

ASSIGNMENT-18.2

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Course: AI Assisted Coding

→Lab Question 1: Weather Forecasting API

A travel company wants to show real-time weather updates for its customers. You are given access to a public weather API that requires an

API key and provides weather data in JSON format.

- Task 1: Use AI-assisted coding to write a script that fetches the current temperature and weather description for a given city. The script should handle errors if the API key is invalid or missing.
- Task 2: Extend the script to save the weather data into a local CSV file, ensuring that duplicate entries are avoided. Implement error handling for file I/O exceptions.

#Prompt: Create a Python script `weather_fetch.py` that fetches current temperature and weather description for a given city using a public weather API (OpenWeatherMap). Requirements:

- Handle missing or invalid API key gracefully. If the API key is missing or invalid, fall back to deterministic demo data so the script can still run for testing.
- Save fetched weather entries into a local CSV file `weather_records.csv` and avoid duplicate entries (consider normalizing timestamp to minute precision and de-duplicating by city+time).
- Implement file I/O error handling and network/API error handling with meaningful messages.
- Keep the code dependency-free except for Python stdlib. Provide usage instructions and ensure the script runs in demo mode when required.

Code :

```

weather_fetch.py > ...
1  import argparse
2  import csv
3  import json
4  import os
5  import sys
6  from datetime import datetime
7  from typing import Optional
8  import urllib.request
9  import urllib.error
10 CSV_FILE = 'weather_records.csv'                                     Follow link (ctrl + click)
11 API_URL_TEMPLATE = 'http://api.openweathermap.org/data/2.5/weather?q={city}&appid={key}&units=metric'
12 def fetch_weather(city: str, api_key: Optional[str] = None):
13     """Fetches weather from OpenWeatherMap. Returns dict on success or raises ValueError on API key error."""
14     key = api_key or os.environ.get('OPENWEATHER_API_KEY')
15     if not key:
16         raise ValueError('Missing API key')
17     url = API_URL_TEMPLATE.format(city=urllib.request.quote(city), key=key)
18     try:
19         with urllib.request.urlopen(url, timeout=10) as resp:
20             data = json.loads(resp.read().decode('utf-8'))
21             if resp.status != 200:
22                 # API returned an error payload
23                 message = data.get('message', 'API error')
24                 raise ValueError(f'API error: {message}')
25             # extract temperature and description
26             temp = data['main']['temp']
27             desc = data['weather'][0]['description']
28             return {'city': city, 'temp': temp, 'description': desc, 'time': datetime.utcnow().isoformat()}
29     except urllib.error.HTTPError as e:
30         # e.code could be 401 for unauthorized
31         try:
32             payload = e.read().decode('utf-8')

def fetch_weather(city: str, api_key: Optional[str] = None):
    obj = json.loads(payload)
    msg = obj.get('message', str(e))
except Exception:
    msg = str(e)
    raise ValueError(f'HTTP error: {e.code} - {msg}')
except urllib.error.URLError as e:
    raise ConnectionError(f'Network error: {e.reason}')
def demo_weather(city: str):
    """Return demo weather data when API key missing or to avoid external calls."""
    # deterministic pseudo-random demo values based on city name hash
    h = abs(hash(city)) % 30
    temp = round(15 + (h % 10) + (h / 50), 1)
    desc = ['clear sky', 'few clouds', 'scattered clouds', 'light rain', 'overcast'][h % 5]
    return {'city': city, 'temp': temp, 'description': desc, 'time': datetime.utcnow().isoformat()}
def append_unique_record(record: dict, csv_file: str = CSV_FILE):
    """Append a weather record to CSV, avoiding exact duplicates by city+time (rounded to minute)."""
    try:
        # Ensure directory exists
        dirpath = os.path.dirname(os.path.abspath(csv_file))
        if dirpath and not os.path.exists(dirpath):
            os.makedirs(dirpath, exist_ok=True)
        # Normalize time to minute precision to reduce duplicates
        t = datetime.fromisoformat(record['time'])
        record_time = t.replace(second=0, microsecond=0).isoformat()
        record_key = (record['city'].lower(), record_time)
        existing = set()
        if os.path.exists(csv_file):
            with open(csv_file, 'r', newline='', encoding='utf-8') as f:
                reader = csv.DictReader(f)
                for row in reader:
                    existing.add((row['city'].lower(), row['time']))

```

```

def append_unique_record(record: dict, csv_file: str = CSV_FILE):
    raise IOError(f'File I/O error: {e}')
def main(argv=None):
    parser = argparse.ArgumentParser(description='Fetch current weather and save to CSV (avoiding duplicates).')
    parser.add_argument('--city', required=True, help='City name to fetch weather for')
    parser.add_argument('--api-key', help='OpenWeatherMap API key (optional, or set OPENWEATHER_API_KEY env var)')
    parser.add_argument('--demo', action='store_true', help='Use demo fallback data even if API key present')
    args = parser.parse_args(argv)
    try:
        if args.demo:
            rec = demo_weather(args.city)
        else:
            try:
                rec = fetch_weather(args.city, api_key=args.api_key)
            except ValueError as e:
                # API key missing or invalid -> fallback to demo
                print(f"API error: {e}; falling back to demo data.")
                rec = demo_weather(args.city)
    except ConnectionError as e:
        print(f"Network error when fetching weather: {e}")
        rec = demo_weather(args.city)
    print(f"City: {rec['city']}, Temp (C): {rec['temp']}, Description: {rec['description']}, Time(UTC): {rec['time']}")
    try:
        appended = append_unique_record(rec)
        if appended:
            print(f"Record saved to {CSV_FILE}")
        else:
            print("Duplicate detected; not saved.")
    except IOError as e:
        print(f"Failed to save record: {e}")
if __name__ == '__main__':
    main()

```

Output :

```

PS C:\Users\THIRUPATHI REDDY\Desktop\AIAC_9> City: London, Temp (C): 15.4, Description: clear sky, Time(UTC): 2025-11-03T08:36:44.182414
>> Record saved to weather_records.csv

```

Observation :

How AI helped:

- The AI suggested the structure and behavior: API fetch + demo fallback, CSV de-duplication by city+minute, and layered error handling for network/API/file I/O.
- It helped draft the code that uses only Python stdlib and provided a clear usage pattern and fallbacks so the script is runnable without an API key.

Usage example:

- Demo run (no API key required):

```
python weather_fetch.py --city "London" -demo
```

→Lab Question 2: Currency Exchange Rate API

A financial startup needs a tool to convert amounts between currencies

using an exchange rate API. However, the API occasionally fails due to

server downtime.

- Task 1: Write a script (with AI assistance) that takes user input (amount, source currency, target currency) and fetches the latest exchange rate from the API. Include errors in handling invalid currency codes.
- Task 2: Add logic to retry the request up to three times if the API

call fails due to network or server issues and log all failed attempts into a local error log file.

#Prompt: Write a Python script that converts amounts between currencies using a public exchange rate API.

Requirements:

- Validate currency codes (3-letter ISO codes) and handle invalid codes gracefully.
- Retry the API call up to 3 times on network/server failures, with brief delays between retries.

- Log failed attempts with timestamps into a local error log file `currency_errors.log`.
- Provide a demo mode that uses deterministic sample rates so the script can be tested without a network/API.
- Keep dependencies to the Python standard library only.

Code:

```

import argparse
import json
import logging
import os
import sys
import time
from typing import Dict, Optional
import urllib.request
import urllib.error
API_URL_TEMPLATE = 'https://api.exchangerate.host/latest?base={base}&symbols={symbols}'
ERROR_LOG = 'currency_errors.log'
logging.basicConfig(filename=ERROR_LOG, level=logging.WARNING,
                    format='%(asctime)s %(levelname)s: %(message)s')
def fetch_rate(base: str, symbols: str, timeout: int = 10) -> Dict:
    url = API_URL_TEMPLATE.format(base=urllib.request.quote(base), symbols=urllib.request.quote(symbols))
    with urllib.request.urlopen(url, timeout=timeout) as resp:
        data = json.loads(resp.read().decode('utf-8'))
        if not data.get('success', True):
            # some APIs send success flags
            raise ValueError('API reported failure')
    return data
def demo_rates(base: str, symbol: str):
    # deterministic demo rates for testing
    base = base.upper()
    symbol = symbol.upper()
    sample = {
        'USD': {'EUR': 0.92, 'INR': 83.5, 'JPY': 110.0},
        'EUR': {'USD': 1.09, 'INR': 91.0, 'JPY': 119.0},
        'INR': {'USD': 0.012, 'EUR': 0.011, 'JPY': 1.3},
    }
    if base not in sample or symbol not in sample.get(base, {}):
        raise KeyError('Unsupported currency code in demo')

```

```

    return {'base': base, 'rates': {symbol: sample[base][symbol]}}

def get_rate_with_retries(base: str, symbol: str, demo: bool = False, max_retries: int = 3):
    attempts = 0
    last_exc = None
    while attempts < max_retries:
        try:
            if demo:
                return demo_rates(base, symbol)
            else:
                return fetch_rate(base, symbol)
        except urllib.error.URLError as e:
            attempts += 1
            msg = f'Network error fetching rates (attempt {attempts}): {e}'
            logging.warning(msg)
            last_exc = e
            time.sleep(1)
        except urllib.error.HTTPError as e:
            attempts += 1
            try:
                payload = e.read().decode('utf-8')
            except Exception:
                payload = str(e)
            msg = f'HTTP error fetching rates (attempt {attempts}): {e.code} - {payload}'
            logging.warning(msg)
            last_exc = e
            time.sleep(1)
        except KeyError as e:
            raise
        except Exception as e:
            attempts += 1
            logging.warning(f'Unexpected error (attempt {attempts}): {e}')

```

```

currency_converter.py > def main():
    def get_rate_with_retries(base: str, symbol: str, demo: bool = False, max_retries: int = 3):
        last_exc = None
        time.sleep(1)
        # after retries
        raise ConnectionError(f'Failed to fetch rates after {max_retries} attempts') from last_exc
    def convert_amount(amount: float, base: str, target: str, demo: bool = False) -> float:
        base = base.upper()
        target = target.upper()
        # basic validation of codes (3-letter)
        if len(base) != 3 or len(target) != 3:
            raise ValueError('Currency codes must be 3-letter ISO codes')
        data = get_rate_with_retries(base, target, demo=demo)
        rates = data.get('rates')
        if not rates or target not in rates:
            raise KeyError(f'Rate for {target} not found')
        rate = float(rates[target])
        return amount * rate
    def main(argv=None):
        parser = argparse.ArgumentParser(description='Convert currency using exchange rate API with retries and logging')
        parser.add_argument('--amount', type=float, required=True, help='Amount to convert')
        parser.add_argument('--from', dest='base', required=True, help='Source currency (3-letter code)')
        parser.add_argument('--to', dest='target', required=True, help='Target currency (3-letter code)')
        parser.add_argument('--demo', action='store_true', help='Use demo rates without external API')
        args = parser.parse_args(argv)
        try:
            result = convert_amount(args.amount, args.base, args.target, demo=args.demo)
            print(f'{args.amount} {args.base.upper()} - {result:.2f} {args.target.upper()}')
        except KeyError as e:
            print(f'Invalid or unsupported currency code: {e}')
        except ValueError as e:
            print(f'Input error: {e}')
        except ConnectionError as e:

```

```
        except KeyError as e:
            print(f'Invalid or unsupported currency code: {e}')
        except ValueError as e:
            print(f'Input error: {e}')
        except ConnectionError as e:
            print(f'Failed to fetch exchange rates: {e}. Check {ERROR_LOG} for details')
        except Exception as e:
            print(f'Unexpected error: {e}')
if __name__ == '__main__':
    main()
```

Output:

```
PS C:\Users\THIRUPATHI REDDY\Desktop\AIAC_f9> 100.0 USD = 92.00 EUR
>> |
```

Observation:

How AI helped:

- Suggested retry logic and exponential backoff pattern (simplified here to fixed delay), logging failures to a local file, and providing a demo mode for offline testing.
- Helped design clear error messages for invalid currency codes and failed API calls.

Usage examples:

- Demo conversion (no network needed):

```
python currency_convert.py --amount 100 --from USD --to EUR
--demo
```

→Lab Question 3: News Headlines API

A news aggregator wants to display the latest technology news headlines

using a news API. Sometimes, the API responds slowly or returns incomplete data.

- Task 1: Use AI-assisted coding to fetch the top 5 technology headlines and print them neatly in the console. Implement error handling for timeout errors by setting a maximum request time.
- Task 2: Clean and preprocess the headlines by removing special characters and converting text to title case. Handle the scenario where the API response contains empty or null values.

#Prompt:

Create a Python script `news_fetch.py` that:

- Fetches the top technology headlines (top 5) from a news API.
- Sets a timeout to handle slow responses and treats timeout/network errors gracefully.
- Cleans headlines by removing special characters and converting text to title case.
- Skips empty or null headlines.
- Provides a demo mode so the script can run without an API key or network.

Code :

```
import argparse
import json
import re
import sys
import urllib.request
import urllib.error
from typing import List
API_URL_TEMPLATE = 'https://newsapi.org/v2/top-headlines?category=technology&pageSize=10&apiKey={key}'
TIMEOUT_SECONDS = 5
def fetch_headlines(api_key: str, timeout: int = TIMEOUT_SECONDS) -> List[str]:
    url = API_URL_TEMPLATE.format(key=api_key)
    try:
        with urllib.request.urlopen(url, timeout=timeout) as resp:
            data = json.loads(resp.read().decode('utf-8'))
            # NewsAPI style: articles list with 'title' field
            articles = data.get('articles', [])
            titles = [a.get('title') for a in articles]
            return titles
    except urllib.error.URLError as e:
        raise ConnectionError(f'Network/timeout error: {e}')
    except Exception as e:
        raise RuntimeError(f'Failed to fetch headlines: {e}')
def demo_headlines() -> List[str]:
    return [
        "OpenAI releases new developer tools!",
        None,
        "Breakthrough in quantum computing: researchers announce milestone",
        "New smartphone launches; features include foldable display & 5G",
        "Study: AI helps reduce energy use in data centers",
        "",
        "Startups raise $500M in funding round",
        "Privacy concerns rise as apps track location",
```

```

        "Advances in battery tech could extend EV range",
        "Tech leaders call for better developer tools"
    ]
def clean_headline(h: str) -> str:
    if not h:
        return ''
    # remove special characters except basic punctuation, collapse whitespace
    cleaned = re.sub(r'[^w\s\-\&]', '', h)
    cleaned = re.sub(r'\+\+', ' ', cleaned).strip()
    # title case but preserve some words like 'AI'
    def smart_title(s: str) -> str:
        # Basic approach: use title() then fix 'Ai' -> 'AI'
        t = s.title()
        t = re.sub(r'\bAi\b', 'AI', t)
        return t
    return smart_title(cleaned)
def get_top_cleaned(headlines: List[str], top_n: int = 5) -> List[str]:
    cleaned = []
    for h in headlines:
        if h is None:
            continue
        ch = clean_headline(h)
        if not ch:
            continue
        cleaned.append(ch)
        if len(cleaned) >= top_n:
            break
    return cleaned
def main(argv=None):
    parser = argparse.ArgumentParser(description='Fetch and clean top technology headlines')
    parser.add_argument('--demo', action='store true', help='Use demo headlines instead of calling API')

```

```

parser.add_argument('--api-key', help='API key for news provider')
args = parser.parse_args(argv)
try:
    if args.demo or not args.api_key:
        headlines = demo_headlines()
    else:
        headlines = fetch_headlines(args.api_key)
except ConnectionError as e:
    print(f'Network/timeout error: {e}; using demo headlines')
    headlines = demo_headlines()
except Exception as e:
    print(f'Error fetching headlines: {e}; using demo headlines')
    headlines = demo_headlines()

top = get_top_cleaned(headlines, top_n=5)
print('Top Technology Headlines:')
for i, h in enumerate(top, start=1):
    print(f'{i}. {h}')
if __name__ == '__main__':
    main()

```

Output :

```
PS C:\Users\THIRUPATHI REDDY\Desktop\ATAC_f9> python "c:\Users\THIRUPATHI REDDY\Desktop\ATAC_f9\news_fetch.py" --demo
Top Technology Headlines:
1. Openai Releases New Developer Tools
Top Technology Headlines:
1. Openai Releases New Developer Tools
2. Breakthrough In Quantum Computing Researchers Announce Milestone
1. Openai Releases New Developer Tools
2. Breakthrough In Quantum Computing Researchers Announce Milestone
2. Breakthrough In Quantum Computing Researchers Announce Milestone
3. New Smartphone Launches Features Include Foldable Display & 5G
3. New Smartphone Launches Features Include Foldable Display & 5G
4. Study AI Helps Reduce Energy Use In Data Centers
4. Study AI Helps Reduce Energy Use In Data Centers
5. Startups Raise $80M In Funding Round
PS C:\Users\THIRUPATHI REDDY\Desktop\ATAC_f9>
```

Observation :

AI assistance:

- The AI suggested robust handling for timeouts (using a request timeout) and fallback to demo headlines.
- It helped with headline cleaning logic and preserving acronyms (e.g., 'AI').

How to run (demo):

```
python news_fetch.py --demo
```