# CatsMeow

March 7, 2025

[33]:
```
%%capture
# Cat Meow Translator Notebook
# Purrceptron Labs (BETA)

# -*- coding: utf-8 -*-
"""
MEOW-to-English Translation System v0.1
(Warning: May contain 99% AI nonsense, 1% actual science)
"""

# -------------------
# 1. SETUP (Human, assemble my kibble!)
# -------------------
!pip install -q librosa matplotlib tensorflow kaggle pandas
!pip install --upgrade openai


import os
import numpy as np
import matplotlib.pyplot as plt
import librosa
import librosa.display
import pandas as pd
from sklearn.model_selection import train_test_split
from tensorflow.keras import layers, models

print("  All systems purr! Let's decode some cat-titude.")
```

[34]:
```
from google.colab import userdata
# Retrieve the OpenAI API key from userdata (if stored)
openai_api_key = userdata.get('OPENAI_API_KEY')

# If not in userdata, prompt the user to enter it:
if openai_api_key is None:
  openai_api_key = input("Please enter your OpenAI API key: ")

# Set the environment variable
```

```
os.environ["OPENAI_API_KEY"] = openai_api_key
```

[35]:
```
# -------------------
# 2. FETCH DATA (Where's my treats?!)
# -------------------
# Upload kaggle.json first!
from google.colab import files
files.upload()  # Upload your kaggle.json

!mkdir -p ~/.kaggle
!cp kaggle.json ~/.kaggle/
!chmod 600 ~/.kaggle/kaggle.json
!# CORRECTED DOWNLOAD COMMAND
!kaggle datasets download -d andrewmvd/cat-meow-classification

!unzip -q cat-meow-classification.zip -d cat_meows

# Add this after unzipping
!ls cat_meows  # Check directory structure

print(" Dataset acquired. Containing:", len(os.listdir("cat_meows/dataset/
 ↪dataset")), "meows of judgement.")

# print(" Dataset acquired. Containing:", len(os.listdir("cat_meows/
 ↪dataset")), "meows of judgement.")
```

```
<IPython.core.display.HTML object>

Saving kaggle.json to kaggle (2).json
Dataset URL: https://www.kaggle.com/datasets/andrewmvd/cat-meow-classification
License(s): Attribution-NonCommercial 4.0 International (CC BY-NC 4.0)
cat-meow-classification.zip: Skipping, found more recently modified local copy
(use --force to force download)
replace cat_meows/dataset/dataset/B_ANI01_MC_FN_SIM01_101.wav? [y]es, [n]o,
[A]ll, [N]one, [r]ename: A
dataset  extras
 Dataset acquired. Containing: 440 meows of judgement.
```

[36]:
```
!find cat_meows -type d  # Debug directory structure
```

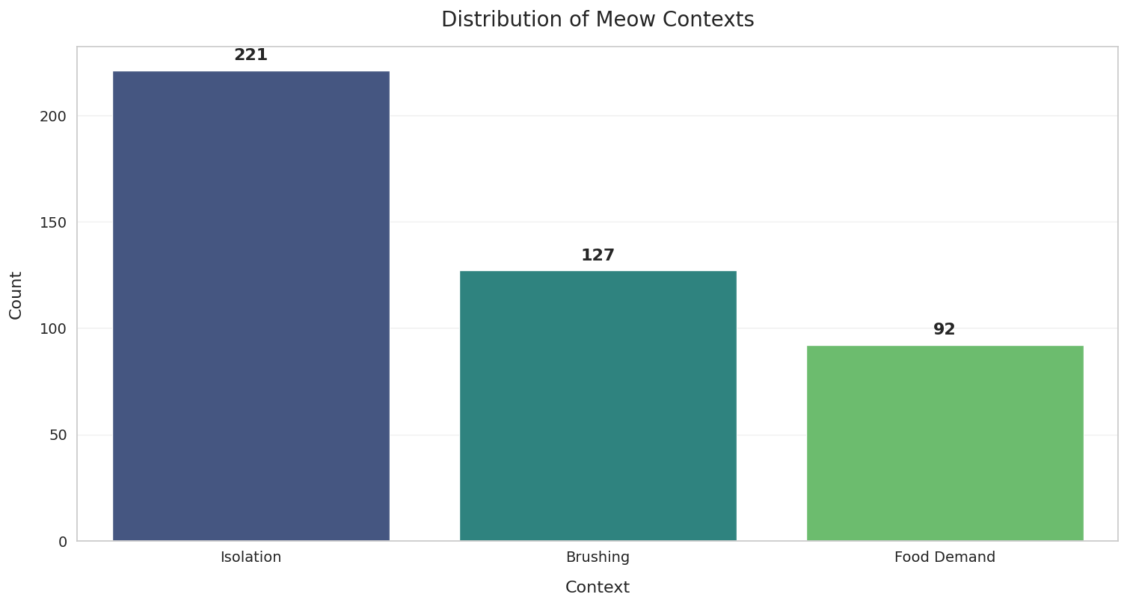
```
cat_meows
cat_meows/dataset
cat_meows/dataset/dataset
cat_meows/extras
cat_meows/extras/sequences
cat_meows/extras/other_vocalizations
```

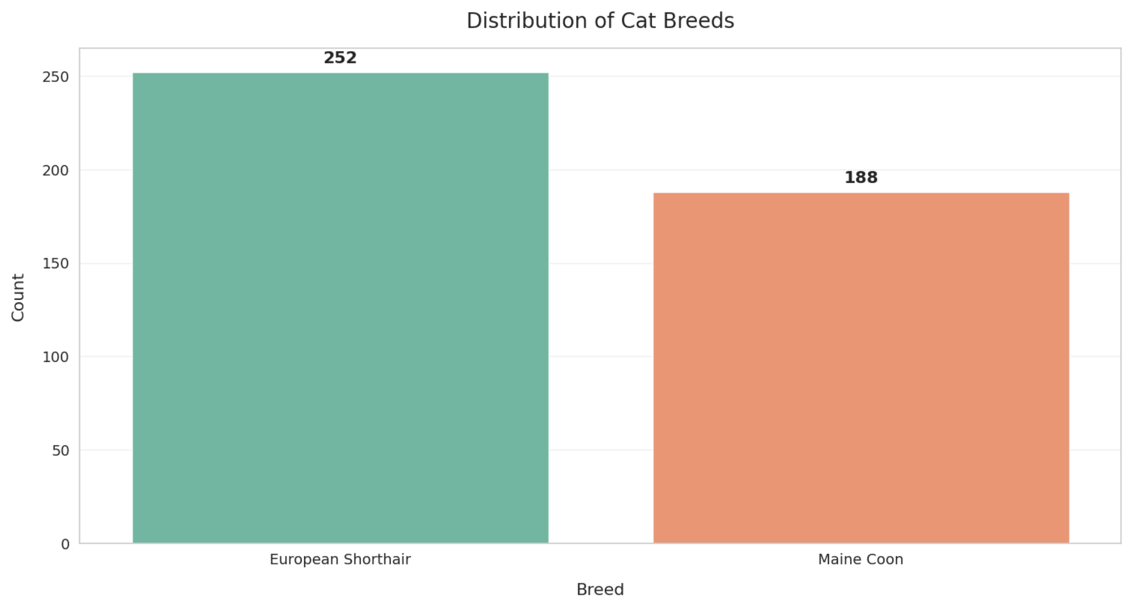
[45]:
```python
# -------------------
# 3. DECODE FILENAMES (Cat cipher breaker)
# -------------------
def parse_cat_filename(filename):
    """Decrypts the feline Da Vinci Code"""
    parts = filename.split('_')
    return {
        'context': {'B': 'Brushing', 'F': 'Food Demand', 'I':␣
↪'Isolation'}[parts[0]],
        'cat_id': parts[1],
        'breed': 'Maine Coon' if parts[2] == 'MC' else 'European Shorthair',
        'sex': parts[3],
        'owner_id': parts[4],
        'session': parts[5][1:],
        'counter': parts[6].split('.')[0]
    }

# Example:
filename = "F_02345_MC_MN_67890_R3_15.wav"
print(" File analysis:", parse_cat_filename(filename))
```

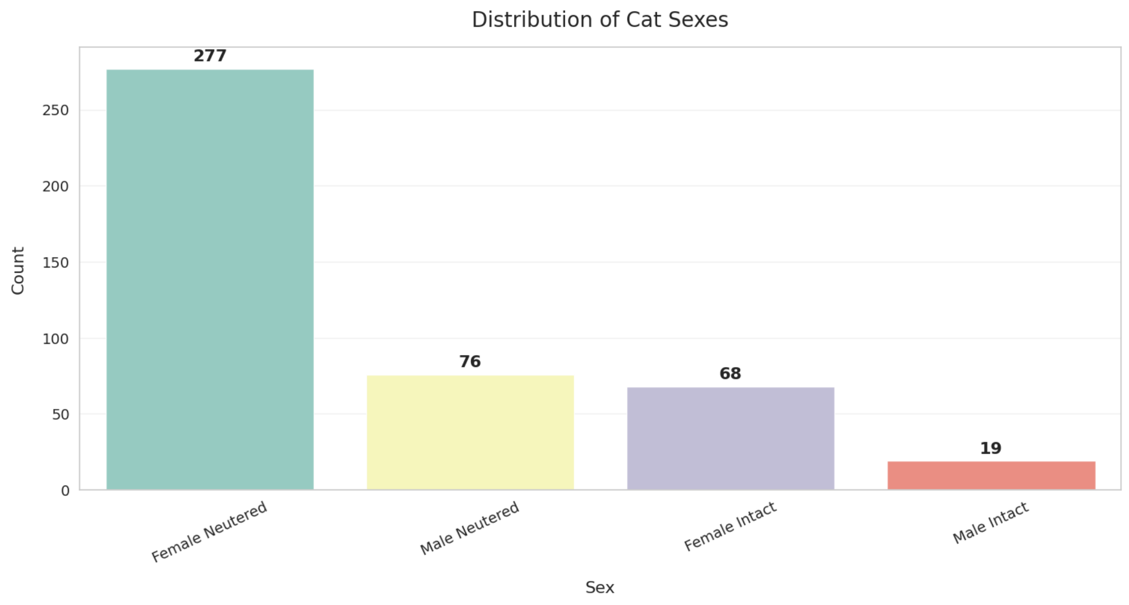
```
 File analysis: {'context': 'Food Demand', 'cat_id': '02345', 'breed': 'Maine
Coon', 'sex': 'MN', 'owner_id': '67890', 'session': '3', 'counter': '15'}
```

[46]:
```python
# -------------------
# 3.5 DATASET VISUALIZATION (Cat Demographics)
# -------------------
import matplotlib.pyplot as plt
import seaborn as sns
import pandas as pd
import os
import re
import warnings

# Suppress all warnings - this is the simplest approach
warnings.filterwarnings('ignore')

# Suppress specific warning types
warnings.simplefilter(action="ignore", category=FutureWarning)
warnings.simplefilter(action="ignore", category=UserWarning)

# Suppress informational messages
import contextlib
import io

# This function can be used to suppress print statements when needed
def suppress_stdout():
    return contextlib.redirect_stdout(io.StringIO())

# Define the robust parsing function
def parse_cat_filename_robust(filename):
    """Parses cat meow filenames with more flexibility"""
    # Extract the first character which represents the context
    context = filename[0] if filename and len(filename) > 0 else "Unknown"

    # Map context codes to full names
    context_map = {'B': 'Brushing', 'F': 'Food Demand', 'I': 'Isolation'}
    context_name = context_map.get(context, "Unknown")

    # Extract breed information (MC or EU) if available
    breed = "Unknown"
    if "_MC_" in filename:
        breed = "Maine Coon"
    elif "_EU_" in filename:
        breed = "European Shorthair"

    # Extract sex information if available
    sex = "Unknown"
    if "_MN_" in filename:
        sex = "Male Neutered"
    elif "_FN_" in filename:
        sex = "Female Neutered"
    elif "_MI_" in filename:
        sex = "Male Intact"
    elif "_FI_" in filename:
        sex = "Female Intact"

    # Try to extract cat ID - this is the code after the first underscore
    cat_id = "Unknown"
    parts = filename.split('_')
    if len(parts) > 1:
        cat_id = parts[1]

    return {
        'context': context_name,
        'breed': breed,
        'sex': sex,
        'cat_id': cat_id,
        'filename': filename
    }

def analyze_cat_dataset_robust(directory):
    """Analyze the cat meow dataset with more robust parsing"""
    cat_data = []
    # Check if we're looking in the right directory
    if not os.path.exists(directory):
        print(f"Warning: Directory {directory} does not exist.")
        # Try to find WAV files in subdirectories
        for root, dirs, files in os.walk("cat_meows"):
            for file in files:
                if file.endswith(".wav"):
                    try:
                        info = parse_cat_filename_robust(file)
                        info['path'] = os.path.join(root, file)
                        cat_data.append(info)
                    except Exception as e:
                        print(f"Could not parse filename {file}: {e}")
    else:
        # Look for files in the specified directory
        for file in os.listdir(directory):
            if file.endswith(".wav"):
                try:
                    info = parse_cat_filename_robust(file)
                    info['path'] = os.path.join(directory, file)
                    cat_data.append(info)
                except Exception as e:
                    print(f"Could not parse filename {file}: {e}")

    if not cat_data:
        print("Warning: No data could be parsed. Check directory path.")

    return pd.DataFrame(cat_data)

# Search for cat meow files
possible_dirs = [
    "cat_meows/dataset/dataset",
    "cat_meows/dataset",
    "cat_meows"
]

df_cats = None
for dir_path in possible_dirs:
    print(f"Trying directory: {dir_path}")
    # Suppress print output for directory searching
    with suppress_stdout():
        df = analyze_cat_dataset_robust(dir_path)
    if not df.empty:
        df_cats = df
        # Only print the final result
        print(f"  Found {len(df)} cat audio files in {dir_path}")
        break

if df_cats is None or df_cats.empty:
    # Last resort: search for WAV files recursively
    print("Searching for WAV files recursively...")
    df_cats = analyze_cat_dataset_robust("cat_meows")

# Now visualize the data if available
if df_cats is not None and not df_cats.empty:
    # Set consistent styling for better video presentation
    plt.rcParams.update({
        'font.size': 14,          # Larger base font size
        'axes.titlesize': 18,     # Larger title
        'axes.labelsize': 16,     # Larger axis labels
        'xtick.labelsize': 14,    # Larger tick labels
        'ytick.labelsize': 14,
        'figure.titlesize': 20,   # Very large figure titles
        'figure.figsize': (16, 9),# 16:9 aspect ratio for video
        'figure.dpi': 100,        # Higher DPI for clarity
        'savefig.dpi': 300,       # Higher save DPI
        'figure.facecolor': 'white',
        'axes.grid': True,
        'grid.alpha': 0.3
    })

    # Use a clean, high-contrast color palette
    sns.set_palette("colorblind")
    sns.set_style("whitegrid")

    # Create separate figures for each plot for better video presentation

    # 1. Context Distribution
    plt.figure(figsize=(16, 9))
    context_counts = df_cats['context'].value_counts()
    # Updated barplot syntax to avoid FutureWarning
    ax = sns.barplot(x=context_counts.index, y=context_counts.values,␣
 ↪hue=context_counts.index, legend=False, palette="viridis")
    plt.title('Distribution of Meow Contexts', fontsize=20, pad=20)
    plt.xlabel('Context', fontsize=16, labelpad=15)
    plt.ylabel('Count', fontsize=16, labelpad=15)
    # Add count labels
    for i, v in enumerate(context_counts.values):
        ax.text(i, v + 5, str(v), ha='center', fontsize=16, fontweight='bold')
    plt.tight_layout(pad=3.0)
    plt.savefig('context_distribution.png')
    plt.show()
    # 2. Breed Distribution
    plt.figure(figsize=(16, 9))
    breed_counts = df_cats['breed'].value_counts()
    # Updated barplot syntax to avoid FutureWarning
    ax = sns.barplot(x=breed_counts.index, y=breed_counts.values,␣
↪hue=breed_counts.index, legend=False, palette="Set2")
    plt.title('Distribution of Cat Breeds', fontsize=20, pad=20)
    plt.xlabel('Breed', fontsize=16, labelpad=15)
    plt.ylabel('Count', fontsize=16, labelpad=15)
    # Add count labels
    for i, v in enumerate(breed_counts.values):
        ax.text(i, v + 5, str(v), ha='center', fontsize=16, fontweight='bold')
    plt.tight_layout(pad=3.0)
    plt.savefig('breed_distribution.png')
    plt.show()

    # 3. Sex Distribution
    plt.figure(figsize=(16, 9))
    sex_counts = df_cats['sex'].value_counts()
    # Updated barplot syntax to avoid FutureWarning
    ax = sns.barplot(x=sex_counts.index, y=sex_counts.values, hue=sex_counts.
↪index, legend=False, palette="Set3")
    plt.title('Distribution of Cat Sexes', fontsize=20, pad=20)
    plt.xlabel('Sex', fontsize=16, labelpad=15)
    plt.ylabel('Count', fontsize=16, labelpad=15)
    plt.xticks(rotation=25)  # Slight rotation for readability
    # Add count labels
    for i, v in enumerate(sex_counts.values):
        ax.text(i, v + 5, str(v), ha='center', fontsize=16, fontweight='bold')
    plt.tight_layout(pad=3.0)
    plt.savefig('sex_distribution.png')
    plt.show()

    # 4. Context by Breed (stacked bar chart)
    plt.figure(figsize=(16, 9))
    context_breed = pd.crosstab(df_cats['breed'], df_cats['context'])
    context_breed.plot(kind='bar', stacked=True, colormap='viridis',
                       figsize=(16, 9), rot=0)
    plt.title('Meow Contexts by Cat Breed', fontsize=20, pad=20)
    plt.xlabel('Breed', fontsize=16, labelpad=15)
    plt.ylabel('Count', fontsize=16, labelpad=15)
    plt.legend(title='Context', title_fontsize=16, fontsize=14, loc='upper␣
↪right')
    # Add annotations for total counts
    for i, breed in enumerate(context_breed.index):
        total = context_breed.loc[breed].sum()
        plt.text(i, total + 5, f'Total: {total}', ha='center', fontsize=14,␣
↪fontweight='bold')
    plt.tight_layout(pad=3.0)
    plt.savefig('context_by_breed.png')
    plt.show()

    # 5. Heatmap of Context vs Sex
    plt.figure(figsize=(16, 10))
    context_sex = pd.crosstab(df_cats['context'], df_cats['sex'])
    sns.heatmap(context_sex, annot=True, cmap="YlGnBu", fmt='d',
                annot_kws={"size": 16, "weight": "bold"}, cbar_kws={"shrink": 0.
↪75})
    plt.title('Heatmap of Meow Context vs Cat Sex', fontsize=20, pad=20)
    plt.xlabel('Sex', fontsize=16, labelpad=15)
    plt.ylabel('Context', fontsize=16, labelpad=15)
    plt.tight_layout(pad=3.0)
    plt.savefig('context_sex_heatmap.png')
    plt.show()

    # 6. Distribution of meows per cat (as a histogram)
    plt.figure(figsize=(16, 9))
    meows_per_cat = df_cats['cat_id'].value_counts()
    sns.histplot(meows_per_cat.values, kde=True, bins=15)
    plt.title('Distribution of Meows per Cat', fontsize=20, pad=20)
    plt.xlabel('Number of Meows', fontsize=16, labelpad=15)
    plt.ylabel('Number of Cats', fontsize=16, labelpad=15)
    plt.tight_layout(pad=3.0)
    plt.savefig('meows_per_cat.png')
    plt.show()

    # Save summary to a text file for reference
    with open('cat_meow_summary.txt', 'w') as f:
        f.write("--- CAT MEOW DATASET SUMMARY ---\n\n")
        f.write(f"Total meow samples: {len(df_cats)}\n")
        f.write(f"Unique cats: {df_cats['cat_id'].nunique()}\n\n")

        f.write("Context distribution:\n")
        for context, count in context_counts.items():
            f.write(f"  {context}: {count} ({count/len(df_cats)*100:.1f}%)\n")

        f.write("\nBreed distribution:\n")
        for breed, count in breed_counts.items():
            f.write(f"  {breed}: {count} ({count/len(df_cats)*100:.1f}%)\n")

        f.write("\nSex distribution:\n")
        for sex, count in sex_counts.items():
            f.write(f"  {sex}: {count} ({count/len(df_cats)*100:.1f}%)\n")
    # Print summary statistics to notebook
    print("\n--- DATASET SUMMARY ---")
    print(f"Total meow samples: {len(df_cats)}")
    print(f"Unique cats: {df_cats['cat_id'].nunique()}")
    print("\nContext distribution:")
    for context, count in context_counts.items():
        print(f"  {context}: {count} ({count/len(df_cats)*100:.1f}%)")

    print("\nBreed distribution:")
    for breed, count in breed_counts.items():
        print(f"  {breed}: {count} ({count/len(df_cats)*100:.1f}%)")

    print("\nSex distribution:")
    for sex, count in sex_counts.items():
        print(f"  {sex}: {count} ({count/len(df_cats)*100:.1f}%)")
    print("----------------------")
else:
    print("Error: Could not find or parse any data files.")
```

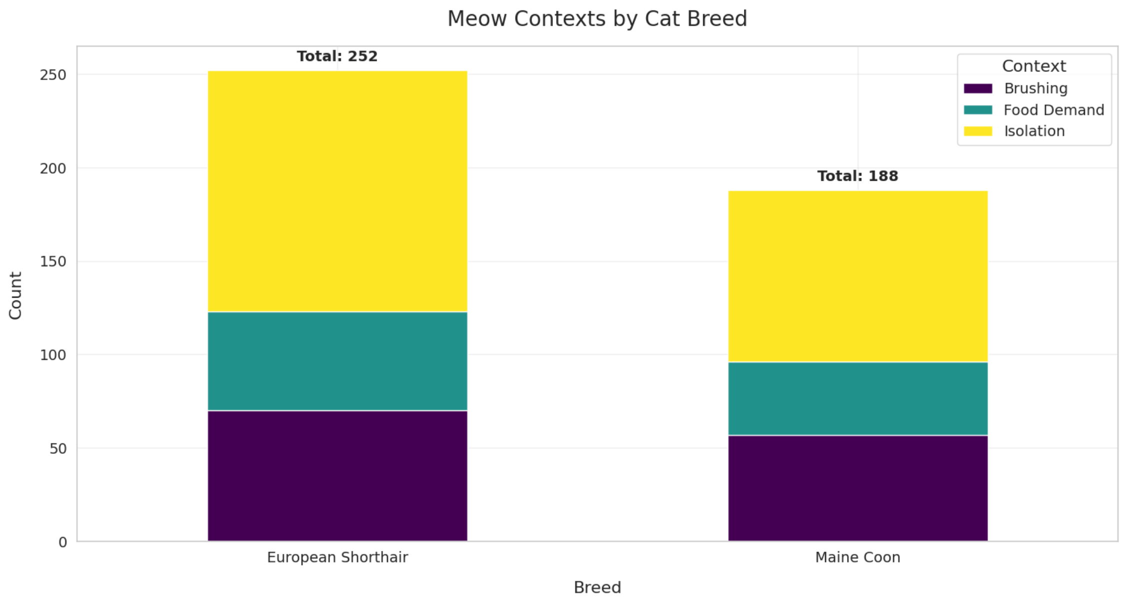
```
Trying directory: cat_meows/dataset/dataset
  Found 440 cat audio files in cat_meows/dataset/dataset
```



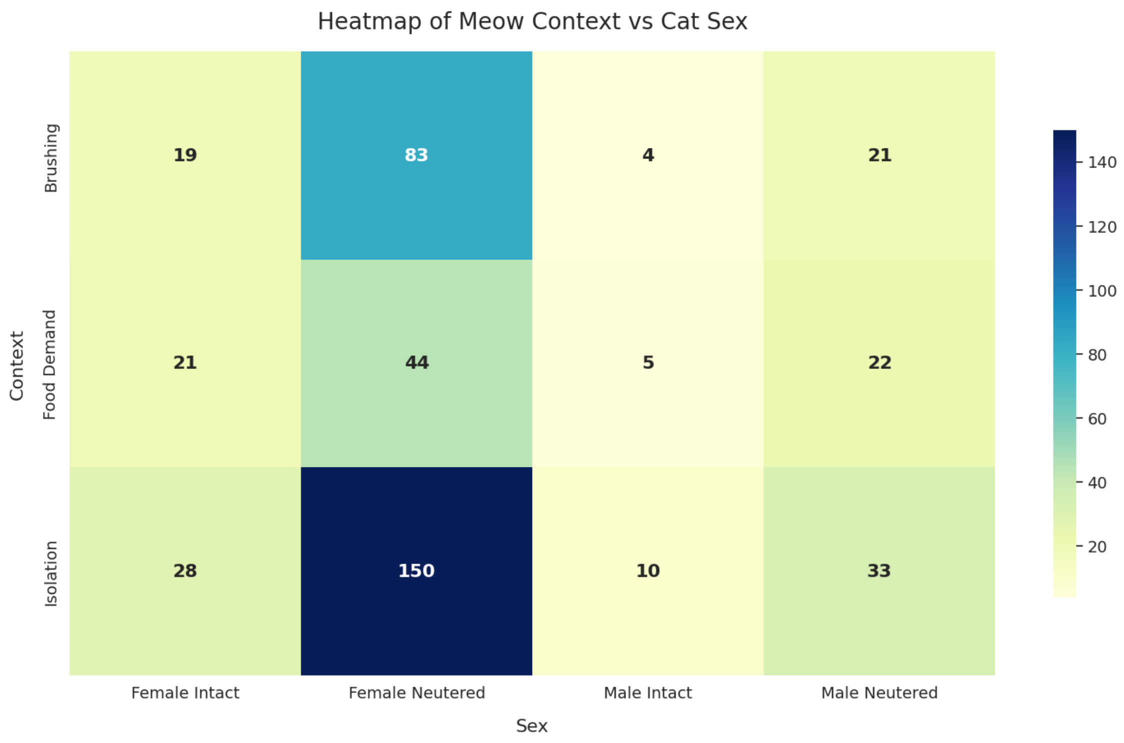

Distribution of Cat Breeds
252
188
Count
250
200
150
100
50
0
European Shorthair
Maine Coon
Breed


Distribution of Cat Sexes
277
76
68
19
Count
250
200
150
100
50
0
Female Neutered
Male Neutered
Female Intact
Male Intact
Sex

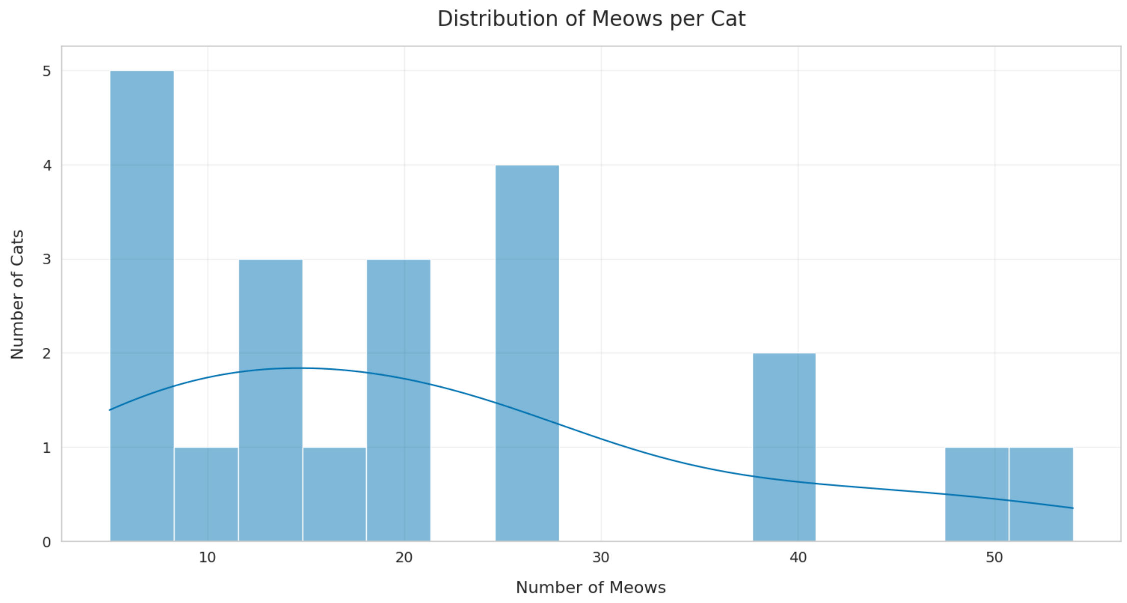
```
<Figure size 1600x900 with 0 Axes>
```



Meow Contexts by Cat Breed
Total: 252
Total: 188
Context
Brushing
Food Demand
Isolation
Count
0
50
100
150
200
250
European Shorthair
Maine Coon
Breed



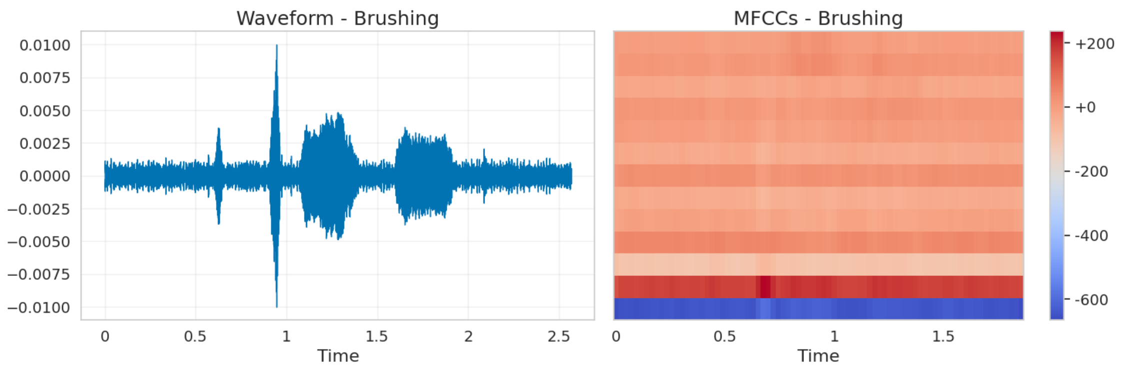
Heatmap of Meow Context vs Cat Sex
Context
Brushing
Food Demand
Isolation
Female Intact
Female Neutered
Male Intact
Male Neutered
Sex
19
83
4
21
21
44
5
22
28
150
10
33
20
40
60
80
100
120
140



```
--- DATASET SUMMARY ---
Total meow samples: 440
Unique cats: 21

Context distribution:
  Isolation: 221 (50.2%)
  Brushing: 127 (28.9%)
  Food Demand: 92 (20.9%)

Breed distribution:
  European Shorthair: 252 (57.3%)
  Maine Coon: 188 (42.7%)

Sex distribution:
  Female Neutered: 277 (63.0%)
  Male Neutered: 76 (17.3%)
  Female Intact: 68 (15.5%)
  Male Intact: 19 (4.3%)
----------------------
```

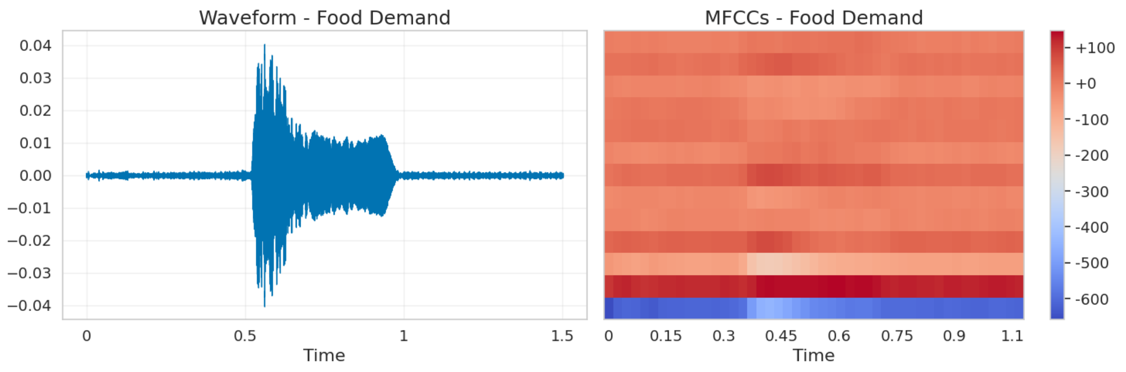
[47]:
```
# ------------------
# 4. AUDIO PREPROCESSING (FIXED PATH)
# ------------------
def load_and_process(file_path):
    """Converts meows to machine-digestible format"""
    try:
        audio, sr = librosa.load(file_path, sr=16000)  # Downsample to 16kHz
        mfccs = librosa.feature.mfcc(y=audio, sr=sr, n_mfcc=13)
        return mfccs.T, audio, sr
    except Exception as e:
        print(f"  Failed to process {file_path}: {str(e)}")
        return None, None, None

# Get WAV FILE paths
wav_files = []
for root, dirs, files in os.walk("cat_meows"):
    for file in files:
        if file.endswith(".wav"):
            wav_files.append(os.path.join(root, file))

print(f"Found {len(wav_files)} meow files")

# Select files from different contexts if possible (B, F, I prefixes)
context_samples = {}
for file_path in wav_files:
    file_name = os.path.basename(file_path)
    context = file_name[0]  # Get first letter of filename (B, F, or I)
    if context not in context_samples:
        context_samples[context] = file_path
    if len(context_samples) >= 3:  # One from each context
        break

# If we couldn't find all contexts, add random samples until we have 5
sample_files = list(context_samples.values())
while len(sample_files) < 5 and len(wav_files) >= 5:
    random_file = np.random.choice(wav_files)
    if random_file not in sample_files:
        sample_files.append(random_file)

# Import for audio display
from IPython.display import Audio, display

# Process each meow sample one by one with its audio player
for i, file_path in enumerate(sample_files[:5]):  # Limit to 5 samples
    mfccs, audio, sr = load_and_process(file_path)
    file_name = os.path.basename(file_path)
    context_type = file_name[0]
    context_name = {'B': 'Brushing', 'F': 'Food Demand', 'I': 'Isolation'}.
 ↪get(context_type, 'Unknown')

    if mfccs is not None:
        # Display info about this meow
        try:
            info = parse_cat_filename(file_name)
            print(f"\n  Sample {i+1}: {context_name} meow")
            print(f"  File: {file_name}")
            print(f"  Cat: {info['breed']} ({info['sex']}), Session:␣
↪{info['session']}")
        except:
            print(f"\n  Sample {i+1}: {file_path}")

        # Display audio player for this meow
        print(f"  Listen to this meow:")
        display(Audio(file_path))

        # Now create a figure with waveform and MFCC for this sample
        plt.figure(figsize=(15, 5))

        # Plot waveform
        plt.subplot(1, 2, 1)
        librosa.display.waveshow(audio, sr=sr)
        plt.title(f"Waveform - {context_name}")

        # Plot MFCCs
        plt.subplot(1, 2, 2)
        librosa.display.specshow(mfccs.T, x_axis='time')
        plt.colorbar(format='%+2.0f')
        plt.title(f"MFCCs - {context_name}")

        plt.tight_layout()
        plt.show()
```

```
Found 483 meow files

  Sample 1: cat_meows/dataset/dataset/B_MAT01_EU_FN_RIT01_204.wav
   Listen to this meow:

<IPython.lib.display.Audio object>
```



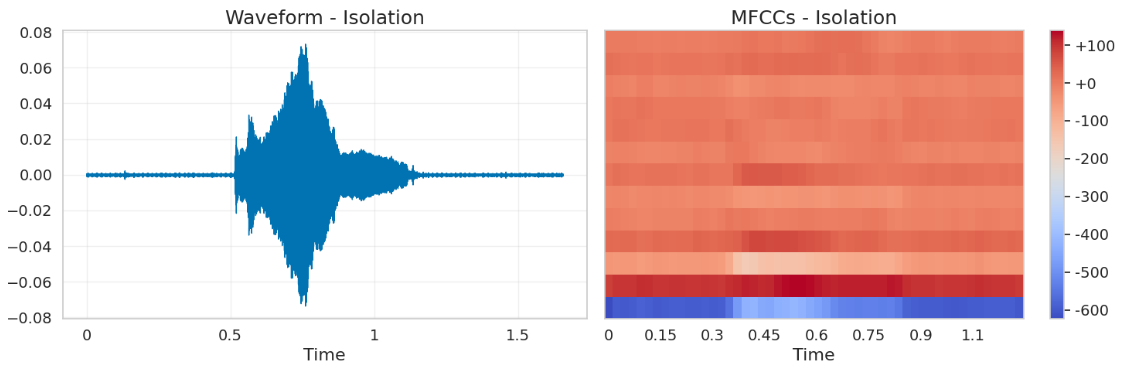
```
 Sample 2: cat_meows/dataset/dataset/F_BLE01_EU_FN_DEL01_101.wav
  Listen to this meow:
```

```
<IPython.lib.display.Audio object>
```



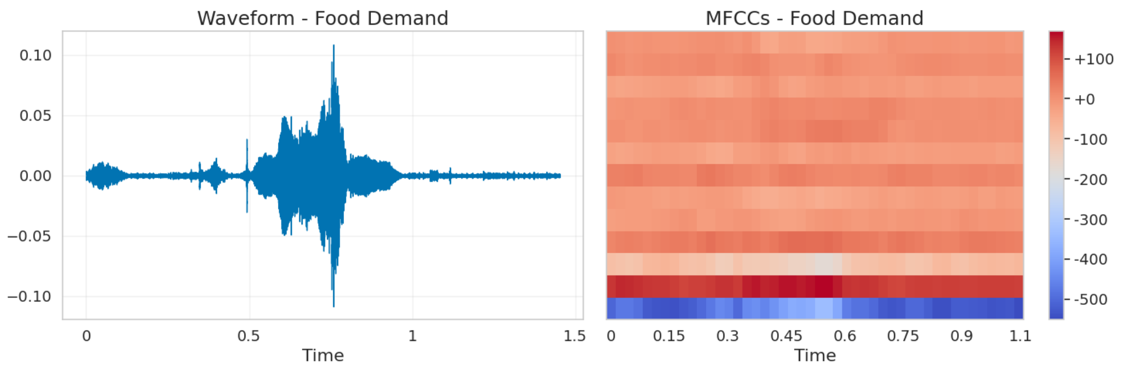
```
 Sample 3: cat_meows/dataset/dataset/I_CAN01_EU_FN_GIA01_107.wav
  Listen to this meow:
```

```
<IPython.lib.display.Audio object>
```



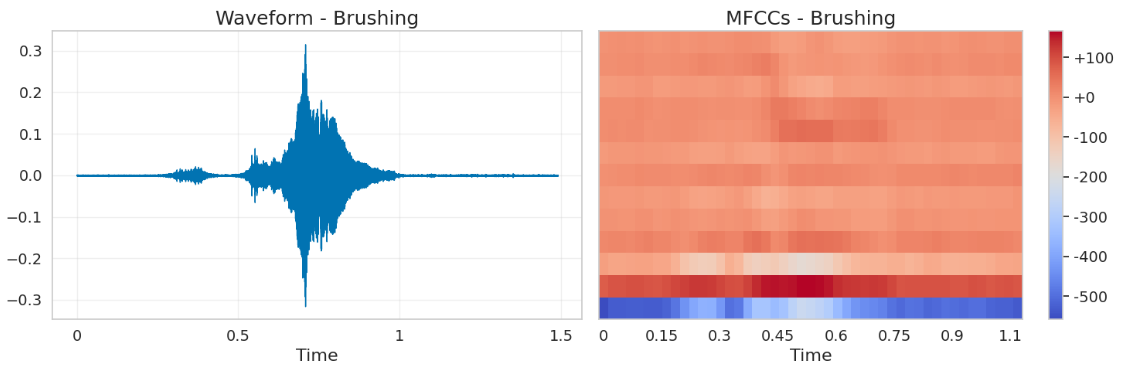
```
 Sample 4: cat_meows/dataset/dataset/F_MEG01_MC_FI_SIM01_301.wav
  Listen to this meow:
```

```
<IPython.lib.display.Audio object>
```



```
Sample 5: cat_meows/dataset/dataset/B_JJX01_MC_FN_SIM01_201.wav
 Listen to this meow:
```

```
<IPython.lib.display.Audio object>
```



[48]:

```python
# ------------------
# 5. BUILD DATASET (Cat food preparation)
# ------------------
X = []
y = []
context_map = {'B': 0, 'F': 1, 'I': 2}
reverse_map = {v:k for k,v in context_map.items()}

for file in os.listdir("cat_meows/dataset/dataset"):
    if file.endswith(".wav"):
        file_path = os.path.join("cat_meows/dataset/dataset", file)
        # Only append the MFCCs to X, not the entire tuple
        mfccs, _, _ = load_and_process(file_path)
        X.append(mfccs)
        y.append(context_map[file[0]])
```

```
# Pad sequences to same length
max_len = max([x.shape[0] for x in X])
X_padded = np.array([np.pad(x, ((0,max_len - x.shape[0]),(0,0))) for x in X])
y = np.array(y)

print(f" Data shape: {X_padded.shape} | Meow contexts: {np.unique(y,␣
↪return_counts=True)}")
```

```
 Data shape: (440, 126, 13) | Meow contexts: (array([0, 1, 2]), array([127,
92, 221]))
```

[49]:
```
# -------------------
# 6. BUILD MODEL (Cat-alyst for translation)
# -------------------
model = models.Sequential([
    layers.Input(shape=(X_padded.shape[1], X_padded.shape[2])),
    layers.Conv1D(64, 3, activation='relu', padding='same'),
    layers.MaxPooling1D(2),
    layers.Conv1D(128, 3, activation='relu', padding='same'),
    layers.GlobalAveragePooling1D(),
    layers.Dense(64, activation='relu'),
    layers.Dense(3, activation='softmax')
])

model.compile(optimizer='adam',
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])

print("  Model architecture:")
model.summary()
```

```
 Model architecture:

Model: "sequential_2"


 Layer (type)                        Output Shape                       ␣
↪Param #

 conv1d_4 (Conv1D)                   (None, 126, 64)                      ␣
↪2,560

 max_pooling1d_2 (MaxPooling1D)      (None, 63, 64)                         ␣
↪  0
```

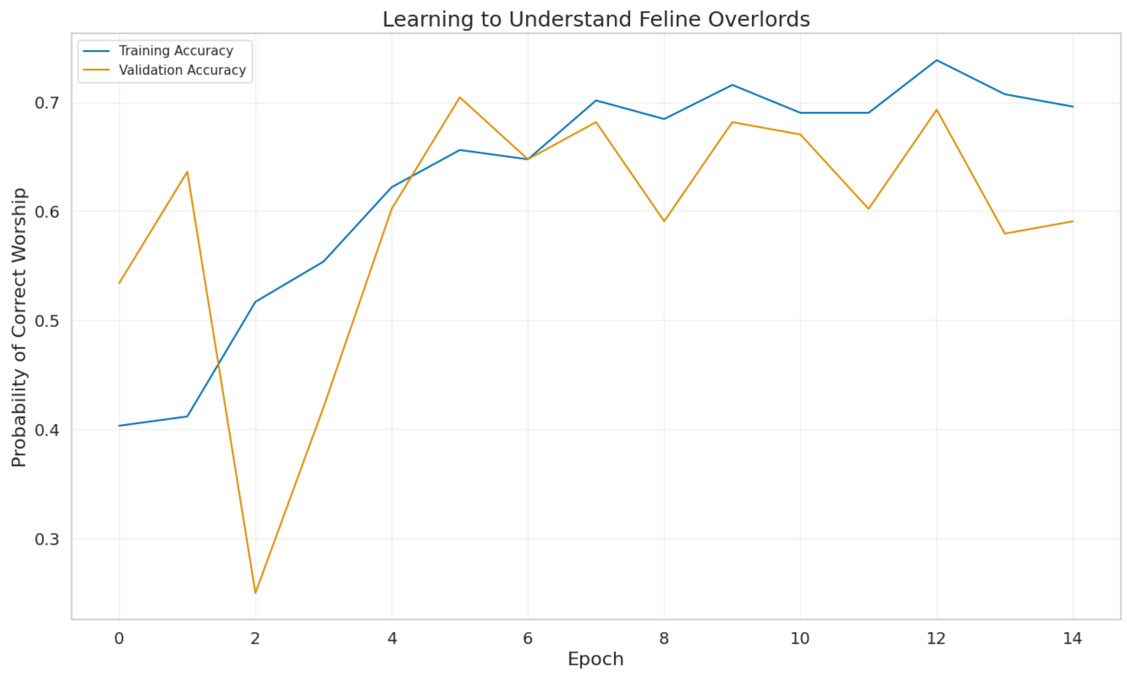
```
 conv1d_5 (Conv1D)                      (None, 63, 128)                         ␣
↪24,704

 global_average_pooling1d_2             (None, 128)                                ␣
↪  0
 (GlobalAveragePooling1D)                                                          ␣
↪

 dense_4 (Dense)                        (None, 64)                               ␣
↪8,256

 dense_5 (Dense)                        (None, 3)                                  ␣
↪195
```

```
Total params: 35,715 (139.51 KB)

Trainable params: 35,715 (139.51 KB)

Non-trainable params: 0 (0.00 B)
```

[50]:
```python
# ------------------
# 7. TRAIN (Teaching AI to serve cats)
# ------------------
X_train, X_test, y_train, y_test = train_test_split(X_padded, y, test_size=0.2)
history = model.fit(X_train, y_train, epochs=15, validation_data=(X_test,␣
 ↪y_test))

# Plot training history
plt.plot(history.history['accuracy'], label='Training Accuracy')
plt.plot(history.history['val_accuracy'], label='Validation Accuracy')
plt.title('Learning to Understand Feline Overlords')
plt.ylabel('Probability of Correct Worship')
plt.xlabel('Epoch')
plt.legend()
plt.show()
```

```
Epoch 1/15
11/11              3s 47ms/step -
accuracy: 0.3979 - loss: 7.5275 - val_accuracy: 0.5341 - val_loss: 3.3312
Epoch 2/15
11/11              0s 24ms/step -
accuracy: 0.4548 - loss: 2.7273 - val_accuracy: 0.6364 - val_loss: 1.7064
Epoch 3/15
11/11              0s 25ms/step -
```

```
accuracy: 0.5933 - loss: 1.8192 - val_accuracy: 0.2500 - val_loss: 1.5745
Epoch 4/15
11/11            0s 24ms/step -
accuracy: 0.5098 - loss: 1.2331 - val_accuracy: 0.4205 - val_loss: 1.3733
Epoch 5/15
11/11            0s 24ms/step -
accuracy: 0.5537 - loss: 0.8967 - val_accuracy: 0.6023 - val_loss: 0.8897
Epoch 6/15
11/11            0s 21ms/step -
accuracy: 0.6781 - loss: 0.7550 - val_accuracy: 0.7045 - val_loss: 0.7882
Epoch 7/15
11/11            0s 22ms/step -
accuracy: 0.6786 - loss: 0.7523 - val_accuracy: 0.6477 - val_loss: 0.8634
Epoch 8/15
11/11            0s 22ms/step -
accuracy: 0.7006 - loss: 0.7457 - val_accuracy: 0.6818 - val_loss: 0.8335
Epoch 9/15
11/11            0s 23ms/step -
accuracy: 0.6671 - loss: 0.7390 - val_accuracy: 0.5909 - val_loss: 0.8216
Epoch 10/15
11/11            0s 23ms/step -
accuracy: 0.6850 - loss: 0.7087 - val_accuracy: 0.6818 - val_loss: 0.7817
Epoch 11/15
11/11            0s 22ms/step -
accuracy: 0.7268 - loss: 0.6181 - val_accuracy: 0.6705 - val_loss: 0.7607
Epoch 12/15
11/11            0s 21ms/step -
accuracy: 0.6957 - loss: 0.7362 - val_accuracy: 0.6023 - val_loss: 0.9510
Epoch 13/15
11/11            0s 23ms/step -
accuracy: 0.7154 - loss: 0.6985 - val_accuracy: 0.6932 - val_loss: 0.7462
Epoch 14/15
11/11            0s 22ms/step -
accuracy: 0.6914 - loss: 0.7190 - val_accuracy: 0.5795 - val_loss: 0.9188
Epoch 15/15
11/11            0s 21ms/step -
accuracy: 0.6774 - loss: 0.7454 - val_accuracy: 0.5909 - val_loss: 0.8273
```



[51]:
```
# ------------------
# 8. TRANSLATION TIME! (Finally...)
# ------------------
class CatTranslator:
    def __init__(self, model, context_map):
        self.model = model
        self.reverse_map = reverse_map
        self.translations = {
            0: ["Human. You disturb my fur.", "The brush displeases me.", "This␣
 ↪grooming is acceptable."],
            1: ["FOOD NOW.", "I smell tuna. Provide it.", "The bowl is EMPTY,␣
 ↪peasant."],
            2: ["WHERE IS EVERYONE?!", "This place smells wrong.", "I demand␣
 ↪cuddles immediately!"]
        }

    def translate(self, file_path):
        # Get only the MFCCs from load_and_process
        features, _, _ = load_and_process(file_path) # <--- Change is here
        padded = np.pad(features, ((0,max_len - features.shape[0]),(0,0)))
        pred = model.predict(padded[np.newaxis, ...])
        context = self.reverse_map[np.argmax(pred)]
        return np.random.choice(self.translations[np.argmax(pred)])

translator = CatTranslator(model, context_map)
```

[52]:
```python
# ------------------
# 9. DEMO (Behold, human!)
# ------------------
test_meow = "cat_meows/dataset/dataset/" + np.random.choice(os.
 ↪listdir("cat_meows/dataset/dataset/"))
from IPython.display import Audio, display
display(Audio(test_meow))
print(f"  Playing: {test_meow}")
print(f"  AI Translation: {translator.translate(test_meow)}")

# Optional: Add audio playback
# from IPython.display import Audio
# Audio(test_meow)

# ------------------
# BONUS: Shakespearean Cat Mode
# ------------------
# (Requires OpenAI API key)
from openai import OpenAI
client = OpenAI()

def dramatic_translation(text):
    import openai
    response = client.chat.completions.create(
        model="gpt-4",
        messages=[{
            "role": "user",
            "content": f"Translate this cat demand into Shakespearean English:␣
 ↪{text}"
        }]
    )
    return response.choices[0].message.content

print("\n  Bard-worthy Translation:", dramatic_translation(translator.
 ↪translate(test_meow)))
```

```
<IPython.lib.display.Audio object>

  Playing: cat_meows/dataset/dataset/I_CLE01_EU_FN_FER01_101.wav
1/1              0s 130ms/step
  AI Translation: I smell tuna. Provide it.
1/1              0s 61ms/step

  Bard-worthy Translation: Mine nose doth detect tuna. Pray, furnish it.
```

[54]:
```python
# ------------------
# 10. SAVE MODEL (Observe, peasant!)
# ------------------

model.save('cat_meow_model.keras')
print(" Model saved as cat_meow_model.keras")
```

```
 Model saved as cat_meow_model.keras
```

[27]:
```
!jupyter nbconvert --to html /content/CatsMeow.ipynb
```

```
[NbConvertApp] Converting notebook /content/CatsMeow.ipynb to html
[NbConvertApp] WARNING | Alternative text is missing on 6 image(s).
[NbConvertApp] Writing 915545 bytes to /content/CatsMeow.html
```

[28]:
```
!pip install nbconvert
!apt-get install texlive texlive-xetex texlive-latex-extra pandoc
!jupyter nbconvert --to pdf /content/CatsMeow.ipynb
```

```
Requirement already satisfied: nbconvert in /usr/local/lib/python3.11/dist-
packages (7.16.6)
Requirement already satisfied: beautifulsoup4 in /usr/local/lib/python3.11/dist-
packages (from nbconvert) (4.13.3)
Requirement already satisfied: bleach!=5.0.0 in /usr/local/lib/python3.11/dist-
packages (from bleach[css]!=5.0.0->nbconvert) (6.2.0)
Requirement already satisfied: defusedxml in /usr/local/lib/python3.11/dist-
packages (from nbconvert) (0.7.1)
Requirement already satisfied: jinja2>=3.0 in /usr/local/lib/python3.11/dist-
packages (from nbconvert) (3.1.5)
Requirement already satisfied: jupyter-core>=4.7 in
/usr/local/lib/python3.11/dist-packages (from nbconvert) (5.7.2)
Requirement already satisfied: jupyterlab-pygments in
/usr/local/lib/python3.11/dist-packages (from nbconvert) (0.3.0)
Requirement already satisfied: markupsafe>=2.0 in
/usr/local/lib/python3.11/dist-packages (from nbconvert) (3.0.2)
Requirement already satisfied: mistune<4,>=2.0.3 in
/usr/local/lib/python3.11/dist-packages (from nbconvert) (3.1.2)
Requirement already satisfied: nbclient>=0.5.0 in
/usr/local/lib/python3.11/dist-packages (from nbconvert) (0.10.2)
Requirement already satisfied: nbformat>=5.7 in /usr/local/lib/python3.11/dist-
packages (from nbconvert) (5.10.4)
Requirement already satisfied: packaging in /usr/local/lib/python3.11/dist-
packages (from nbconvert) (24.2)
Requirement already satisfied: pandocfilters>=1.4.1 in
/usr/local/lib/python3.11/dist-packages (from nbconvert) (1.5.1)
Requirement already satisfied: pygments>=2.4.1 in
/usr/local/lib/python3.11/dist-packages (from nbconvert) (2.18.0)
Requirement already satisfied: traitlets>=5.1 in /usr/local/lib/python3.11/dist-
packages (from nbconvert) (5.7.1)
Requirement already satisfied: webencodings in /usr/local/lib/python3.11/dist-
```

```
packages (from bleach!=5.0.0->bleach[css]!=5.0.0->nbconvert) (0.5.1)
Requirement already satisfied: tinycss2<1.5,>=1.1.0 in
/usr/local/lib/python3.11/dist-packages (from bleach[css]!=5.0.0->nbconvert)
(1.4.0)
Requirement already satisfied: platformdirs>=2.5 in
/usr/local/lib/python3.11/dist-packages (from jupyter-core>=4.7->nbconvert)
(4.3.6)
Requirement already satisfied: jupyter-client>=6.1.12 in
/usr/local/lib/python3.11/dist-packages (from nbclient>=0.5.0->nbconvert)
(6.1.12)
Requirement already satisfied: fastjsonschema>=2.15 in
/usr/local/lib/python3.11/dist-packages (from nbformat>=5.7->nbconvert) (2.21.1)
Requirement already satisfied: jsonschema>=2.6 in
/usr/local/lib/python3.11/dist-packages (from nbformat>=5.7->nbconvert) (4.23.0)
Requirement already satisfied: soupsieve>1.2 in /usr/local/lib/python3.11/dist-
packages (from beautifulsoup4->nbconvert) (2.6)
Requirement already satisfied: typing-extensions>=4.0.0 in
/usr/local/lib/python3.11/dist-packages (from beautifulsoup4->nbconvert)
(4.12.2)
Requirement already satisfied: attrs>=22.2.0 in /usr/local/lib/python3.11/dist-
packages (from jsonschema>=2.6->nbformat>=5.7->nbconvert) (25.1.0)
Requirement already satisfied: jsonschema-specifications>=2023.03.6 in
/usr/local/lib/python3.11/dist-packages (from
jsonschema>=2.6->nbformat>=5.7->nbconvert) (2024.10.1)
Requirement already satisfied: referencing>=0.28.4 in
/usr/local/lib/python3.11/dist-packages (from
jsonschema>=2.6->nbformat>=5.7->nbconvert) (0.36.2)
Requirement already satisfied: rpds-py>=0.7.1 in /usr/local/lib/python3.11/dist-
packages (from jsonschema>=2.6->nbformat>=5.7->nbconvert) (0.23.1)
Requirement already satisfied: pyzmq>=13 in /usr/local/lib/python3.11/dist-
packages (from jupyter-client>=6.1.12->nbclient>=0.5.0->nbconvert) (24.0.1)
Requirement already satisfied: python-dateutil>=2.1 in
/usr/local/lib/python3.11/dist-packages (from jupyter-
client>=6.1.12->nbclient>=0.5.0->nbconvert) (2.8.2)
Requirement already satisfied: tornado>=4.1 in /usr/local/lib/python3.11/dist-
packages (from jupyter-client>=6.1.12->nbclient>=0.5.0->nbconvert) (6.4.2)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.11/dist-
packages (from python-dateutil>=2.1->jupyter-
client>=6.1.12->nbclient>=0.5.0->nbconvert) (1.17.0)
Reading package lists… Done
Building dependency tree… Done
Reading state information… Done
pandoc is already the newest version (2.9.2.1-3ubuntu2).
texlive is already the newest version (2021.20220204-1).
texlive-latex-extra is already the newest version (2021.20220204-1).
texlive-xetex is already the newest version (2021.20220204-1).
0 upgraded, 0 newly installed, 0 to remove and 29 not upgraded.
[NbConvertApp] Converting notebook /content/CatsMeow.ipynb to pdf
```

```
[NbConvertApp] Support files will be in CatsMeow_files/
[NbConvertApp] Making directory ./CatsMeow_files
[NbConvertApp] Writing 72403 bytes to notebook.tex
[NbConvertApp] Building PDF
[NbConvertApp] Running xelatex 3 times: ['xelatex', 'notebook.tex', '-quiet']
[NbConvertApp] Running bibtex 1 time: ['bibtex', 'notebook']
[NbConvertApp] WARNING | bibtex had problems, most likely because there were no
citations
[NbConvertApp] PDF successfully created
[NbConvertApp] Writing 281500 bytes to /content/CatsMeow.pdf
```