warnings

# Set up plotting
plt.style.use('default')
sns.set_palette("husl")
plt.rcParams['figure.figsize'] = (12, 8)
warnings.filterwarnings('ignore')

print("Libraries imported!")
```

```
Libraries imported!
```

1. Data Loading and Initial Exploration

In [135…

```
# Load the dataset
df = pd.read_csv('../data/train.csv').astype(str)

print(f"Dataset shape: {df.shape}")
print(f"Columns: {list(df.columns)}")
print("\nHead:")
df.head()
```

```
Dataset shape: (3512, 2)
Columns: ['Context', 'Response']

Head:
```

Out[135…

	Context	Response
0	I'm going through some things with my feelings...	If everyone thinks you're worthless, then mayb...
1	I'm going through some things with my feelings...	Hello, and thank you for your question and see...
2	I'm going through some things with my feelings...	First thing I'd suggest is getting the sleep y...
3	I'm going through some things with my feelings...	Therapy is essential for those that are feelin...
4	I'm going through some things with my feelings...	I first want to let you know that you are not ...

In [136…

```
# Basic dataset information
print("Dataset Info")
df.info()

print("\nMissing Values")
missing_data = df.isnull().sum()
print(missing_data)

print("\nBasic Statistics")
print(f"Total rows: {len(df):,}")
print(f"Missing Context: {df['Context'].isnull().sum()}")
print(f"Missing Response: {df['Response'].isnull().sum()}")
print(f"Empty Context: {(df['Context'].str.strip() == '').sum()}")
print(f"Empty Response: {(df['Response'].str.strip() == '').sum()}")
print(f"Duplicate contexts: {df.duplicated().sum()} duplicates")
```

```
Dataset Info
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3512 entries, 0 to 3511
Data columns (total 2 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   Context   3512 non-null   object
 1   Response  3512 non-null   object
dtypes: object(2)
memory usage: 55.0+ KB

Missing Values
Context     0
Response    0
dtype: int64

Basic Statistics
Total rows: 3,512
Missing Context: 0
Missing Response: 0
Empty Context: 0
Empty Response: 0
Duplicate contexts: 760 duplicates
```

In [137…

```python
# Check  duplicate rows
duplicates = df[df.duplicated(keep=False)]

print(f"Total duplicate rows: {len(duplicates)}")

if not duplicates.empty:
    display(duplicates.head(10))  # Show first 10 duplicates
else:
    print("✅ No duplicate rows found.")
```

```
Total duplicate rows: 1501
```

	Context	Response
23	I have so many issues to address. I have a his...	Let me start by saying there are never too man...
24	I have so many issues to address. I have a his...	It is never too late to get help and begin mak...
25	I have so many issues to address. I have a his...	You have been through so much and it sounds li...
26	I have so many issues to address. I have a his...	Absolutely not. I strongly recommending worki...
27	I have so many issues to address. I have a his...	Absolutely not! In fact, most people have man...
28	I have so many issues to address. I have a his...	This is a great question! I personally don't b...
29	I have so many issues to address. I have a his...	Hi! Many people begin their therapeutic journe...
30	I have so many issues to address. I have a his...	Absolutely not. It sounds like you have signif...
31	I have so many issues to address. I have a his...	Most clients have many issues that need workin...
32	I have so many issues to address. I have a his...	Just go! You start with the most prevalent iss...

2. Text Length Analysis

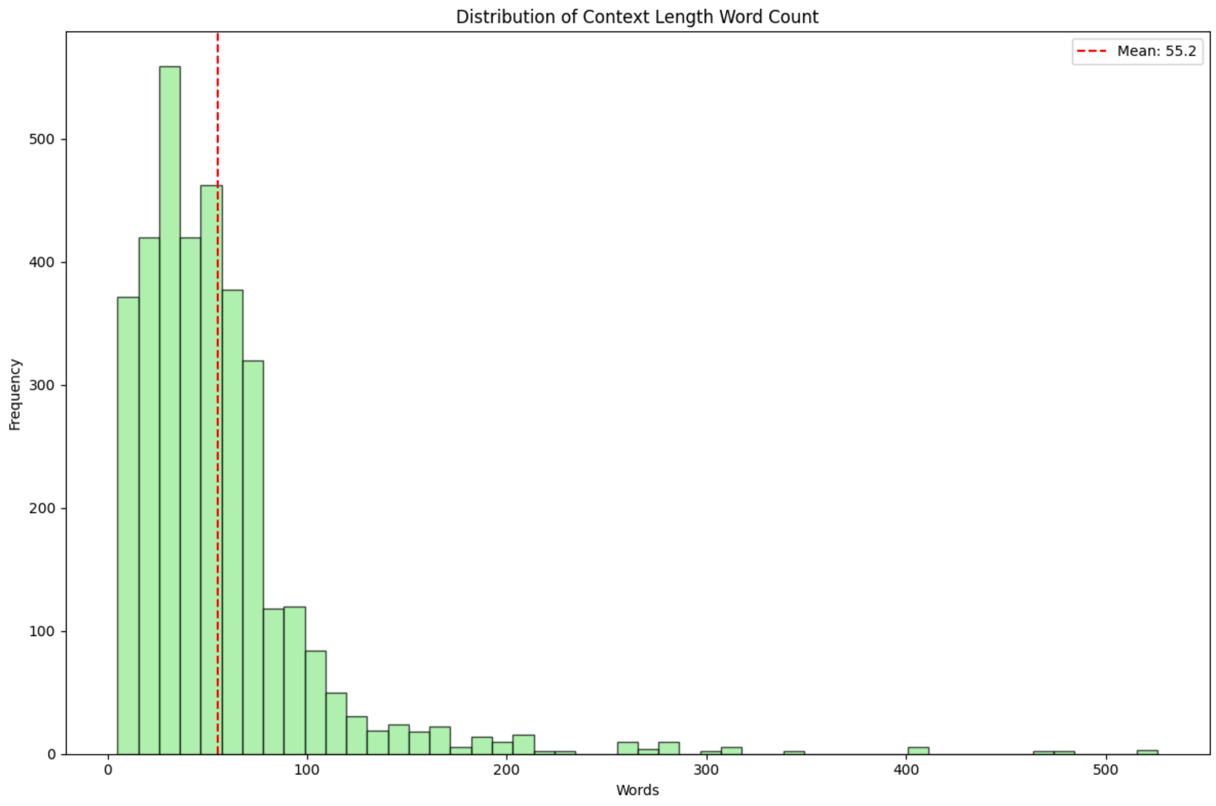
In [138…

```python
# Add text length features
df['context_words'] = df['Context'].str.split().str.len()
df['response_words'] = df['Response'].str.split().str.len()

# Text length statistics
print(f"\nWord Count Statistics:")
print(f"\nContext words: \n{df['context_words'].describe()}")
print(f"\nResponse words: \n{df['response_words'].describe()}")
```

```
Word Count Statistics:

Context words:
count    3512.000000
mean       55.180809
std        48.275077
min         5.000000
25%        28.000000
50%        46.000000
75%        68.000000
max       526.000000
Name: context_words, dtype: float64

Response words:
count    3512.000000
mean      177.003132
std       120.743207
min         1.000000
25%        93.000000
50%       144.000000
75%       221.000000
max       939.000000
Name: response_words, dtype: float64
```

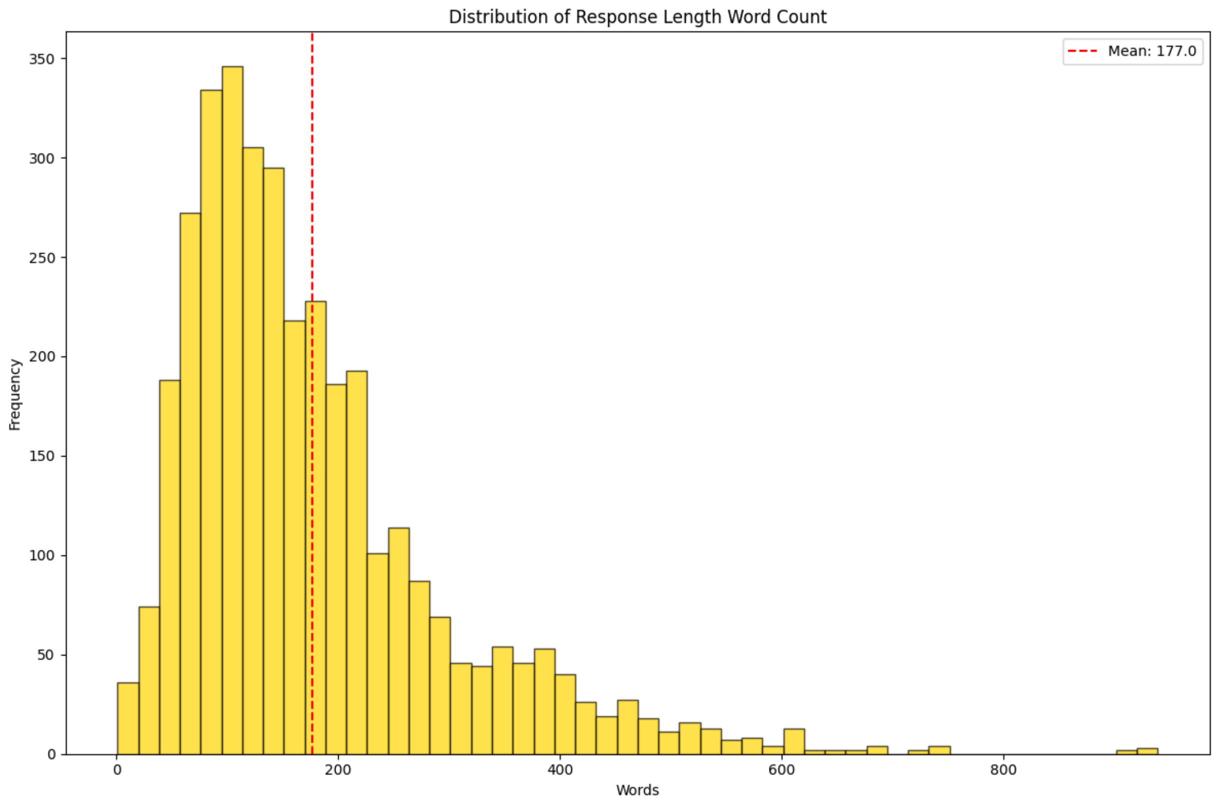
In [139…

```
#Visualize context word count
plt.figure()
plt.hist(df['context_words'], bins=50, alpha=0.7, color='lightgreen', edgecolor='bl
plt.title('Distribution of Context Length Word Count')
plt.xlabel('Words')
plt.ylabel('Frequency')
plt.axvline(df['context_words'].mean(), color='red', linestyle='--', label=f'Mean:
plt.legend()
plt.tight_layout()
plt.show()
```



In [140…

```
# Visualize response word count
plt.figure()
plt.hist(df['response_words'], bins=50, alpha=0.7, color='gold', edgecolor='black')
plt.title('Distribution of Response Length Word Count')
plt.xlabel('Words')
plt.ylabel('Frequency')
plt.axvline(df['response_words'].mean(), color='red', linestyle='--', label=f'Mean:
plt.legend()
plt.tight_layout()
plt.show()
```



3. Word Analysis

In [141…

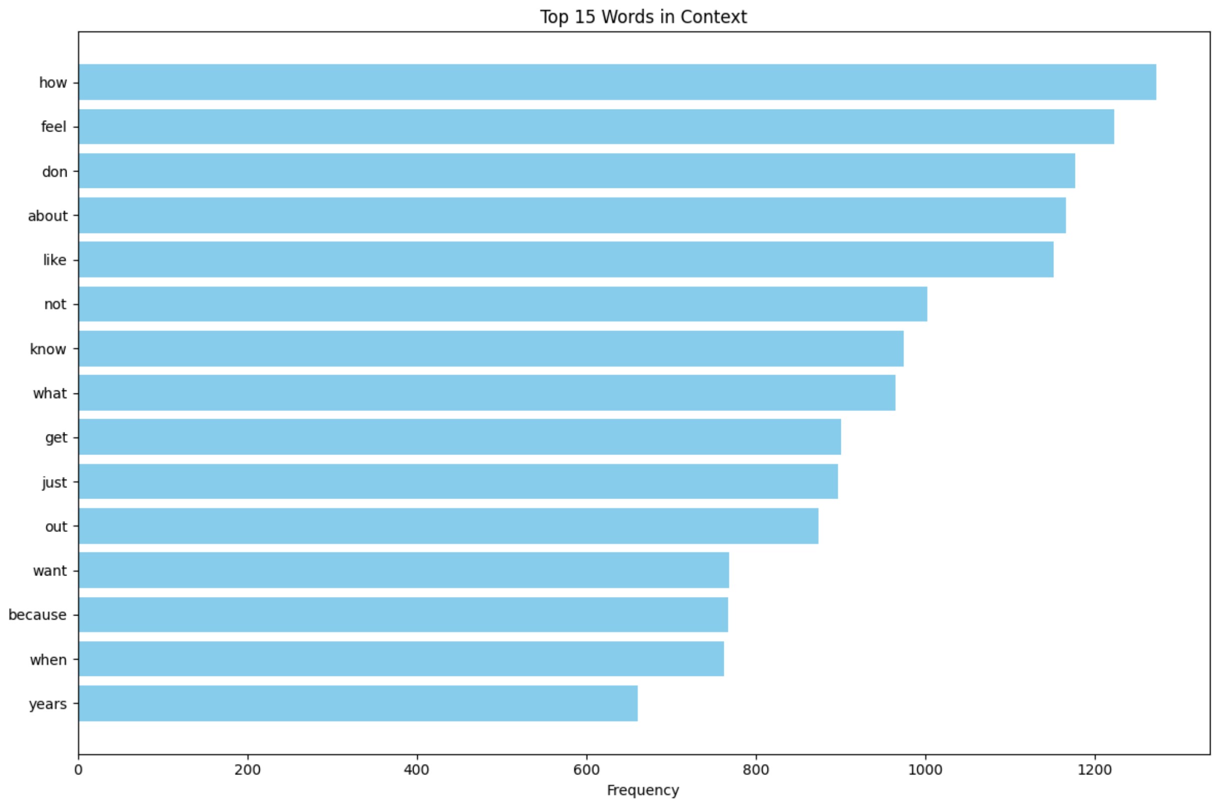
```
# Function to get most common words
def get_top_words(texts, n=15, min_length=3):
    """Get most common words from a series of texts"""
    # Combine all texts
    all_text = ' '.join(texts.astype(str)).lower()

    # Remove punctuation and extract words
    words = re.findall(r'\b\w+\b', all_text)

    # Filter by length and common stop words
    stop_words = {'the', 'and', 'or', 'but', 'in', 'on', 'at', 'to', 'for', 'of', '

    filtered_words = [word for word in words if len(word) >= min_length and word no

    # Count and return top words
    word_counts = Counter(filtered_words)
    return word_counts.most_common(n)

# Get top words for contexts and responses
top_context_words = get_top_words(df['Context'])
top_response_words = get_top_words(df['Response'])

print("Most Common Words in Context")
for word, count in top_context_words:
    print(f"{word}: {count:,}")

print("\nMost Common Words in Responses")
```

```
for word, count in top_response_words:
    print(f"{word}: {count:,}")
```

```
Most Common Words in Context
how: 1,272
feel: 1,223
don: 1,177
about: 1,166
like: 1,152
not: 1,002
know: 974
what: 965
get: 901
just: 897
out: 874
want: 768
because: 767
when: 762
years: 661

Most Common Words in Responses
what: 4,564
not: 4,198
about: 3,792
feel: 2,730
there: 2,591
help: 2,344
like: 2,274
yourself: 2,217
when: 2,206
how: 2,158
more: 2,154
from: 2,133
some: 2,114
relationship: 2,026
who: 1,996
```

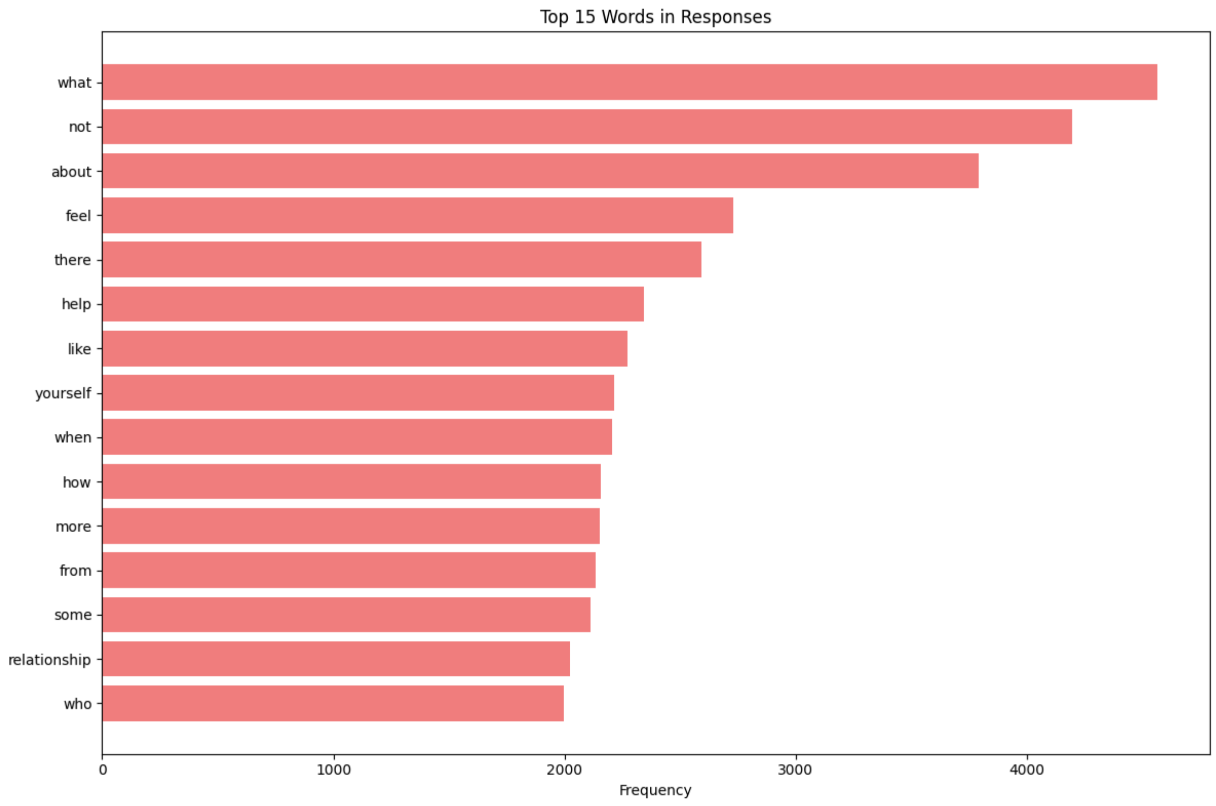
In [142…

```
# Visualize top words in context
context_words, context_counts = zip(*top_context_words[:15])

plt.figure()
plt.barh(range(len(context_words)), context_counts, color='skyblue')
plt.yticks(range(len(context_words)), context_words)
plt.xlabel('Frequency')
plt.title('Top 15 Words in Context')
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()
```



In [143…

```
# Visualize top words in responses
response_words, response_counts = zip(*top_response_words[:15])

plt.figure()
plt.barh(range(len(response_words)), response_counts, color='lightcoral')
plt.yticks(range(len(response_words)), response_words)
plt.xlabel('Frequency')
plt.title('Top 15 Words in Responses')
plt.gca().invert_yaxis()
plt.tight_layout()
plt.show()
```



5. Summary and Next Steps

In [144…

```
print("\nNext steps:")
print("1. Clean and preprocess the data")
print("2. Create train/validation/test splits")
print("3. Tokenize text")
print("4. Train LLM locally")
print("5. Evaluate model performance")
print("7. Send model data to front end")
```

```
Next steps:
1. Clean and preprocess the data
2. Create train/validation/test splits
3. Tokenize text
4. Train LLM locally
5. Evaluate model performance
7. Send model data to front end
```