Fetch Google Reviews for POIs (Aveiro)

Goal: Build a pipeline to fetch reviews for Points of Interest (POIs) in Aveiro, using:

- **OSM-derived POIs** (from `pois_aveiro.csv`)
- **Google Places API (v1)** for place search and place details (reviews)
- Output to `reviews_output.csv` for downstream **NLP** (sentiment & topic modeling)

> **Note:** Google Places **reviews** are limited to 5 reviews per POI

1. Setup & Requirements

Requirements

1. A **Google Cloud Project** with **Places API** enabled.
2. A valid **API key**
3. The input file `pois_aveiro.csv` including `geom_pt` (EWKB, SRID=4326) and/or `geom` .

Environment variables:

- `GOOGLE_API_KEY` : API key.

In [14]:

```
import requests
import time
import os
import pandas as pd
from shapely import wkb

GOOGLE_API_KEY = os.getenv("GOOGLE_API_KEY", "AIzaSyAwme_k4xStLv2_bLFAckn
INPUT_CSV = "../pois_aveiro.csv"
SLEEP_BETWEEN_REQUESTS = 0.25  # seconds to avoid hitting rate limits
RADIUS_METERS = 10  # Search within a 10-meter radius by default
MAX_PLACES_PER_RUN = 20  # Limit the number of places to query
```

2. Helper Functions

Utilities for geometry parsing and API calls.

In [15]:

```
def ewkb_hex_point_to_lonlat(hex_str: str):
    """
    Convert EWKB hex POINT (SRID=4326) to (lon, lat).
    Many exports store POINT as EWKB hex like '0101000020E6100000...'
    """
    if not isinstance(hex_str, str) or not hex_str:
        return None
    try:
        geom = wkb.loads(bytes.fromhex(hex_str))
        if geom.geom_type == "Point":
            return (geom.x, geom.y)
    except Exception:
        pass
    return None


# Helper Functions for Places API

def places_search_nearby(lat, lon, radius=500, types=["restaurant"]):
    """
    Use Google Places Nearby Search to search for places within a given r
    Returns the places found and the API call status.
    """
    url = "https://places.googleapis.com/v1/places:searchNearby"
    payload = {
        "locationRestriction": {
            "circle": {
                "center": {
                    "latitude": lat,
                    "longitude": lon
                },
                "radius": radius
            }
        },
        # "includedTypes": types,
        "maxResultCount":  (MAX_PLACES_PER_RUN or 10),
    }
    params = { 'key': GOOGLE_API_KEY }
    headers = {
        "X-Goog-FieldMask": "places.displayName,places.id,places.reviews,
        "X-Goog-Api-Key": GOOGLE_API_KEY,
        "Content-Type": "application/json",
    }

    try:
        # Send POST request to the Nearby Search API
        response = requests.post(url, params=params, json=payload, header
        time.sleep(SLEEP_BETWEEN_REQUESTS)
        response.raise_for_status()
    except requests.exceptions.RequestException as e:
        print(f"Error during API request: {e}")
        return None, "ERROR"

    data = response.json()
    places = data.get("places", [])
    return places, "OK" if places else "ZERO_RESULTS"

def process_reviews(reviews):
    """
    Extract the reviews from the response and format them into a list of
    """
    reviews_data = []
    for review in reviews:
        reviews_data.append({
            "author_name": review.get("authorAttribution", {}).get("displ
            "rating": review.get("rating"),
            "review_text": review.get("text", {}).get("text", ""),
            "publish_time": review.get("publishTime"),
        })
    return reviews_data

def get_reviews_for_nearby_places(lat, lon, radius=500):
    """
    Fetch nearby places and their reviews within the specified radius.
    Returns a list of reviews and the status of the operation.
    """
    places, status = places_search_nearby(lat, lon, radius)
    if not places:
        return [], f"No nearby places found. Status: {status}"

    all_reviews = []
    for place in places:
        place_id = place.get("id")
        place_name = place.get("displayName", {}).get("text", "")
        place_location = place.get("location", {})
        place_rating = place.get("rating")
        place_primary_type = place.get("primaryType", "Unknown")
        reviews = place.get("reviews", [])
        processed_reviews = process_reviews(reviews)

        for review in processed_reviews:
            review["place_name"] = place_name
            review["place_id"] = place_id
            review["place_location"] = place_location
            review["place_rating"] = place_rating
            review["place_primary_type"] = place_primary_type
            all_reviews.append(review)

    return all_reviews, "OK"
```

3. Load & Preview POIs

We expect `pois_aveiro.csv` to contain, among many attributes, at least:

- `gid` : unique id
- `amenity` / `shop` / `tourism` : category hints
- `geom_pt` (preferred) or `geom` : EWKB encoded `POINT` (SRID 4326)

In [16]:

```
pd.set_option("display.max_columns", 60)
try:
    df = pd.read_csv(INPUT_CSV, low_memory=False)
    display(df.head(3))
    print(f"Loaded {len(df)} rows from {INPUT_CSV}")
except FileNotFoundError:
    print(f"WARNING: {INPUT_CSV} not found. Place it next to this noteboo
    df = pd.DataFrame()
```

	gid	access	addr:city	addr:country	addr:hamlet	addr:housename	addr:housenumbe
0	1	NaN	NaN	NaN	NaN	NaN	Na
1	2	NaN	NaN	NaN	NaN	NaN	Na
2	3	NaN	Aveiro	NaN	NaN	NaN	Na

3 rows × 530 columns

```
Loaded 13258 rows from ../pois_aveiro.csv
```

4. Processing Logic per-POI

For each row:

1. Determine **amenity** (or fallbacks).
2. Parse **coordinates** from `geom_pt` / `geom` .
3. Build a **name hint** from available name columns.
4. **Nearby Search** to fetch place name, place ID, place location, place rating, place type and **reviews** (limited to `MAX_REVIEWS_PER_PLACE`).

In [17]:

```
def run_pipeline():
    # Load POIs from file
    df = pd.read_csv(INPUT_CSV)

    out_rows = []
    processed = 0

    # Loop over each POI and process reviews
    for idx, row in df.iterrows():
        if processed >= MAX_PLACES_PER_RUN:
            break

        # Get coordinates from 'geom_pt' or 'geom' column
        lonlat = None
        if "geom_pt" in df.columns and isinstance(row.get("geom_pt"), str
            lonlat = ewkb_hex_point_to_lonlat(row.get("geom_pt"))
            print(lonlat)
        if lonlat is None and "geom" in df.columns and isinstance(row.get
            lonlat = ewkb_hex_point_to_lonlat(row.get("geom"))

        if not lonlat:
            continue

        lon, lat = lonlat

        # Fetch reviews for the nearby places
        reviews_data, status = get_reviews_for_nearby_places(lat, lon, RA

        if reviews_data:
            # Add reviews data to output rows
            for review in reviews_data:
                out_rows.append(review)

        processed += 1

    # Create DataFrame and save to CSV
    if out_rows:
        df_reviews = pd.DataFrame(out_rows)
        df_reviews.to_csv("nearby_reviews.csv", index=False)
        print(f"Saved reviews data to 'nearby_reviews.csv'.")
    else:
        print("No reviews fetched.")

    return df_reviews
```

```
df_reviews = run_pipeline()
display(df_reviews.head(10))
```

```
/tmp/ipykernel_106354/3264769247.py:3: DtypeWarning:

Columns (3,4,5,6,7,8,9,11,12,13,16,17,18,19,20,21,22,23,24,25,26,27,28,2
9,30,31,32,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,5
4,55,56,57,59,60,61,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,8
0,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,10
3,104,105,106,107,108,109,111,112,113,114,115,116,117,118,119,120,121,12
2,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,14
0,142,143,144,145,146,147,149,150,151,152,153,154,155,156,157,158,159,16
0,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,17
8,179,180,181,182,183,186,187,188,189,190,191,192,193,194,196,197,198,19
9,200,201,202,203,204,205,206,207,208,209,211,212,213,214,215,217,220,22
2,223,224,225,226,227,228,229,230,232,236,237,240,241,242,243,244,245,24
6,248,249,250,251,252,253,254,256,257,258,259,261,262,263,264,265,266,26
7,268,269,270,271,272,273,274,275,276,278,279,280,282,283,284,286,287,28
8,289,290,291,292,293,294,295,296,298,299,300,301,302,303,304,305,306,30
7,308,309,310,311,312,313,314,315,316,317,318,319,320,321,322,323,324,32
5,326,327,328,329,330,331,332,333,334,335,336,337,338,339,340,341,342,34
3,344,345,346,347,348,349,350,351,352,353,354,355,356,357,358,359,360,36
1,362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378,37
9,380,381,382,383,384,385,386,387,388,389,390,392,398,399,401,402,403,40
4,405,407,408,411,412,413,415,416,417,418,419,420,421,423,424,425,426,42
7,428,429,430,431,432,433,434,435,436,437,438,439,440,442,443,444,445,44
6,449,452,455,459,463,465,466,467,468,469,470,471,472,473,474,475,476,47
7,479,480,481,482,483,484,485,486,487,488,489,490,491,492,493,494,495,49
6,497,498,499,500,502,503,504,505,506,507,508,509,510,511,512,513,514,51
5,516,517,518,520,521,523,524,525,526) have mixed types. Specify dtype opt
ion on import or set low_memory=False.

(-8.7288263, 40.6338208)
(-8.558722, 40.7202822)
(-8.6412275, 40.6318767)
(-8.6303399, 40.6483621)
(-8.6529905, 40.6408293)
(-8.6155501, 40.6530001)
(-8.6302907, 40.6481634)
(-8.6289941, 40.6490393)
(-8.6305762, 40.6464895)
(-8.6398177, 40.6372592)
(-8.6186598, 40.6448436)
(-8.6232773, 40.6425727)
(-8.6553328, 40.6424277)
(-8.643414, 40.6219823)
(-8.6424403, 40.6202283)
(-8.6397822, 40.6160724)
(-8.6556364, 40.6407427)
(-8.6544847, 40.6414747)
(-8.540525, 40.5609636)
(-8.529471, 40.5664656)
Saved reviews data to 'nearby_reviews.csv'.
```

	author_name	rating	review_text	publish_time	place_name	
0	Markus Wenger	4		2024-11-08T10:05:22.566412Z	Avelab - Esgueira	(
1	Lara Mendes	5	Muito simpáticos! A entrega foi rapidíssima e ...	2025-10-28T20:47:06.519725824Z	EATIN	Chl
2	Diogo Moço	5	Encomendei comida para casa e foram rápidos na...	2025-10-28T20:47:48.904490884Z	EATIN	Chl
3	Nicole	5	saboroso, ótima entrega e muito simpáticos	2025-10-24T03:35:24.556694520Z	EATIN	Chl
4	José Cândido	5	O Mercado Gastronômico e Cultural de Aveiro, t...	2025-08-29T13:11:40.256631901Z	Mercado Gstronomico e Cultural	Cl
5	Guilherme Gomes	5		2025-07-31T14:13:32.213237010Z	Capela de Aradas A	
6	Christian Efraim Haziel	5	I simply loved it. Best value for money I foun...	2025-07-13T15:31:19.697171341Z	Garden Hostel	
7	Félix Cloutier	1	It's a forty minutes walk away (3km) from Avei...	2023-05-21T18:55:05.704969Z	Garden Hostel	
8	Diego andres Camargo	2	I give him two stars for the backyard and the ...	2021-08-12T23:21:10.035467Z	Garden Hostel	
9	Adarsha আদর্শ シ	4	Fairly ok for overnight stay, in low price!! ...	2023-08-19T01:33:20.314940Z	Garden Hostel	

5. Graphical Analysis of the Output

In [18]:

```
import pandas as pd
import ast

csv_path = "nearby_reviews.csv"
df = pd.read_csv(csv_path)

df['publish_time'] = pd.to_datetime(df['publish_time'], errors='coerce')
df['rating'] = pd.to_numeric(df['rating'], errors='coerce')
```

```
df['place_rating'] = pd.to_numeric(df['place_rating'], errors='coerce')

def parse_loc(s):
    try:
        return ast.literal_eval(s)
    except Exception:
        return {}
df['place_location'] = df['place_location'].fillna('').apply(parse_loc)
df['lat'] = df['place_location'].apply(lambda x: x.get('latitude'))
df['lon'] = df['place_location'].apply(lambda x: x.get('longitude'))
df['review_length'] = df['review_text'].fillna('').str.len()
df['year_month'] = df['publish_time'].dt.to_period('M')
```

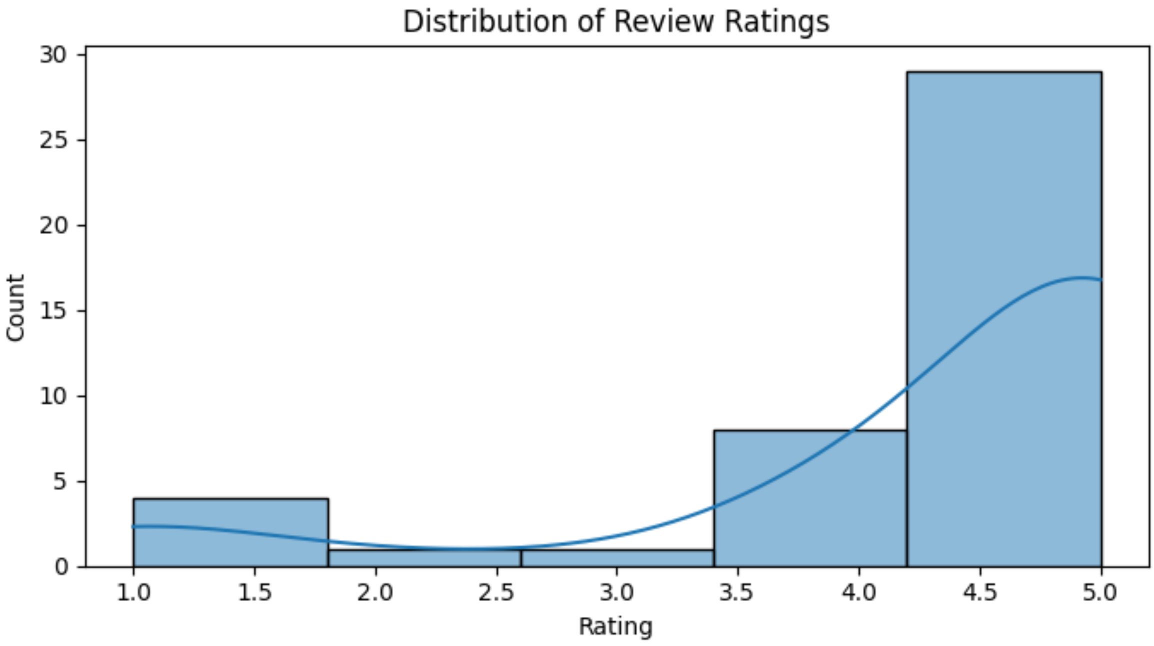
```
/tmp/ipykernel_106354/4028166443.py:20: UserWarning:

Converting to PeriodArray/Index representation will drop timezone informat
ion.
```

6. Rating distribution (histogram + kde)

Overall distribution of review ratings (1–5).

In [19]:

```
import seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(7,4))
sns.histplot(df['rating'].dropna(), bins=5, kde=True)
plt.title("Distribution of Review Ratings")
plt.xlabel("Rating")
plt.ylabel("Count")
plt.tight_layout()
plt.show()
```

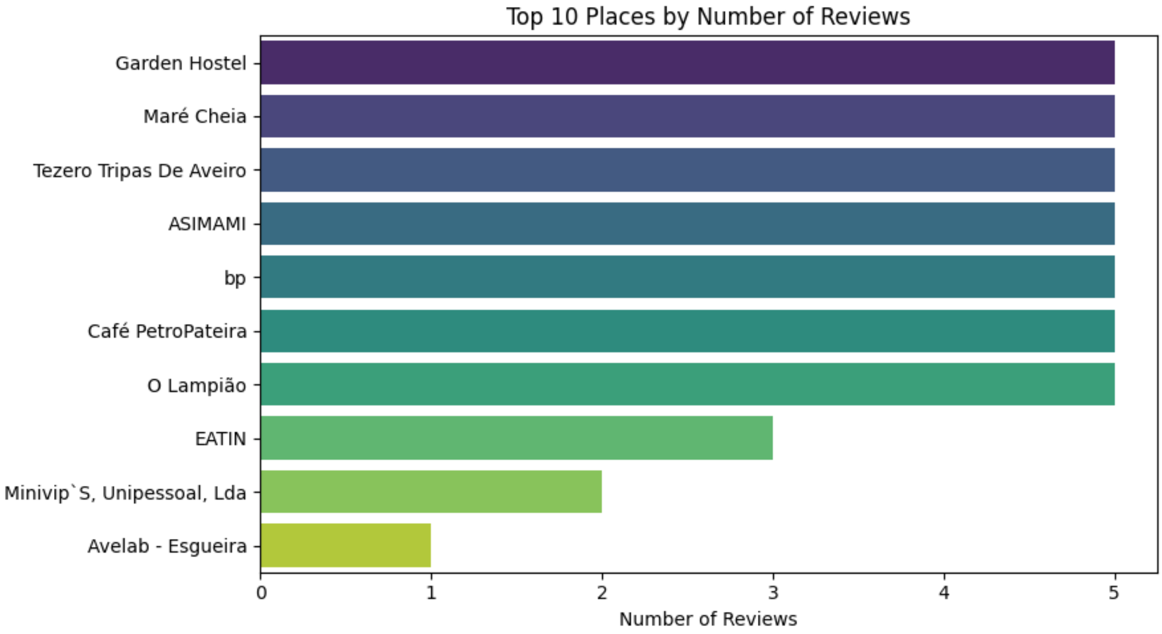


7. Reviews per place (top N) — bar chart

Number of reviews per place (top 10 places by count).

```
In [20]: top_places = df['place_name'].value_counts().nlargest(10).reset_index()
         top_places.columns = ['place_name','n_reviews']

         plt.figure(figsize=(9,5))
         sns.barplot(data=top_places, y='place_name', x='n_reviews', palette='viri
         plt.title("Top 10 Places by Number of Reviews")
         plt.xlabel("Number of Reviews")
         plt.ylabel("")
         plt.tight_layout()
         plt.show()
```

```
/tmp/ipykernel_106354/3900431756.py:5: FutureWarning:



Passing `palette` without assigning `hue` is deprecated and will be remove
d in v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for
the same effect.
```

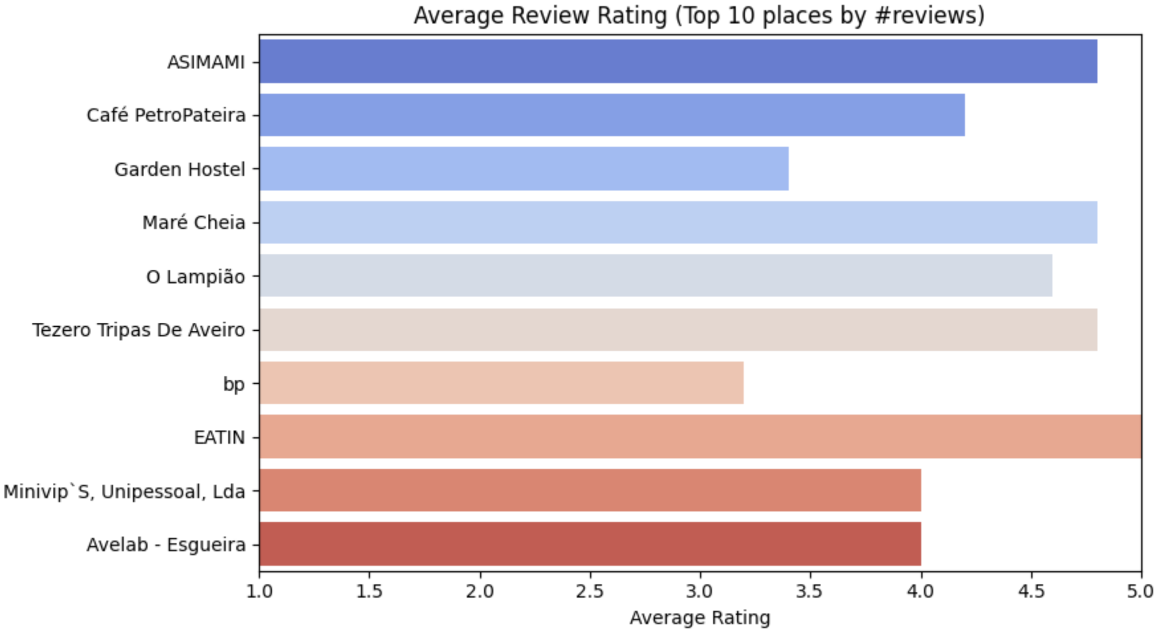


8. Average review rating per place (top N)

Average user rating per place (show top 10 by review count).

```
In [21]: agg = df.groupby('place_name').agg(n_reviews=('rating','count'), mean_rat
         agg_top = agg.sort_values('n_reviews', ascending=False).head(10)

         plt.figure(figsize=(9,5))
         sns.barplot(data=agg_top, y='place_name', x='mean_rating', palette='coolw
         plt.xlim(1,5)
         plt.title("Average Review Rating (Top 10 places by #reviews)")
         plt.xlabel("Average Rating")
         plt.ylabel("")
         plt.tight_layout()
         plt.show()
```

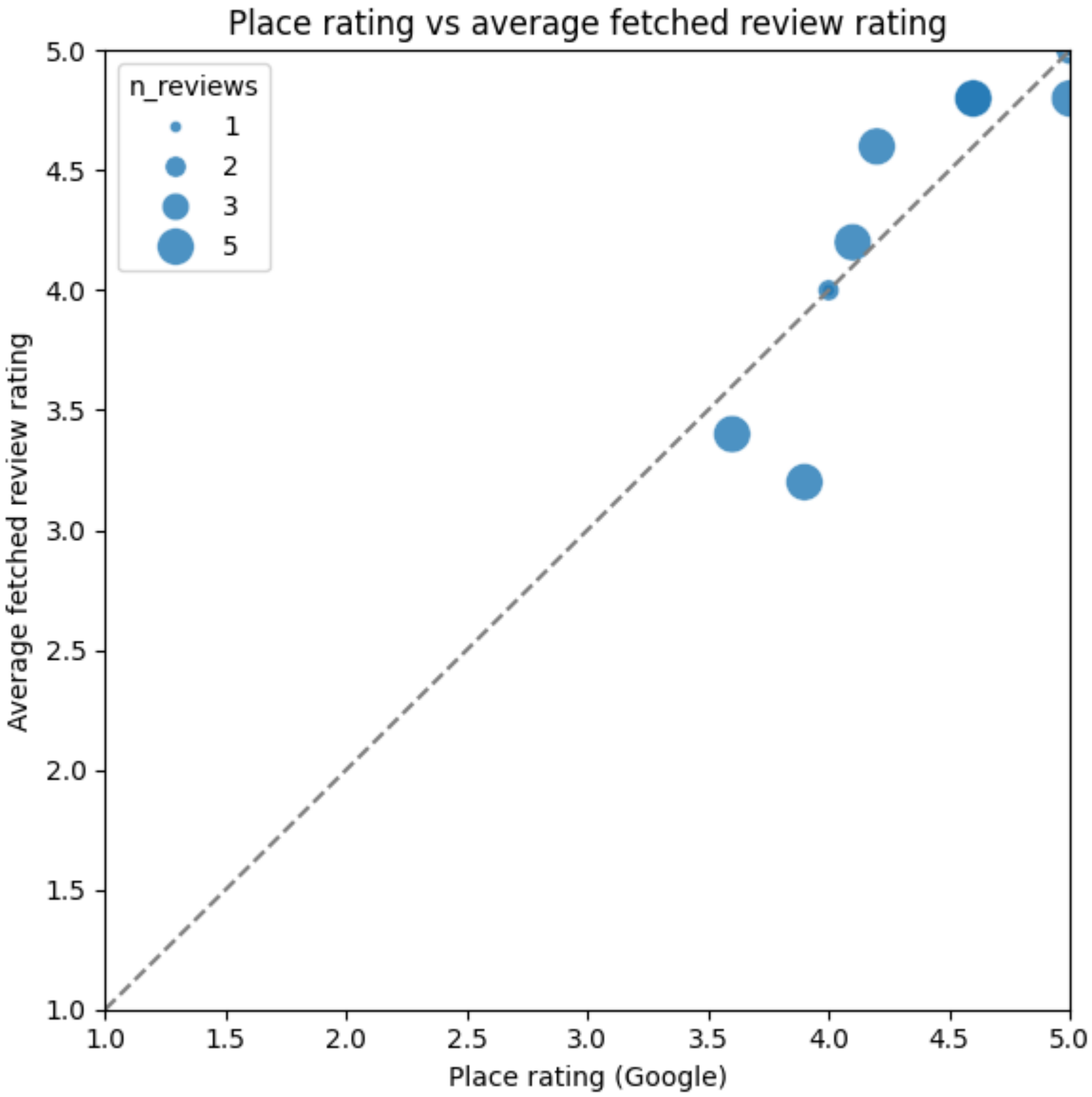
```
/tmp/ipykernel_106354/2439568483.py:5: FutureWarning:



Passing `palette` without assigning `hue` is deprecated and will be remove
d in v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for
the same effect.
```



9. Place rating (Google) vs average review rating (scatter)

Relationship between place overall rating (place_rating) and the average review rating fetched.

In [22]:
```
place_stats = df.groupby('place_id').agg(place_name=('place_name','first'
                                         avg_review_rating=('rating','mea
                                         place_rating=('place_rating','fi
                                         n_reviews=('rating','count')).re
plt.figure(figsize=(6,6))
sns.scatterplot(data=place_stats, x='place_rating', y='avg_review_rating'
plt.plot([1,5],[1,5], color='gray', linestyle='--')  # identity
plt.xlabel("Place rating (Google)")
plt.ylabel("Average fetched review rating")
plt.title("Place rating vs average fetched review rating")
plt.xlim(1,5); plt.ylim(1,5)
plt.tight_layout()
plt.show()
```

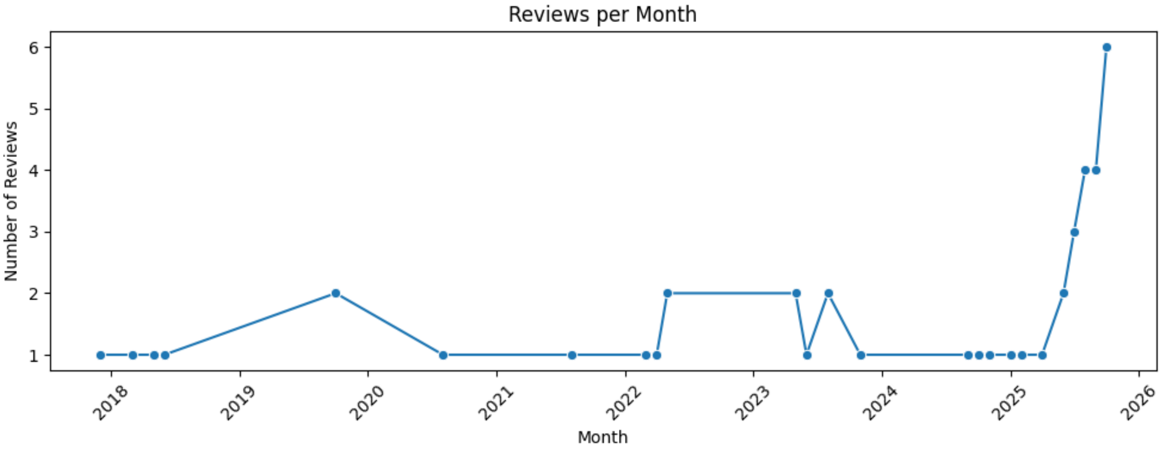


10. Time series — reviews per month

Volume of reviews over time (monthly).

In [23]:

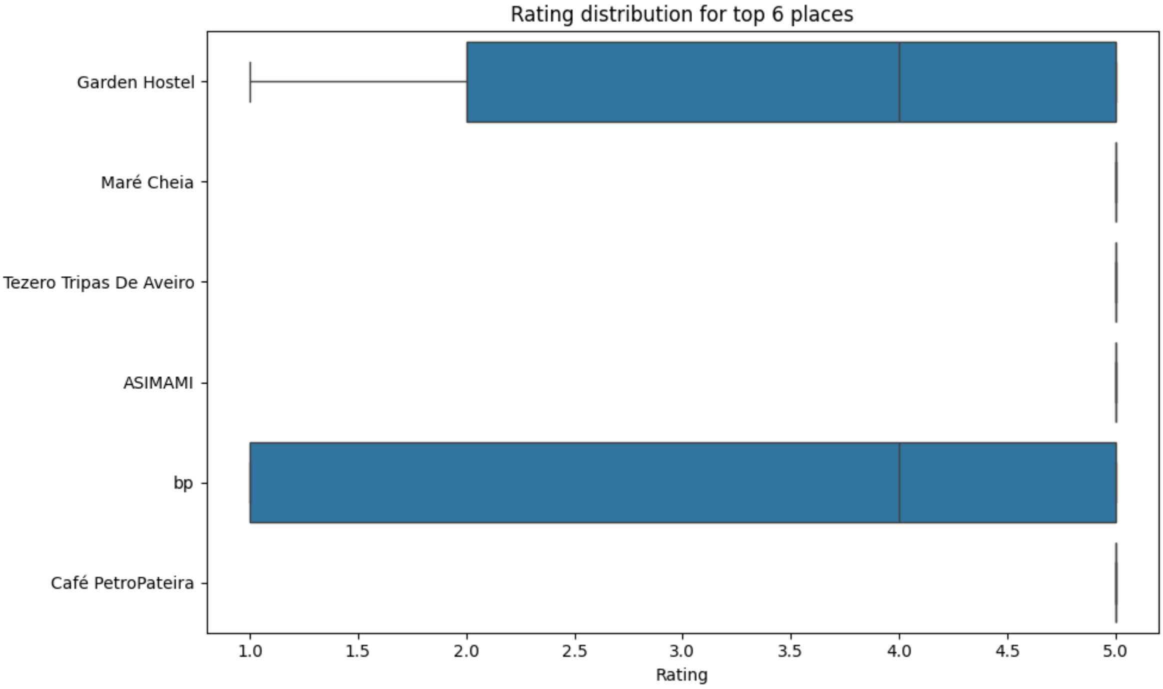
```
ts = df.groupby('year_month').size().reset_index(name='n_reviews')
ts['year_month'] = ts['year_month'].dt.to_timestamp()

plt.figure(figsize=(10,4))
sns.lineplot(data=ts, x='year_month', y='n_reviews', marker='o')
plt.title("Reviews per Month")
plt.xlabel("Month")
plt.ylabel("Number of Reviews")
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



11. Rating dispersion per place (boxplot / violin)

Show variability of ratings for a few places (choose top 6 by count).

In [24]:
```
top6 = df['place_name'].value_counts().nlargest(6).index.tolist()
plt.figure(figsize=(10,6))
sns.boxplot(data=df[df['place_name'].isin(top6)], x='rating', y='place_na
plt.title("Rating distribution for top 6 places")
plt.xlabel("Rating")
plt.ylabel("")
plt.tight_layout()
plt.show()
```

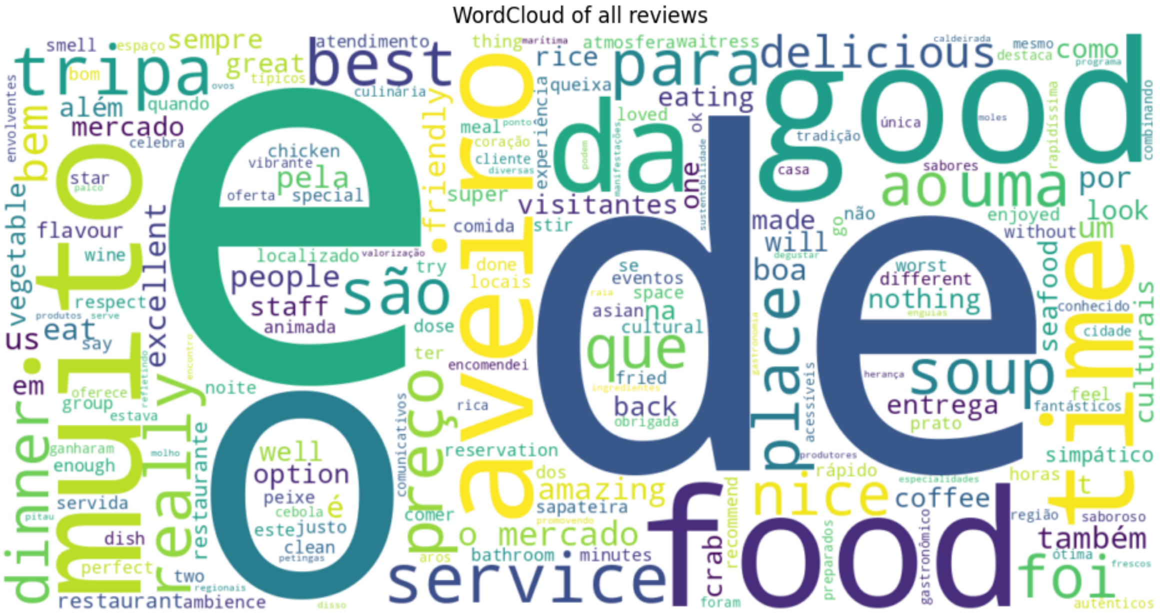


12. Word cloud — overall or per-place

Visualize most frequent words in reviews (withou cleaned text for now).

In [25]:
```
from wordcloud import WordCloud
import matplotlib.pyplot as plt
import re
```

```
def clean_text(s):
    s = re.sub(r'\\W+', ' ', str(s).lower())
    return s

text = " ".join(df['review_text'].dropna().map(clean_text).tolist())
wc = WordCloud(width=1200, height=600, background_color='white', max_word

plt.figure(figsize=(12,6))
plt.imshow(wc, interpolation='bilinear')
plt.axis('off')
plt.title("WordCloud of all reviews")
plt.show()
```


WordCloud of all reviews
de
e
o
good
food
aveiro
muito
tripa
best
da
para
delicious
time
service
really
place
soup
nice
preço
ao
uma
que
são
foi
dinner
friendly
excellent
visitantes
people
staff
option
well
amazing
o mercado
coffee
também
simpático
bathroom
minutes
crab
recommend
entrega
back
nothing
different
worst
boa
will
made
look
enjoyed
without
um
por
como
destaca
mesmo
eating
loved
rice
queixa
atmosfera
waitress
thing
atendimento
sempre
great
típicos
bom
smell
espaço
além
mercado
quando
bem
star
flavour
wine
vegetable
respect
eat
us
say
em
group
oferece
estava
enough
servida
dish
perfect
two
restaurant
ambience
restaurante
noite
animada
localizado
chicken
vibrante
oferta
pela
special
super
comida
stir
cliente
coração
meal
experiência
one
ok
tradição
única
casa
sabores
go
não
seafood
conhecido
cidade
culturais
feel
fantásticos
prato
rápido
horas
t
região
saboroso
ótima
frescos
autênticos
gastronómico
preparados
foram
sapateira
dos
comer
reservation
peixe
cebola
é
este
justo
clean
petingas
aros
rica
encomendei
dose
ter
done
try
locais
se
eventos
space
asian
na
cultural
fried
obrigada
acessíveis
comunicativos
envolventes
celebra
culinária
ovos
caldeirada
programa
moles
combinando
rapidíssima
herança
produtores
especialidades
valorização
sustentabilidade
manifestações
ganharam
molho
pitau
produtos
serve
regionais
disso
promovendo
diversas
ponto
marítima
palco
ingredientes
enguias
degustar