

EDA_netflix

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1 EDA Netflix

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[22]: # 0) Importaciones y configuración

```
try:
    get_ipython().run_line_magic("matplotlib", "inline") # asegura gráficos
    ↵inline
except Exception:
    pass
import matplotlib
import matplotlib.pyplot as plt
from IPython.display import display
from pathlib import Path
import numpy as np
import pandas as pd
import re, unicodedata, ast
from datetime import datetime

print("backend:", matplotlib.get_backend())

# Si quieres guardar PNGs de respaldo (sin mostrarlos para evitar duplicados)
MOSTRAR_PNG_RESPALDO = False
carpeta_plots = Path("/mnt/data/plots_eda4"); carpeta_plots.
    ↵mkdir(exist_ok=True, parents=True)

def mostrar_fig(fig, ruta_png=None):
    """Muestra una sola vez la figura. Si MOSTRAR_PNG_RESPALDO=True, guarda PNG
    (sin mostrar de nuevo)."""
    display(fig)
    if MOSTRAR_PNG_RESPALDO and ruta_png is not None:
        fig.savefig(ruta_png, bbox_inches="tight")
    plt.close(fig)

np.random.seed(42) # reproducibilidad
```

backend: module://matplotlib_inline.backend_inline

1.1 1) Carga de archivos (sin cambiar tus nombres)

Se cargan los CSV a las **mismas** variables que usas: `data_netflix`, `actores`, `mejores_peliculas`, `mejores_shows`. La lectura es tolerante a encoding y separador.

```
[23]: base_dir = Path(r"C:\Users\mario\Downloads\PRUEBA_BI BOOSTER\00_Datos")

rutas = {
    "data_netflix": base_dir / "data_netflix.csv",
    "actores": base_dir / "Actores.csv",
    "mejores_peliculas": base_dir / "mejores peliculas Netflix.csv",
    "mejores_shows": base_dir / "mejores Shows Netflix.csv",
}

def leer_csv_tolerante(path):
    """Lee CSV probando encoding y separadores comunes, sin romper si hay BOM/
    ↪acentos."""
    encodings = ["utf-8", "utf-8-sig", "latin-1"]
    sep = [",", ";", "\t"]
    ultimo_error = None
    for enc in encodings:
        for sep in sep:
            try:
                df = pd.read_csv(path, encoding=enc, sep=sep, engine="python")
                # heurística: evitar leer todo en una sola columna por mal
                ↪separador
                if df.shape[1] == 1 and sep != "\t":
                    continue
                return df
            except Exception as e:
                ultimo_error = e
                continue
    raise RuntimeError(f"No se pudo leer {path}: {ultimo_error}")

# Carga con nombres
data_netflix = leer_csv_tolerante(rutas["data_netflix"]) if
    ↪rutas["data_netflix"].exists() else None
actores = leer_csv_tolerante(rutas["actores"]) if rutas["actores"].exists()
    ↪else None
mejores_peliculas = leer_csv_tolerante(rutas["mejores_peliculas"]) if
    ↪rutas["mejores_peliculas"].exists() else None
mejores_shows = leer_csv_tolerante(rutas["mejores_shows"]) if
    ↪rutas["mejores_shows"].exists() else None

tablas = {k:v for k,v in {
    "data_netflix": data_netflix,
    "actores": actores,
```

```

    "mejores_peliculas": mejores_peliculas,
    "mejores_shows": mejores_shows,
}.items() if v is not None}

print("Tablas cargadas:", list(tablas.keys()))
for nombre, df in tablas.items():
    print(f"\n== {nombre.upper()} ==")
    print("shape:", df.shape)
    display(df.head(3))
    display(df.dtypes.to_frame("dtype").T)

assert "data.netflix" in tablas, "Falta data.netflix.csv en /mnt/data"

```

Tablas cargadas: ['data.netflix', 'actores', 'mejores_peliculas',
'mejores_shows']

== DATA_NETFLIX ==

shape: (5806, 12)

			id	title	type	release_year	\
0	ts300399	Five Came Back: The Reference Films		SHOW		1945	
1	tm84618			Taxi Driver	MOVIE	1976	
2	tm127384	Monty Python and the Holy Grail		MOVIE		1975	

	age_certification	runtime		genres	production_countries	\
0	TV-MA	48		['documentation']		['US']
1	R	113		['crime', 'drama']		['US']
2	PG	91		['comedy', 'fantasy']		['GB']

	seasons	imdb_id	imdb_score	imdb_votes
0	1.0	NaN	NaN	NaN
1	NaN	tt0075314	8.3	795222.0
2	NaN	tt0071853	8.2	530877.0

	id	title	type	release_year	age_certification	runtime	genres	\
--	----	-------	------	--------------	-------------------	---------	--------	---

	production_countries	seasons	imdb_id	imdb_score	imdb_votes
--	----------------------	---------	---------	------------	------------

== ACTORES ==

shape: (77213, 5)

	person_id	id	name	character	role
0	3748	tm84618	Robert De Niro	Travis Bickle	ACTOR
1	14658	tm84618	Jodie Foster	Iris Steensma	ACTOR
2	7064	tm84618	Albert Brooks	Tom	ACTOR

	person_id	id	name	character	role
--	-----------	----	------	-----------	------

```

dtype      int64  object  object     object  object

==== MEJORES_PELICULAS ====
shape: (387, 7)

          TITLE  RELEASE_YEAR  SCORE  \
0  David Attenborough: A Life on Our Planet        2020    9.0
1                      Inception        2010    8.8
2                      Forrest Gump        1994    8.8

  NUMBER_OF_VOTES  DURATION  MAIN_GENRE MAIN_PRODUCTION
0            31180       83  documentary           GB
1          2268288      148      scifi           GB
2          1994599      142      drama           US

          TITLE  RELEASE_YEAR  SCORE  NUMBER_OF_VOTES  DURATION  MAIN_GENRE  \
dtype  object        int64   float64        int64      int64      object

  MAIN_PRODUCTION
dtype      object

==== MEJORES_SHOWS ====
shape: (246, 8)

          TITLE  RELEASE_YEAR  SCORE  NUMBER_OF_VOTES  DURATION  \
0  Breaking Bad        2008    9.5      1727694       48
1  Avatar: The Last Airbender        2005    9.3      297336       24
2  Our Planet         2019    9.3      41386       50

  NUMBER_OF_SEASONS  MAIN_GENRE MAIN_PRODUCTION
0                  5      drama           US
1                  3      scifi           US
2                  1  documentary           GB

          TITLE  RELEASE_YEAR  SCORE  NUMBER_OF_VOTES  DURATION  \
dtype  object        int64   float64        int64      int64

  NUMBER_OF_SEASONS  MAIN_GENRE MAIN_PRODUCTION
dtype        int64      object      object

```

Comentarios del punto 1) - Lectura **tolerante** de los 4 CSV (encoding y separador) → evita fallas de carga y columnas “pegadas”. - Los objetos quedan con **tus mismos nombres** (`data.netflix`, `actores`, `mejores_peliculas`, `mejores_shows`), listo para trabajar sin refactors.

1.2 2) Utilidades

Funciones para normalizar títulos, crear vistas estandarizadas y medir calidad.

```
[24]: def norm_title(s):
    if pd.isna(s): return s
    s = unicodedata.normalize("NFKD", str(s)).encode("ascii","ignore").
    decode("ascii")
    s = re.sub(r"[^a-z0-9 ]+", " ", s.lower())
    s = re.sub(r"\s+", " ", s).strip()
    return s

def vista_estandar(df, mapping):
    """Crea una vista con nombres comunes SOLO para medir (no altera el df
    original)."""
    d = df.rename(columns={k:v for k,v in mapping.items() if k in df.columns}).
    copy()
    keep = [c for c in_
    ["title", "release_year", "imdb_score", "imdb_votes", "runtime", "seasons", "main_genre", "type", "]
    if c in d.columns]
    d = d[keep]
    if {"title", "release_year"}.issubset(d.columns):
        d["title_norm"] = d["title"].map(norm_title)
    # no convertimos tipos aquí;
    return d

def cobertura_llave(df):
    if not set(["title", "release_year"]).issubset(df.columns):
        return None
    total = len(df)
    validos = df["title"].notna() & df["title"].astype(str).str.strip().ne("")_
    & df["release_year"].notna()
    return {
        "filas": total,
        "con_title_y_year": int(validos.sum()),
        "pct_cobertura": round(validos.mean()*100, 2),
        "duplicados_por_llave": int(df[validos].
    duplicated(subset=["title", "release_year"]).sum())),
    }

def revisar_reglas(df, nombre):
    viol = {}
    if "imdb_score" in df.columns:
        v = df[~pd.to_numeric(df["imdb_score"], errors="coerce").between(0,10,_
    inclusive="both") & df["imdb_score"].notna()]
        viol["imdb_score_fuera_0_10"] = len(v)
    if "imdb_votes" in df.columns:
        vv = pd.to_numeric(df["imdb_votes"], errors="coerce")
        v = df[(vv < 0) & df["imdb_votes"].notna()]
        viol["imdb_votes_negativos"] = len(v)
```

```

if "runtime" in df.columns:
    rr = pd.to_numeric(df["runtime"], errors="coerce")
    v = df[~rr.between(1, 600, inclusive="both") & df["runtime"].notna()]
    viol["runtime_fuera_1_600"] = len(v)
if "seasons" in df.columns:
    ss = pd.to_numeric(df["seasons"], errors="coerce")
    v = df[(ss < 0) & df["seasons"].notna()]
    viol["seasons_negativas"] = len(v)
if "release_year" in df.columns:
    ry = pd.to_numeric(df["release_year"], errors="coerce")
    v = df[(ry < 1900) & df["release_year"].notna()]
    viol["release_year_menor_1900"] = len(v)
if "title" in df.columns:
    v = df[df["title"].astype(str).str.strip().eq("")]
    viol["title_vacio"] = len(v)
if nombre.lower().startswith("actor") or nombre=="df_actors" or
   nombre=="actores":
    for c in [x for x in ["name", "character", "role"] if x in df.columns]:
        blancos = df[c].astype(str).str.strip().eq("").sum()
        nulos = df[c].isna().sum()
        viol[f"{c}_blancos"] = int(blancos)
        viol[f"{c}_nulos"] = int(nulos)
return pd.Series(viol, name=nombre)

```

Comentarios del punto 2) - Se definen utilidades sin tocar los DataFrames: normalización de títulos (`title_norm`) y “vistas” para medir. - **Decisión de diseño:** toda transformación “fuerte” se reserva para el ETL; aquí solo medimos.

1.3 3) Vistas estandarizadas para medi

Sirven para correlacionar columnas con nombres distintos entre archivos (ej. `TITLE` → `title`).

```

[25]: vistas = {}
if "data.netflix" in tablas:
    vistas["data.netflix"] = vista_estandar(tablas["data.netflix"], {})
if "mejores_peliculas" in tablas:
    vistas["mejores_peliculas"] = vista_estandar(tablas["mejores_peliculas"], {
        "TITLE": "title", "RELEASE_YEAR": "release_year", "SCORE": "imdb_score",
        "NUMBER_OF_VOTES": "imdb_votes", "DURATION": "runtime", "MAIN_GENRE": "main_genre",
        "TYPE": "type", "IMDB_ID": "imdb_id"
    })
if "mejores_shows" in tablas:
    vistas["mejores_shows"] = vista_estandar(tablas["mejores_shows"], {
        "TITLE": "title", "RELEASE_YEAR": "release_year", "SCORE": "imdb_score",
        "NUMBER_OF_VOTES": "imdb_votes", "DURATION": "runtime", "NUMBER_OF_SEASONS": "seasons",
        "MAIN_GENRE": "main_genre", "TYPE": "type", "IMDB_ID": "imdb_id"
    })

```

```
print("Vistas disponibles:", list(vistas.keys()))
```

Vistas disponibles: ['data.netflix', 'mejores_peliculas', 'mejores_shows']

Comentarios del punto 3) - Las **vistas estandarizadas** alinean columnas heterogéneas (TITLE→title, etc.) para poder comparar bases. - title_norm (minúsculas, sin acentos/ruido) incrementa la **chance de match** en cruces entre archivos.

1.4 4) Diagnóstico base: duplicados exactos, nulos, reglas y cobertura de llave

```
[26]: # Duplicados exactos (todas las columnas)
for nombre, df in tablas.items():
    dups = df[df.duplicated(keep=False)]
    print(f"\n==== {nombre.upper()} - duplicados exactos === filas:", len(dups))
    display(dups.head(10))

# Nulos por columna (Top 20)
for nombre, df in tablas.items():
    print(f"\n==== {nombre.upper()} - nulos por columna (Top 20) ===")
    pct = (df.isna().mean().sort_values(ascending=False)*100).round(2).
        rename("pct_nulos")
    display(pct.head(20).to_frame())

# Reglas de negocio
res = []
for nombre, df in tablas.items():
    res.append(revisar_reglas(df, nombre))
resumen_reglas = pd.concat(res, axis=1).fillna(0).astype(int).T if res else pd.
    DataFrame()
print("\n==== Resumen reglas de negocio (violaciones) ===")
display(resumen_reglas)

# Cobertura de llave title+release_year
for nombre, df in vistas.items():
    info = cobertura_llave(df)
    if info:
        print(f"\n==== {nombre.upper()} - cobertura llave title+release_year_"
        "====")
        for k,v in info.items():
            print(f"{k}: {v}")
```

==== DATA_NETFLIX - duplicados exactos === filas: 0

Empty DataFrame

Columns: [id, title, type, release_year, age_certification, runtime, genres, ↴ production_countries, seasons, imdb_id, imdb_score, imdb_votes]

Index: []

```

==== ACTORES - duplicados exactos === filas: 0

Empty DataFrame
Columns: [person_id, id, name, character, role]
Index: []

==== MEJORES_PELICULAS - duplicados exactos === filas: 0

Empty DataFrame
Columns: [TITLE, RELEASE_YEAR, SCORE, NUMBER_OF_VOTES, DURATION, MAIN_GENRE, MAIN_PRODUCTION]
Index: []

==== MEJORES_SHOWS - duplicados exactos === filas: 0

Empty DataFrame
Columns: [TITLE, RELEASE_YEAR, SCORE, NUMBER_OF_VOTES, DURATION, NUMBER_OF_SEASONS, MAIN_GENRE, MAIN_PRODUCTION]
Index: []

==== DATA_NETFLIX - nulos por columna (Top 20) ===

          pct_nulos
seasons           64.74
age_certification    44.95
imdb_votes            9.28
imdb_score             9.01
imdb_id                7.65
title                  0.02
id                      0.00
type                      0.00
release_year              0.00
runtime                  0.00
genres                  0.00
production_countries      0.00

==== ACTORES - nulos por columna (Top 20) ===

          pct_nulos
character        12.47
person_id          0.00
id                  0.00
name                  0.00
role                  0.00

==== MEJORES_PELICULAS - nulos por columna (Top 20) ===

```

	pct_nulos
TITLE	0.0
RELEASE_YEAR	0.0
SCORE	0.0
NUMBER_OF_VOTES	0.0
DURATION	0.0
MAIN_GENRE	0.0
MAIN_PRODUCTION	0.0

==== MEJORES_SHOWS - nulos por columna (Top 20) ===

	pct_nulos
TITLE	0.0
RELEASE_YEAR	0.0
SCORE	0.0
NUMBER_OF_VOTES	0.0
DURATION	0.0
NUMBER_OF_SEASONS	0.0
MAIN_GENRE	0.0
MAIN_PRODUCTION	0.0

==== Resumen reglas de negocio (violaciones) ===

	imdb_score_fuera_0_10	imdb_votes_negativos	\
data.netflix	0	0	
actores	0	0	
mejores_peliculas	0	0	
mejores_shows	0	0	

	runtime_fuera_1_600	seasons_negativas	\
data.netflix	24	0	
actores	0	0	
mejores_peliculas	0	0	
mejores_shows	0	0	

	release_year_menor_1900	title_vacio	name_blanacos	\
data.netflix	0	0	0	
actores	0	0	0	
mejores_peliculas	0	0	0	
mejores_shows	0	0	0	

	name_nulos	character_blanacos	character_nulos	\
data.netflix	0	0	0	
actores	0	0	9627	
mejores_peliculas	0	0	0	
mejores_shows	0	0	0	

	role_blanacos	role_nulos
--	---------------	------------

```

data.netflix          0          0
actores              0          0
mejores_películas   0          0
mejores_shows        0          0

==== DATA_NETFLIX - cobertura llave title+release_year ====
filas: 5806
con_title_y_year: 5805
pct_cobertura: 99.98
duplicados_por_llave: 4

==== MEJORES_PELÍCULAS - cobertura llave title+release_year ====
filas: 387
con_title_y_year: 387
pct_cobertura: 100.0
duplicados_por_llave: 0

==== MEJORES_SHOWS - cobertura llave title+release_year ====
filas: 246
con_title_y_year: 246
pct_cobertura: 100.0
duplicados_por_llave: 0

```

Comentarios del punto 4) - data.netflix **5,806** filas; **0** duplicados exactos → calidad estructural buena. - Faltantes relevantes: **imdb_score 9.01%**, **imdb_votes 9.28%**, **age_certification 44.95%**, **imdb_id 7.65%**; runtime completo.

1.5 5) Gráficas básicas (crudo)

Histogramas de métricas, barras de categóricas y conteo por año.

```
[27]: def serie_numerica(df, c):
    return pd.to_numeric(df[c], errors="coerce") if c in df.columns else pd.Series(dtype=float)

metricas = ["imdb_score", "imdb_votes", "runtime", "seasons"]
for nombre, df in vistas.items():
    cols = [c for c in metricas if c in df.columns]
    for c in cols:
        s = serie_numerica(df, c).dropna()
        if s.empty: continue
        fig, ax = plt.subplots(); ax.hist(s, bins=30)
        ax.set_title(f"{nombre} - distribución {c}"); ax.set_xlabel(c)
        mostrar_fig(fig, carpeta_plots / f"{nombre}_{c}_hist.png")

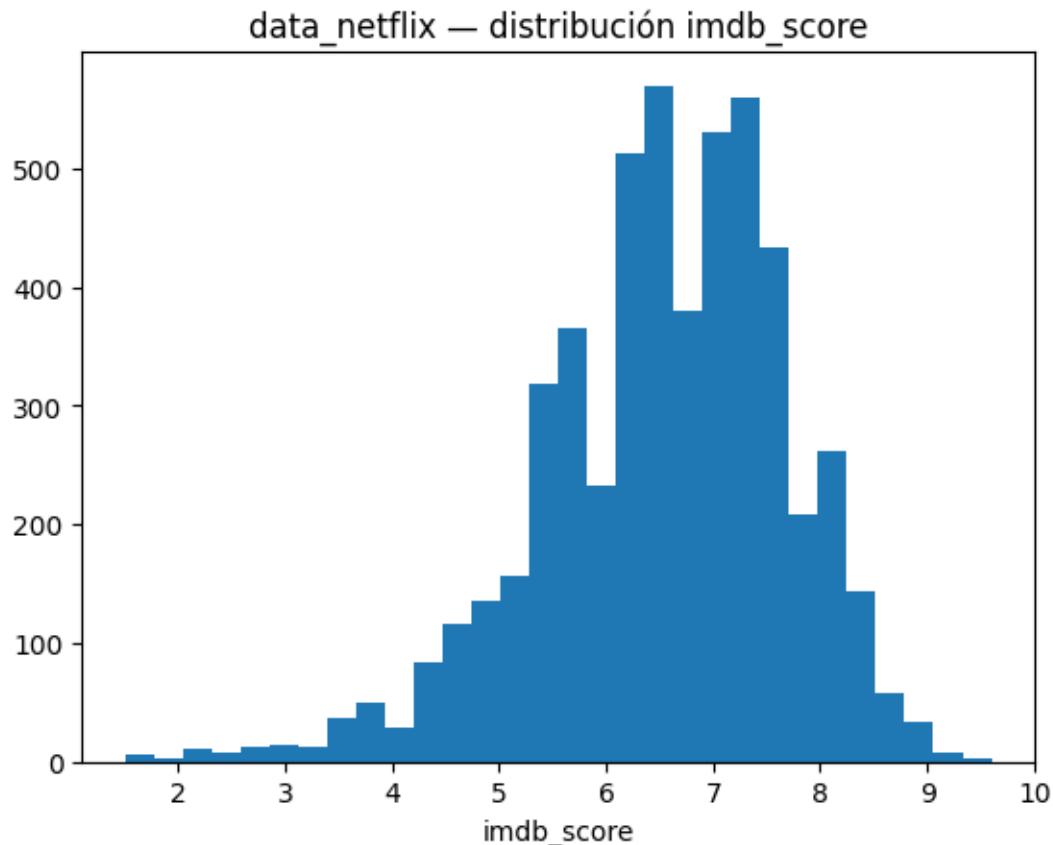
categoricas = ["main_genre", "production_countries", "age_certification", "type"]
for nombre, df in vistas.items():
    for c in [x for x in categoricas if x in df.columns]:
```

```

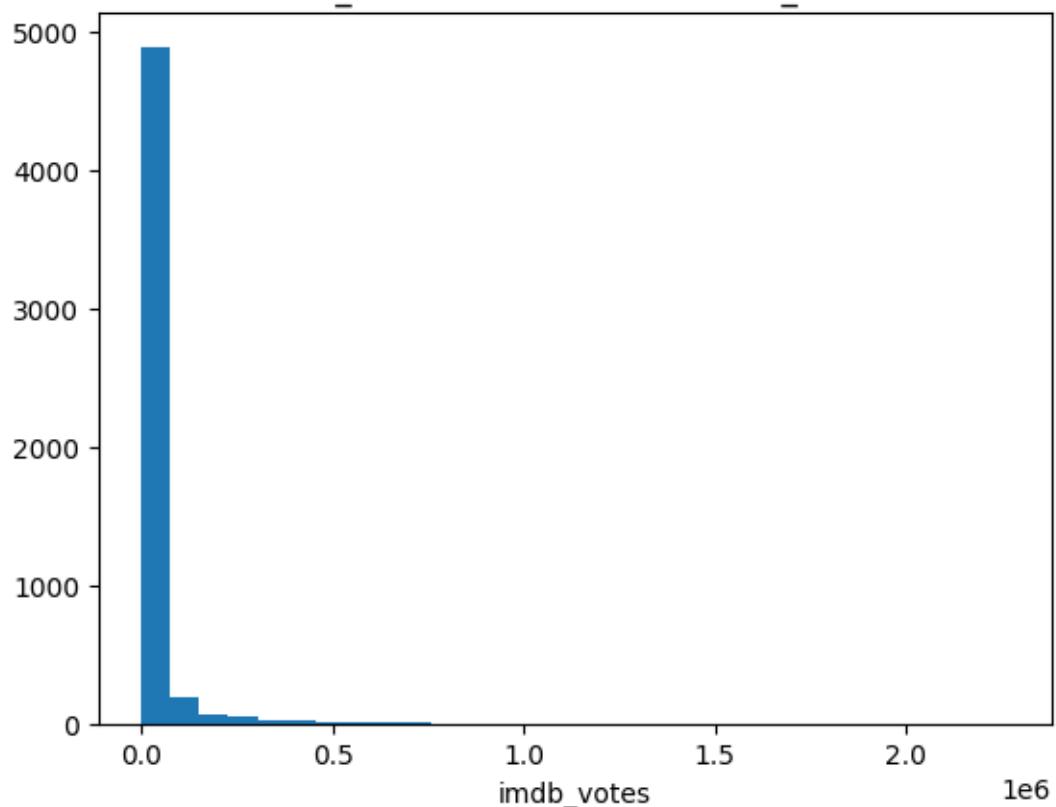
conteo = df[c].fillna("desconocido").astype(str).str.strip()
conteo = conteo[conteo.ne("")].value_counts().head(12)
if conteo.empty: continue
fig, ax = plt.subplots(); conteo.plot(kind="bar", ax=ax, ▾
↪title=f"{nombre} - top {c}")
plt.xticks(rotation=45, ha="right")
mostrar_fig(fig, carpeta_plots / f"{nombre}_top_{c}.png")

for nombre, df in vistas.items():
    if "release_year" not in df.columns: continue
    conteo = pd.to_numeric(df["release_year"], errors="coerce").dropna().\
↪astype(int).value_counts().sort_index()
    if conteo.empty: continue
    fig, ax = plt.subplots(); conteo.plot(kind="bar", ax=ax, title=f"{nombre} - ▾
↪conteo por release_year")
    plt.xticks(rotation=45, ha="right")
    mostrar_fig(fig, carpeta_plots / f"{nombre}_por_release_year.png")

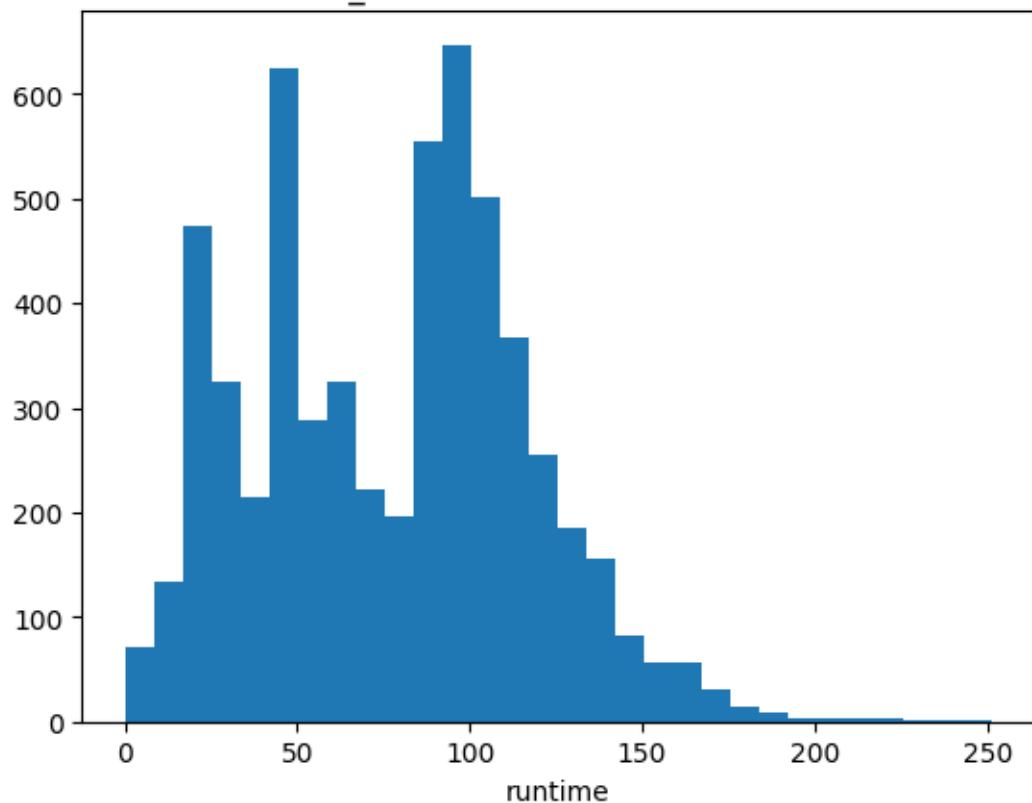
```



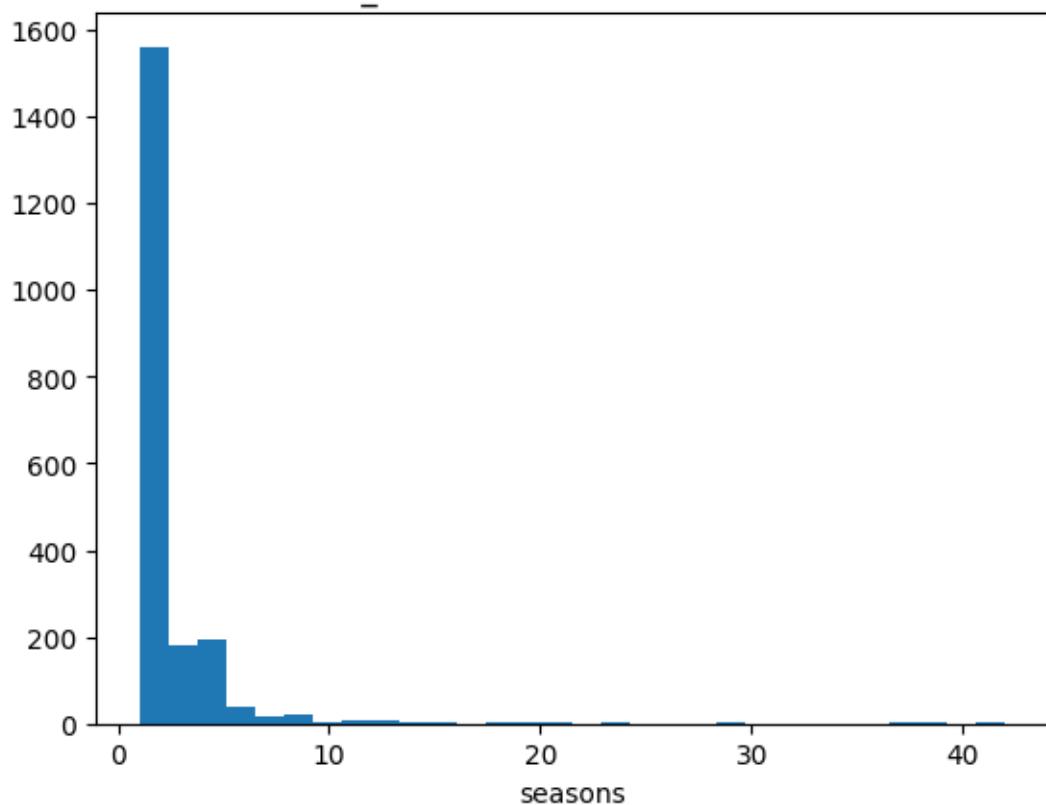
data.netflix — distribución imdb_votes



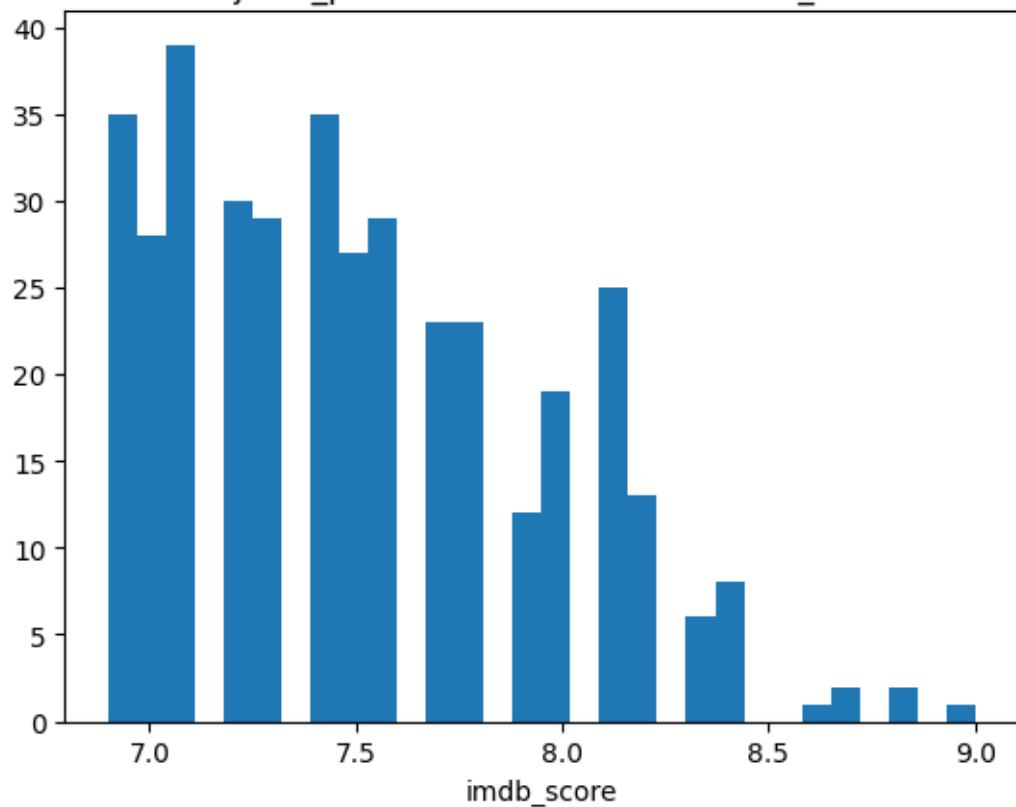
data_netflix — distribución runtime



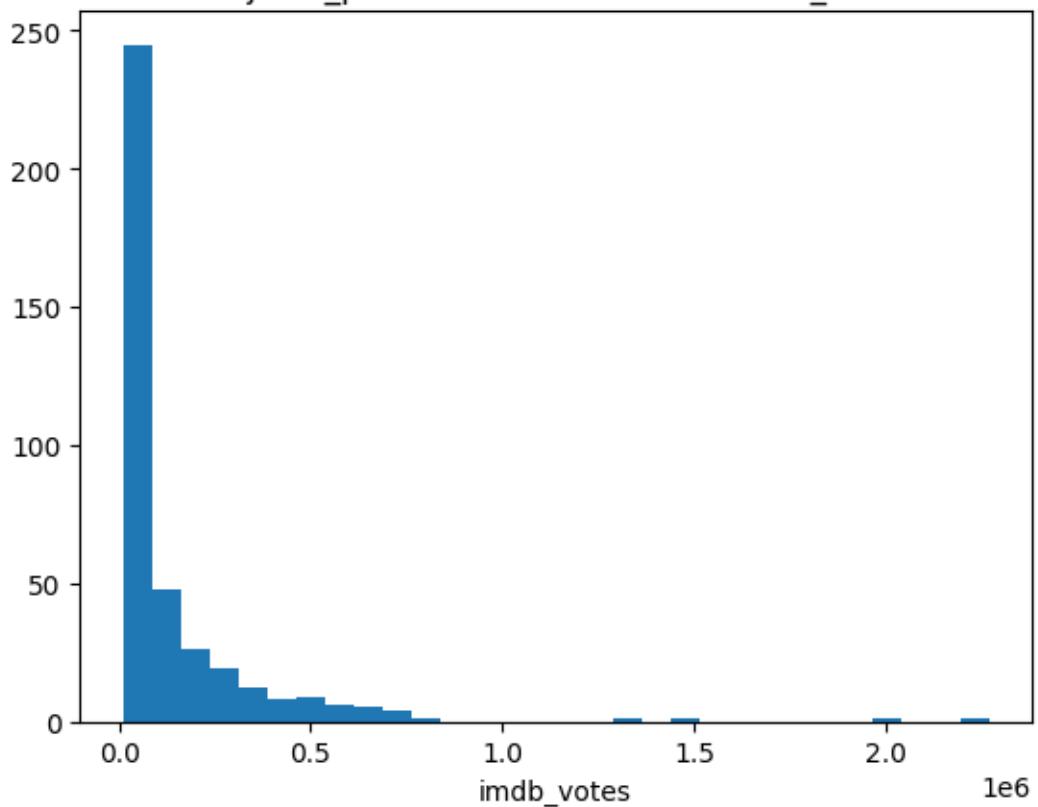
data_netflix — distribución seasons



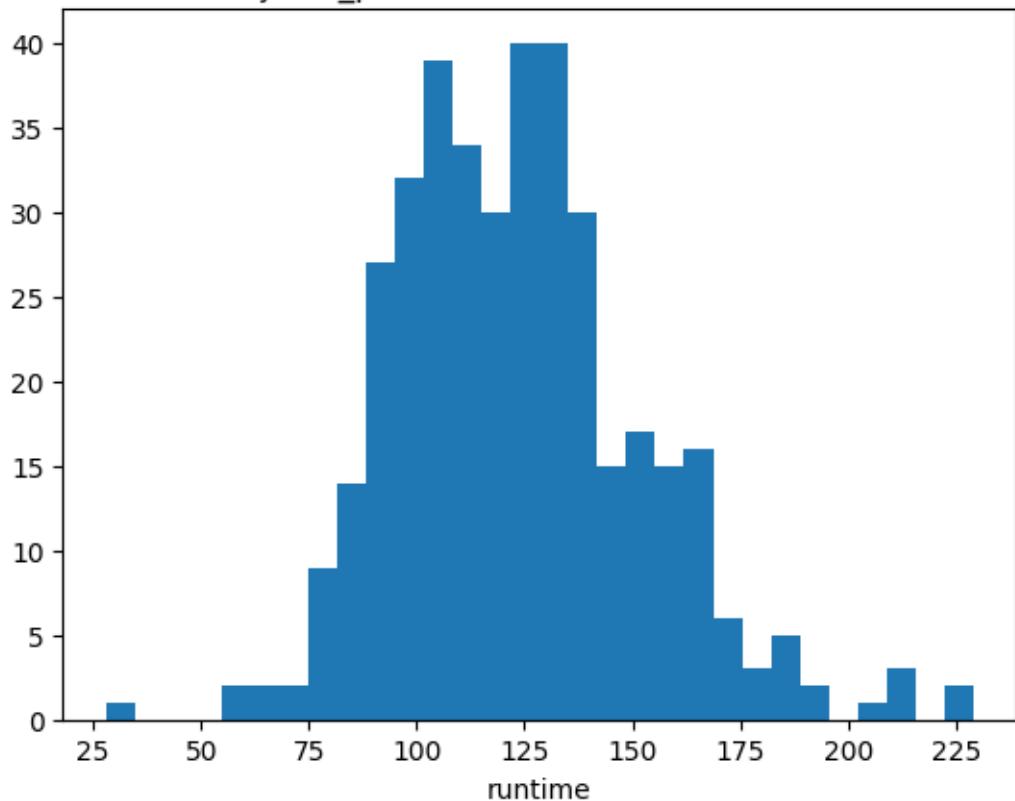
mejores_peliculas — distribución imdb_score



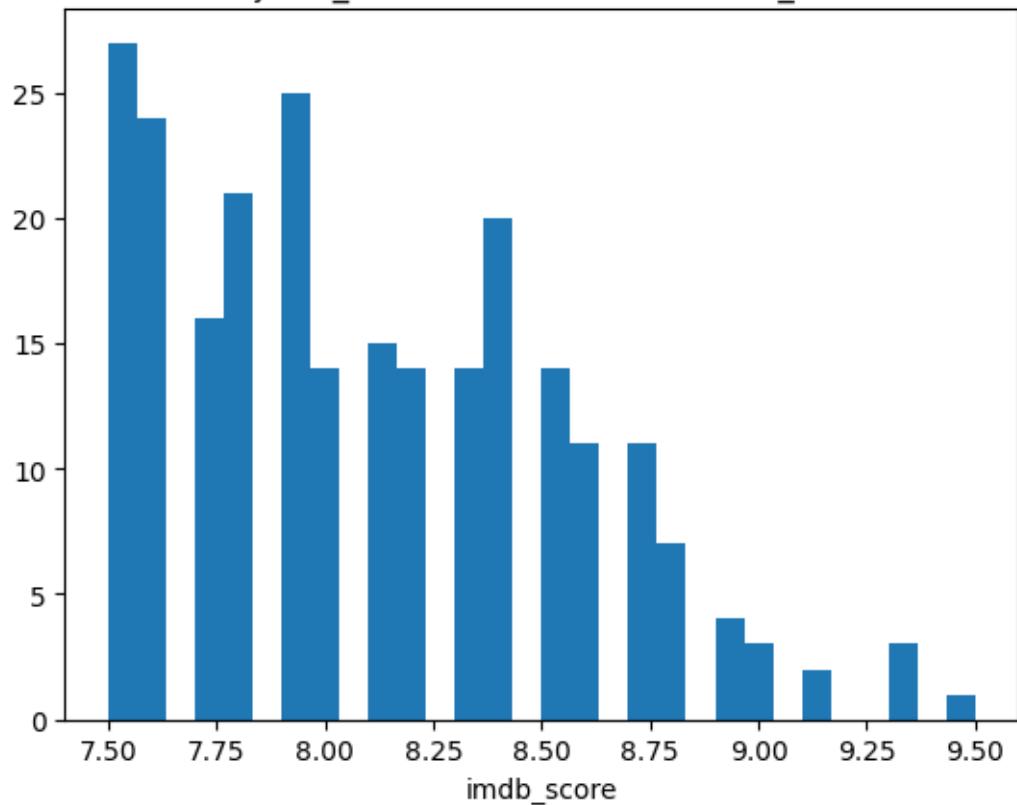
mejores_peliculas — distribución imdb_votes



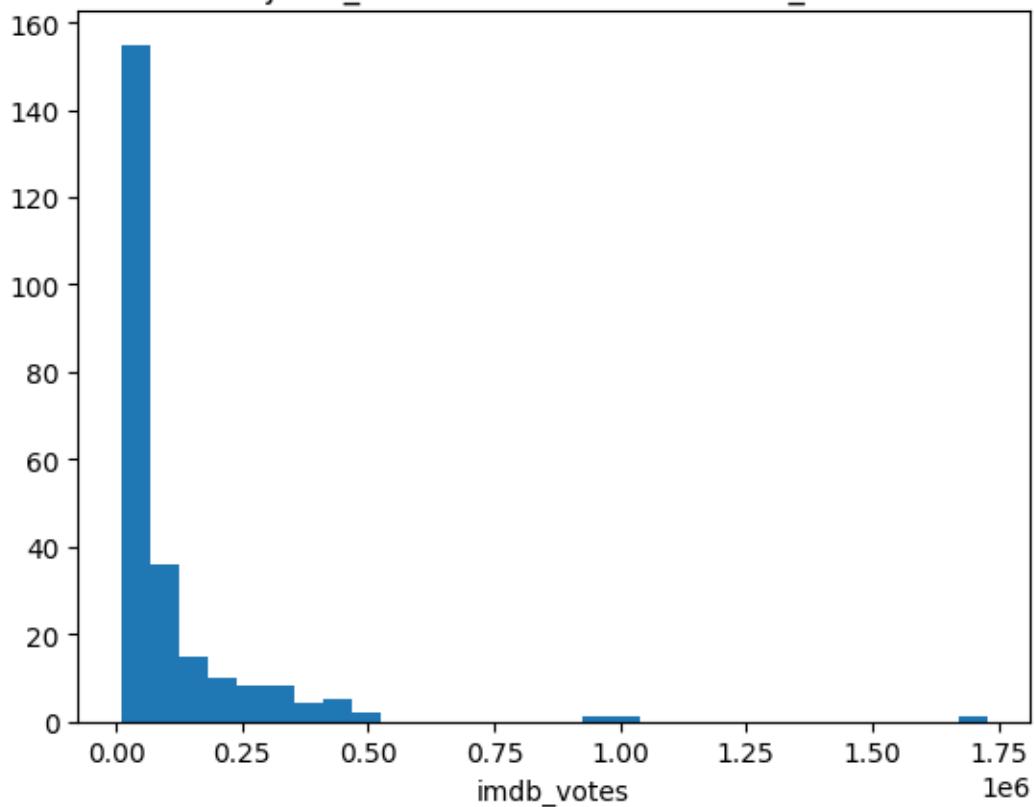
mejores_peliculas — distribución runtime



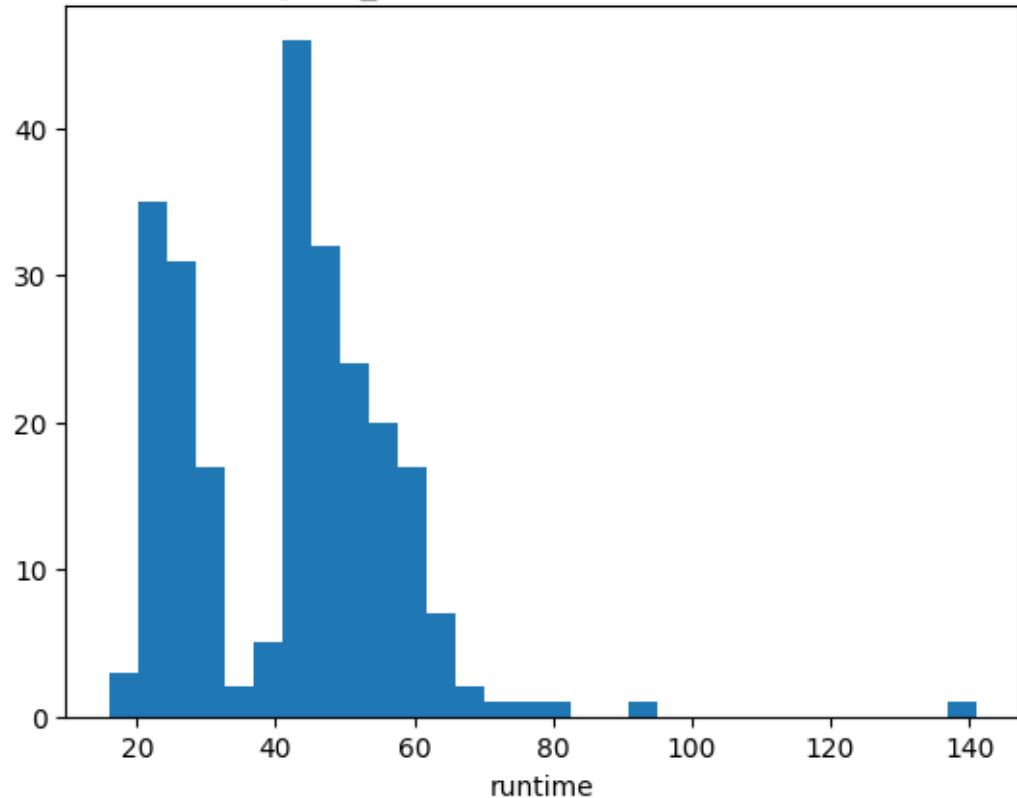
mejores_shows — distribución imdb_score



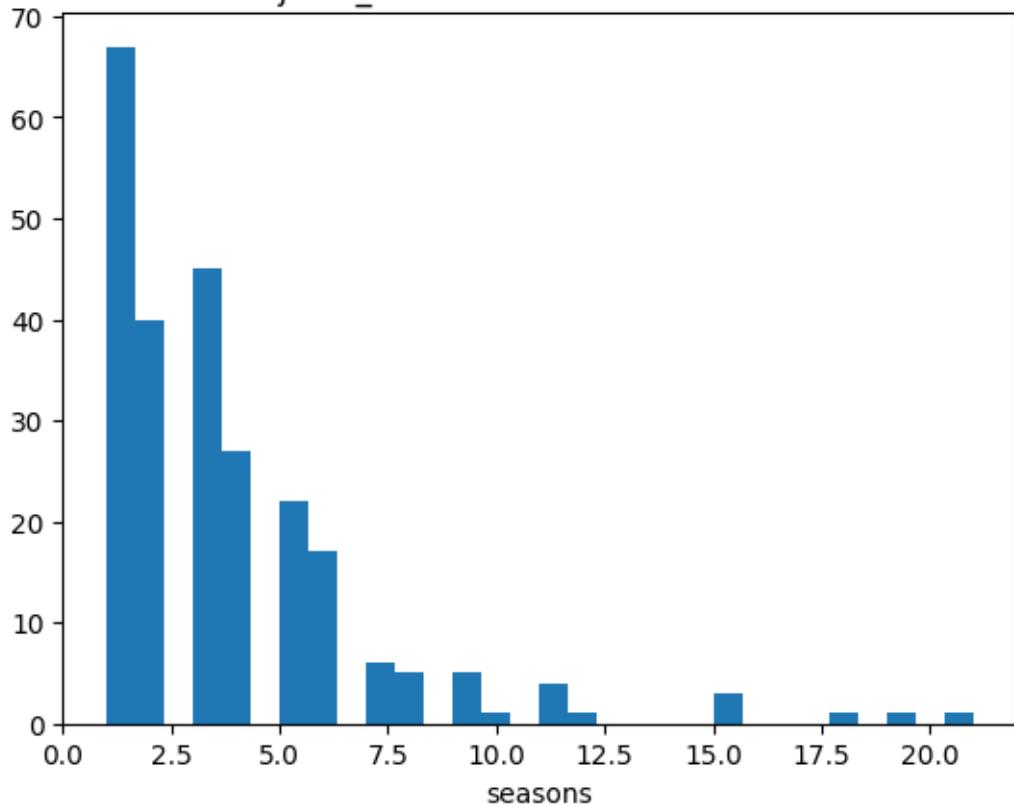
mejores_shows — distribución imdb_votes



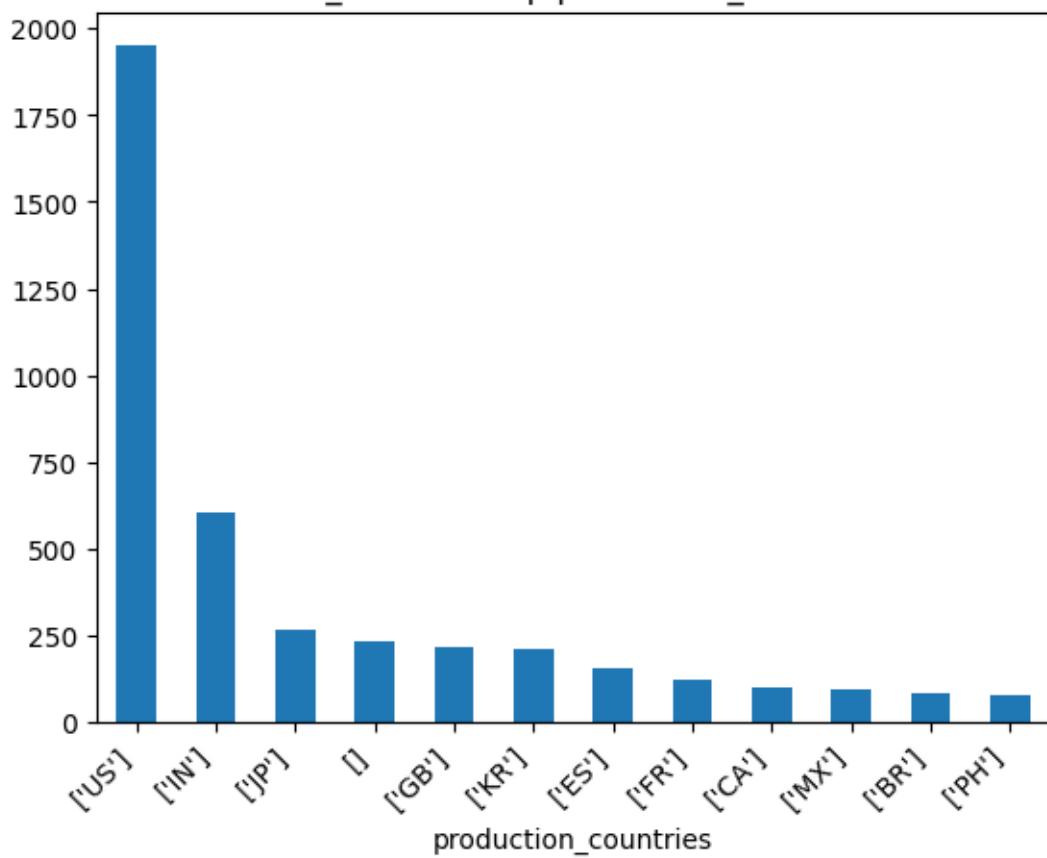
mejores_shows — distribución runtime



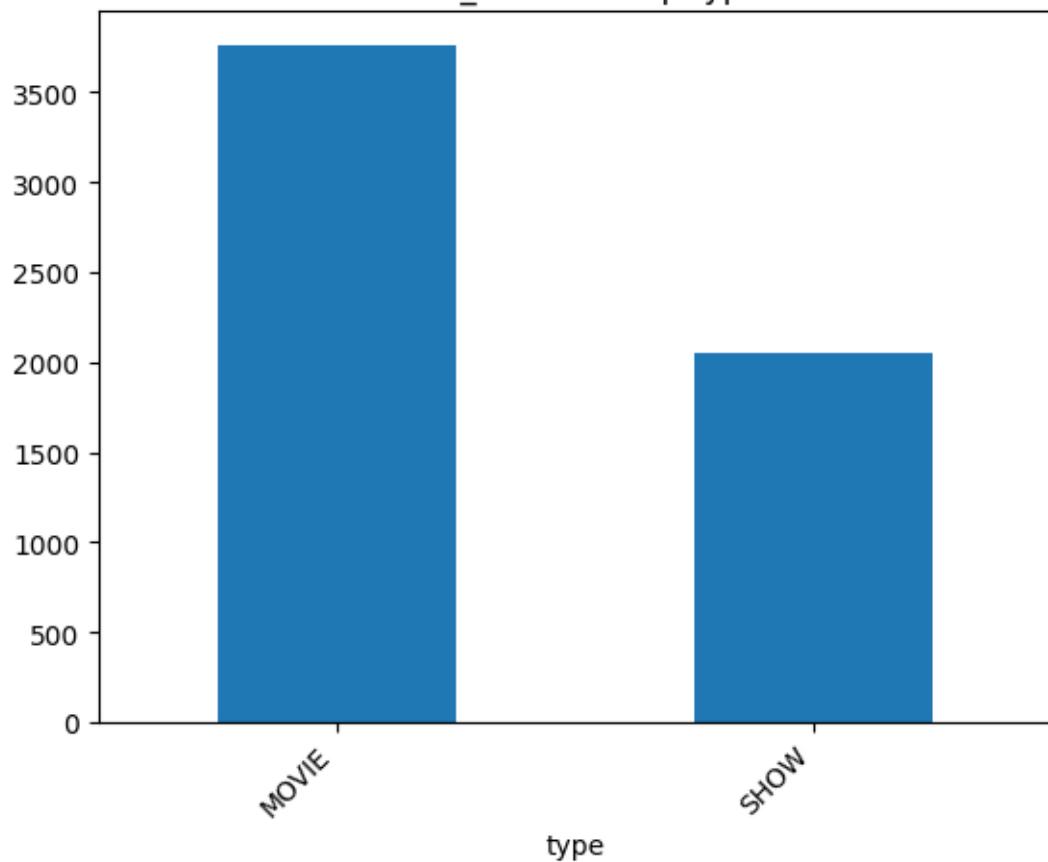
mejores_shows — distribución seasons



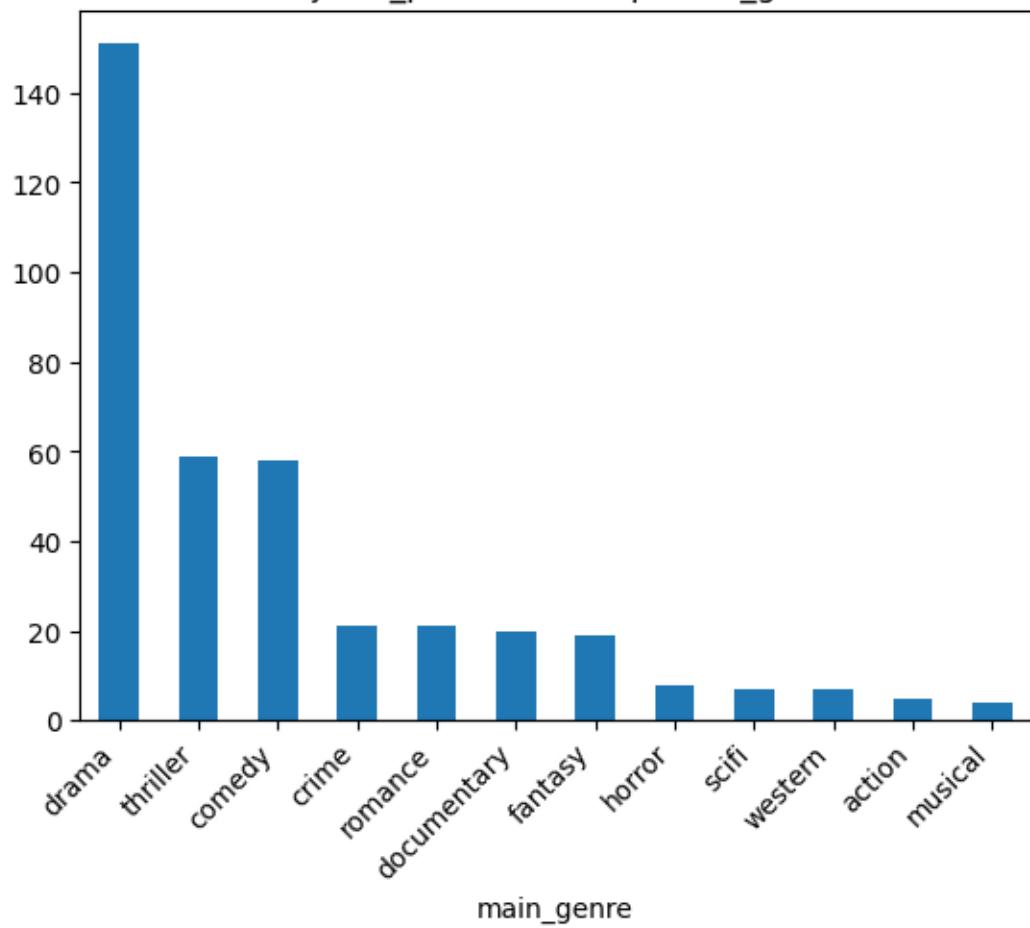
data.netflix — top production_countries



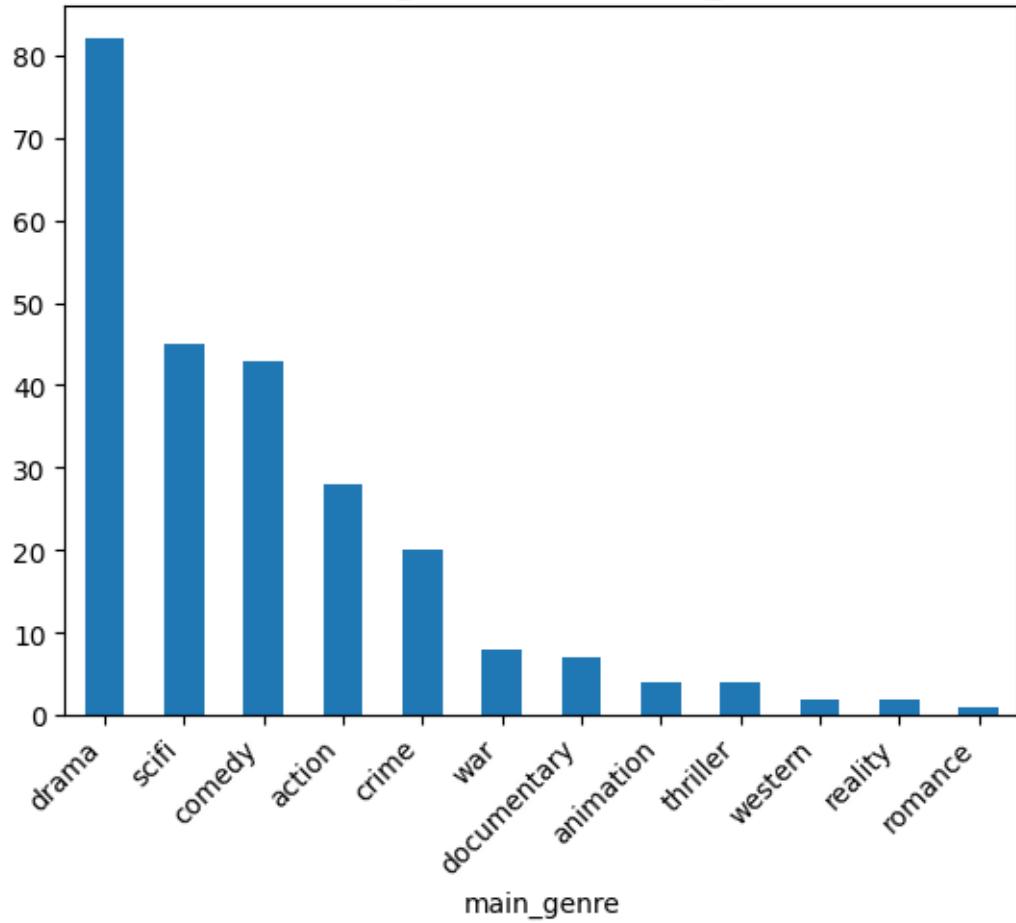
data_netflix — top type



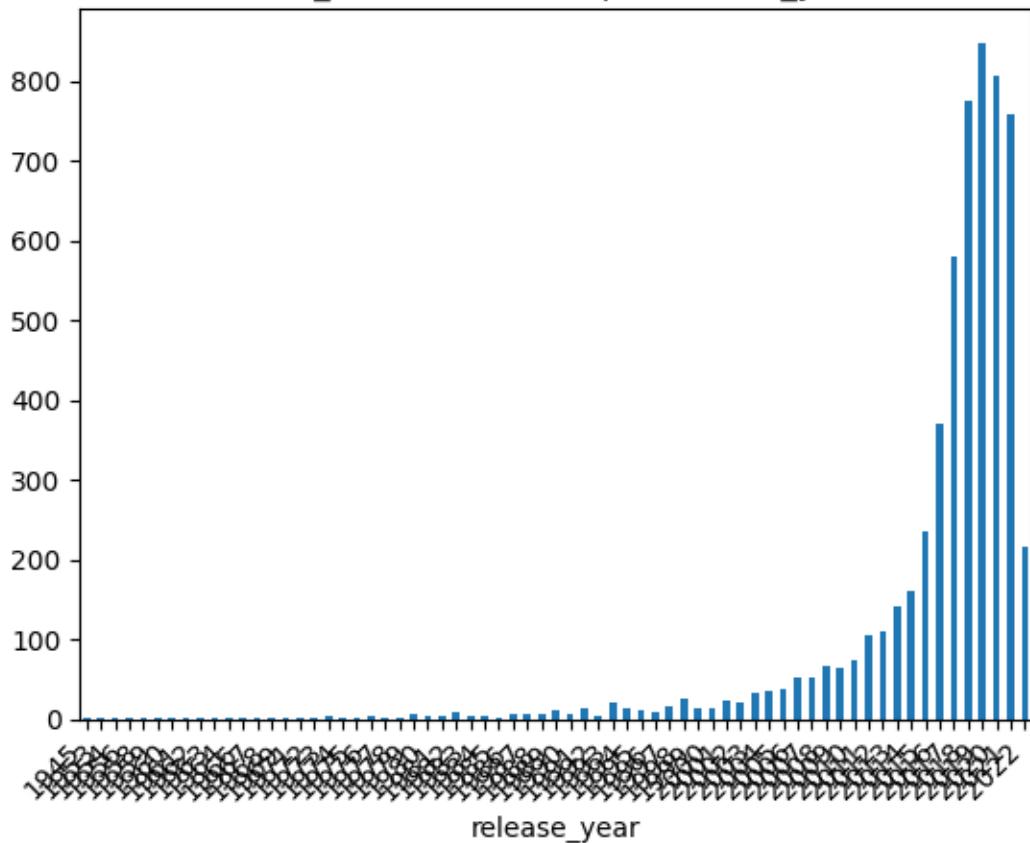
mejores_peliculas — top main_genre

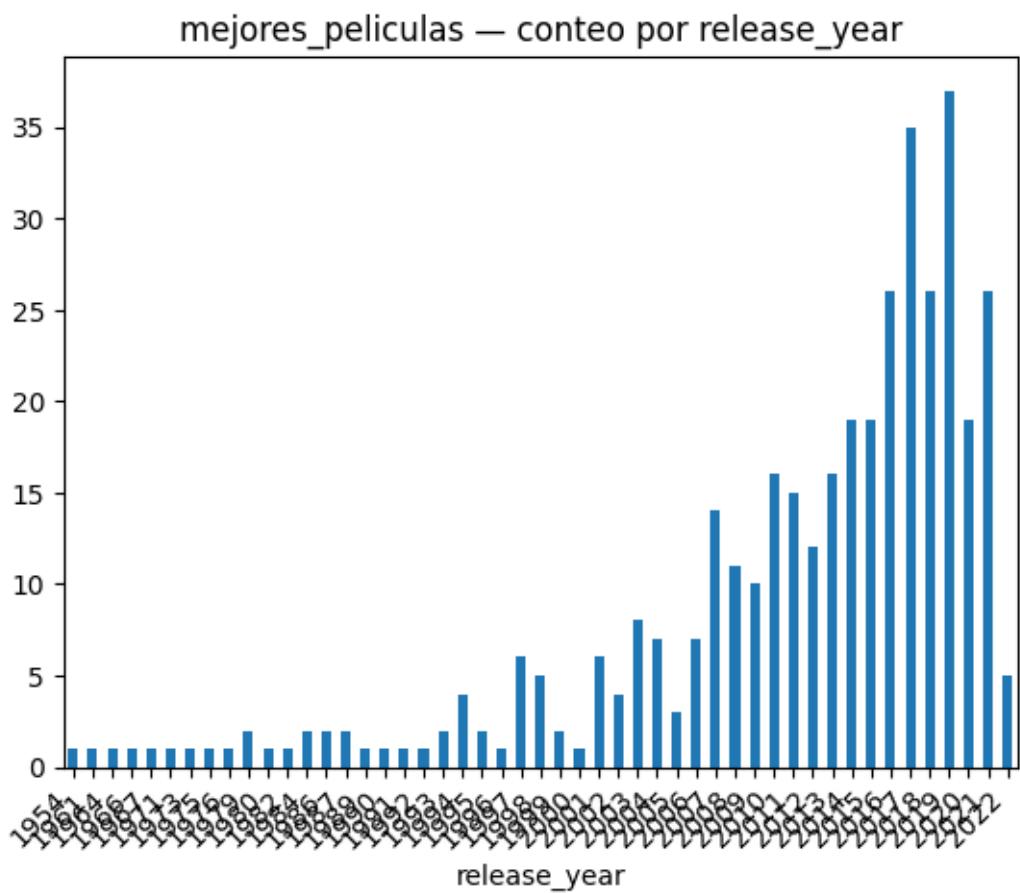


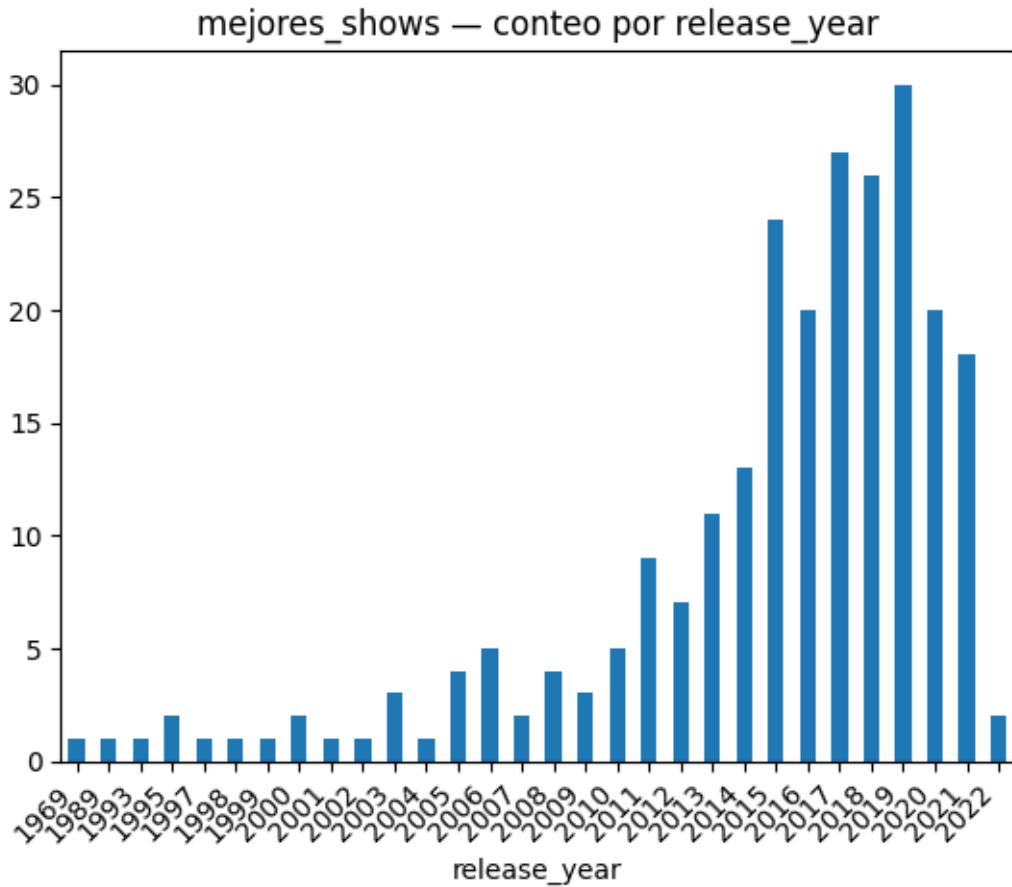
mejores_shows — top main_genre



data.netflix — conteo por release_year







Comentarios del punto 5) - Histogramas muestran **imdb_score centrado en 6–7** con cola a la derecha; **imdb_votes cola pesada** (pocos muy populares). - Barras por categóricas revelan **alta concentración** en pocos géneros/países y **larga cola** de categorías raras (recomendable Top-N).

1.6 6) Correlación y estratificados

Heatmap numérico y histogramas por type / main_genre (Top 8).

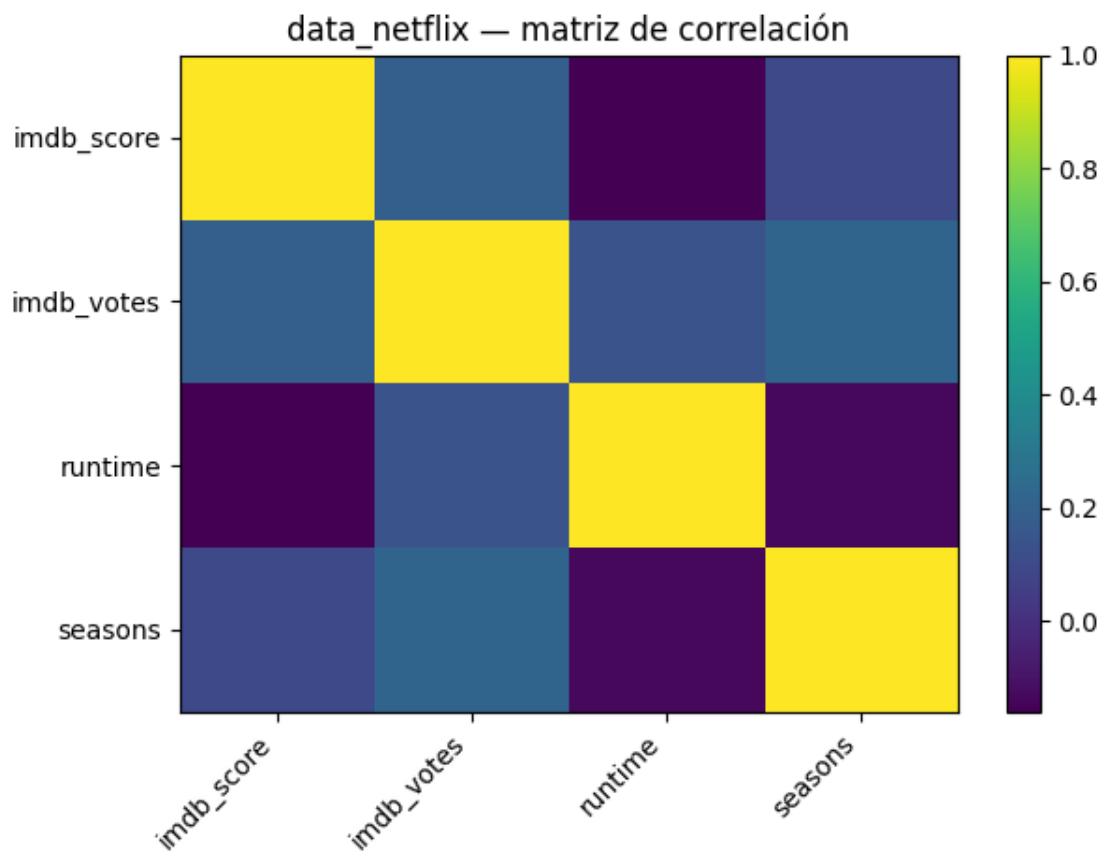
```
[28]: for nombre, df in vistas.items():
    cols = [c for c in ["imdb_score", "imdb_votes", "runtime", "seasons"] if c in df.columns]
    if len(cols) >= 2:
        m = df[cols].apply(pd.to_numeric, errors="coerce").corr()
        fig, ax = plt.subplots(); im = ax.imshow(m.values, aspect="auto")
        ax.set_xticks(range(len(cols))); ax.set_xticklabels(cols, rotation=45, ha="right")
        ax.set_yticks(range(len(cols))); ax.set_yticklabels(cols)
        ax.set_title(f"{nombre} - matriz de correlación"); fig.colorbar(im, ax=ax)
```

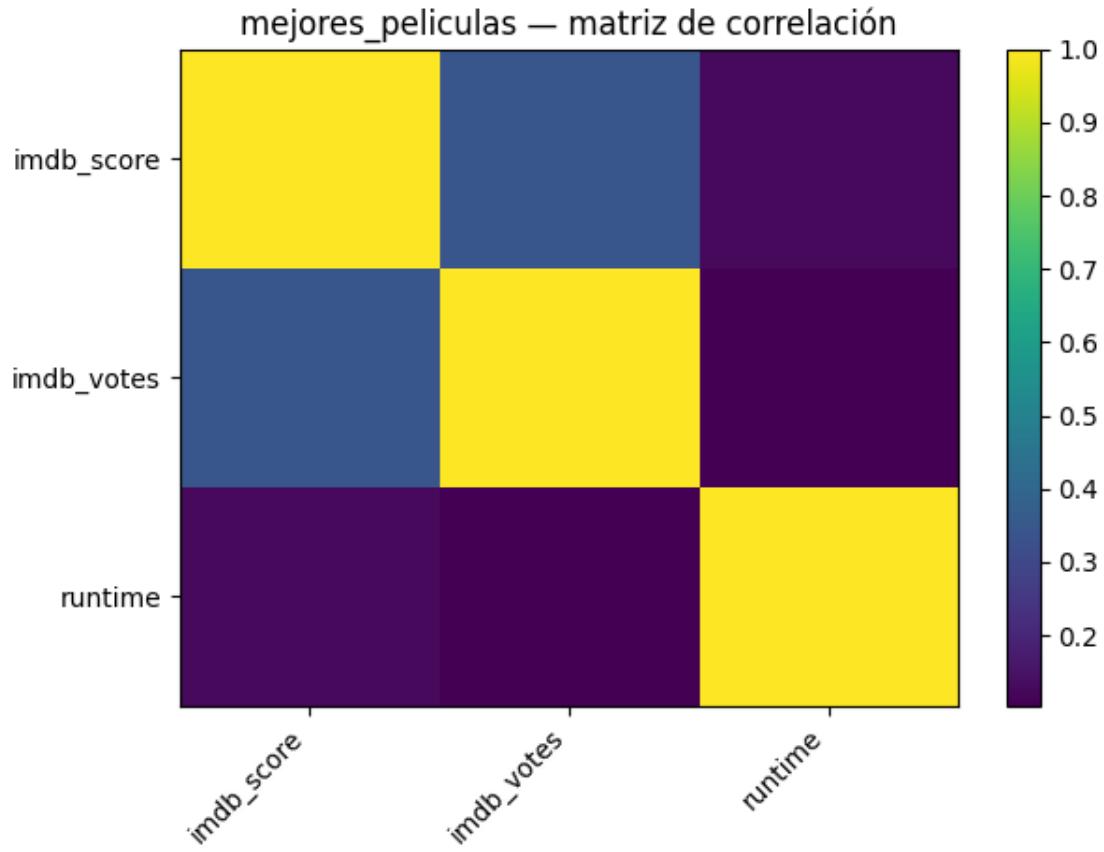
```

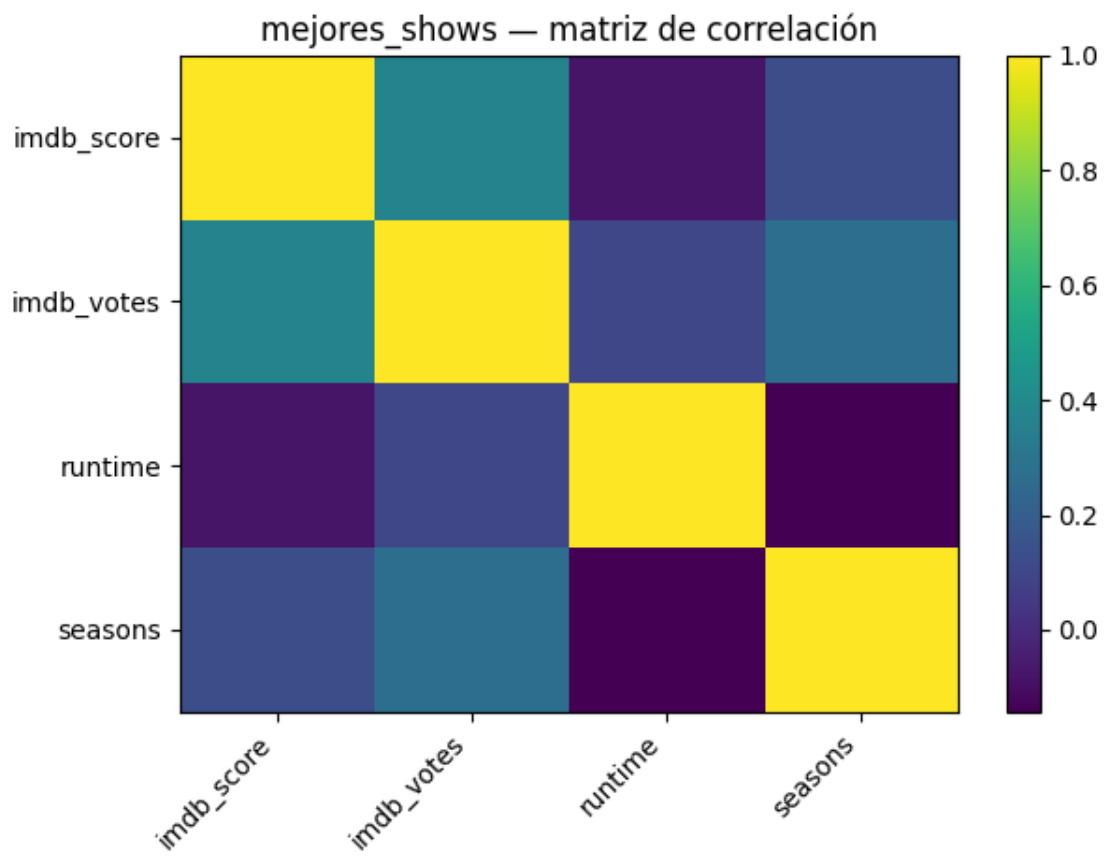
plt.tight_layout(); mostrar_fig(fig, carpeta_plots /_
↪f"{nombre}_correlacion.png")

metricas_strata = ["imdb_score", "imdb_votes", "runtime"]
for nombre, df in vistas.items():
    if "type" in df.columns:
        for c in [m for m in metricas_strata if m in df.columns]:
            for t, g in df.groupby("type", dropna=False):
                s = pd.to_numeric(g[c], errors="coerce").dropna()
                if s.empty: continue
                fig, ax = plt.subplots(); ax.hist(s, bins=30)
                ax.set_title(f"{nombre} - {c} (type={t})"); ax.set_xlabel(c)
                mostrar_fig(fig, carpeta_plots / f"{nombre}_{c}_type_{t}.png")
    if "main_genre" in df.columns:
        top_gen = df["main_genre"].fillna("desconocido").value_counts().head(8).
↪index.tolist()
        dft = df[df["main_genre"].isin(top_gen)].copy()
        for c in [m for m in metricas_strata if m in dft.columns]:
            for gen, g in dft.groupby("main_genre", dropna=False):
                s = pd.to_numeric(g[c], errors="coerce").dropna()
                if s.empty: continue
                fig, ax = plt.subplots(); ax.hist(s, bins=30)
                ax.set_title(f"{nombre} - {c} (main_genre={gen})"); ax.
↪set_xlabel(c)
                mostrar_fig(fig, carpeta_plots / f"{nombre}_{c}_genre_{gen}.
↪png")

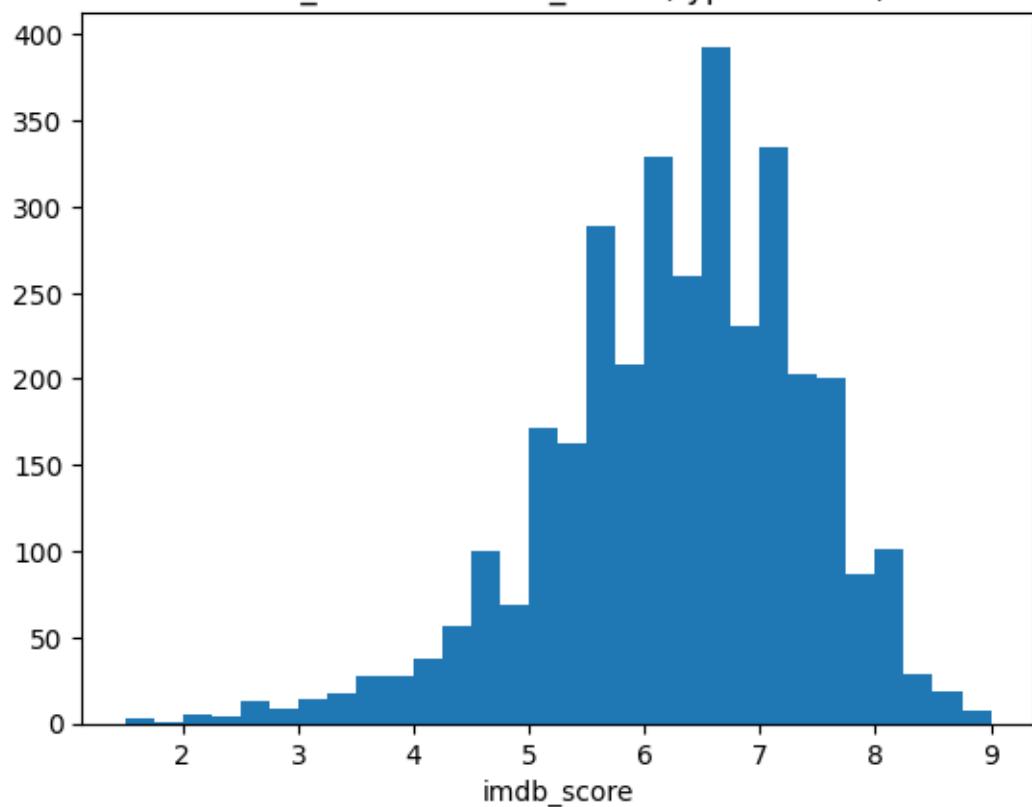
```

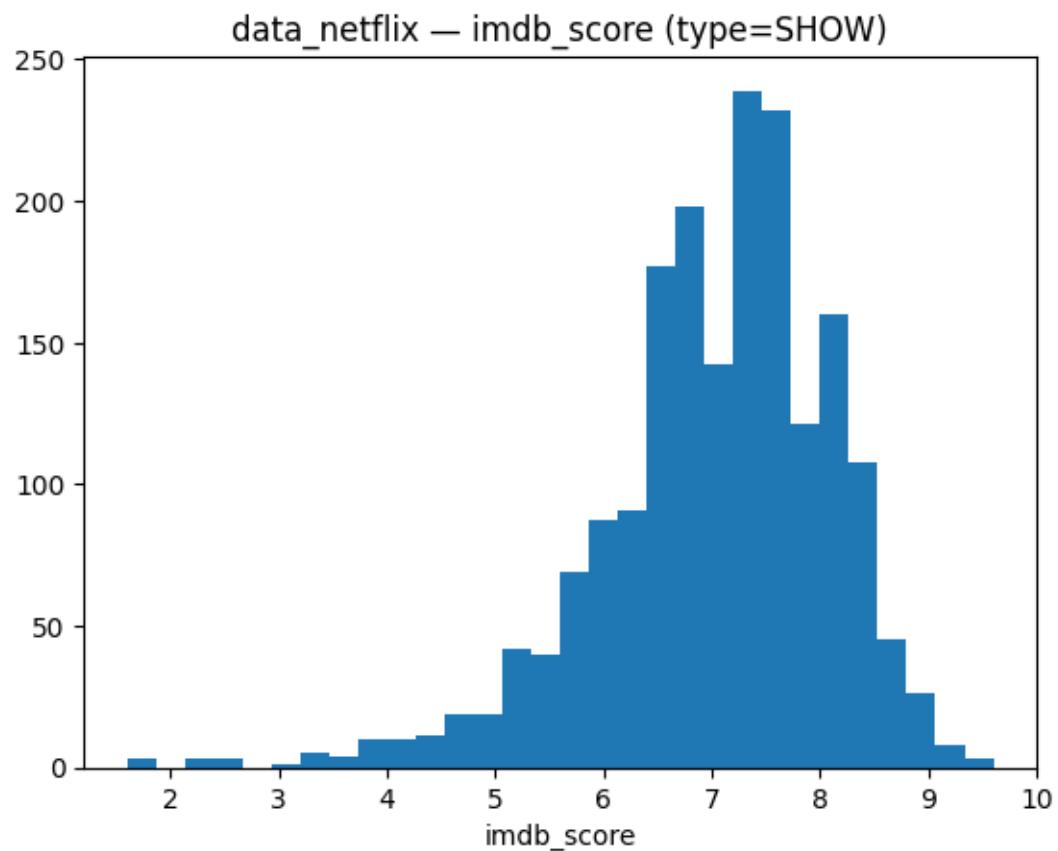




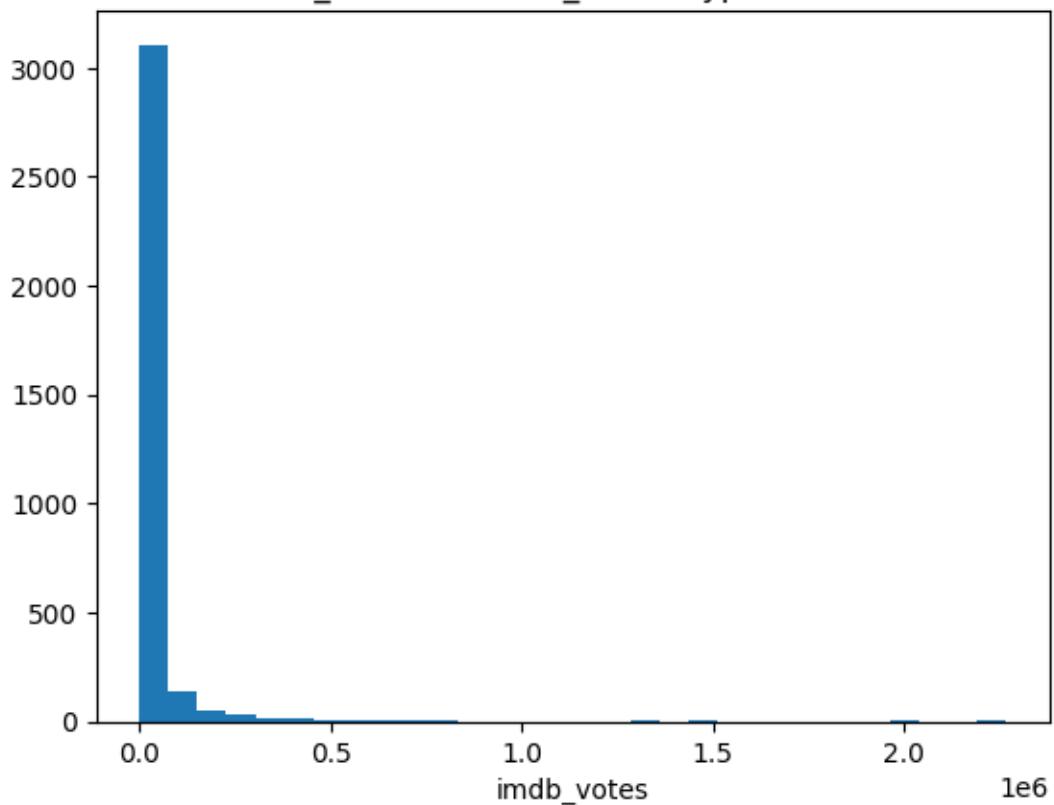


data.netflix — imdb_score (type=MOVIE)

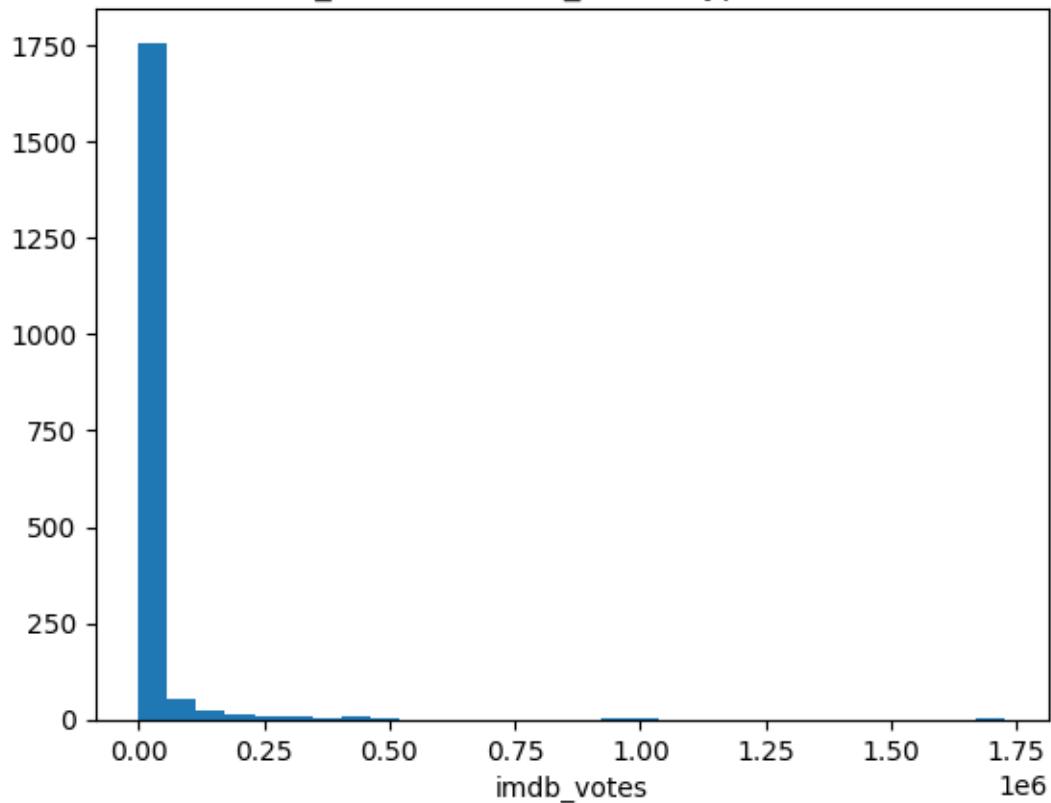




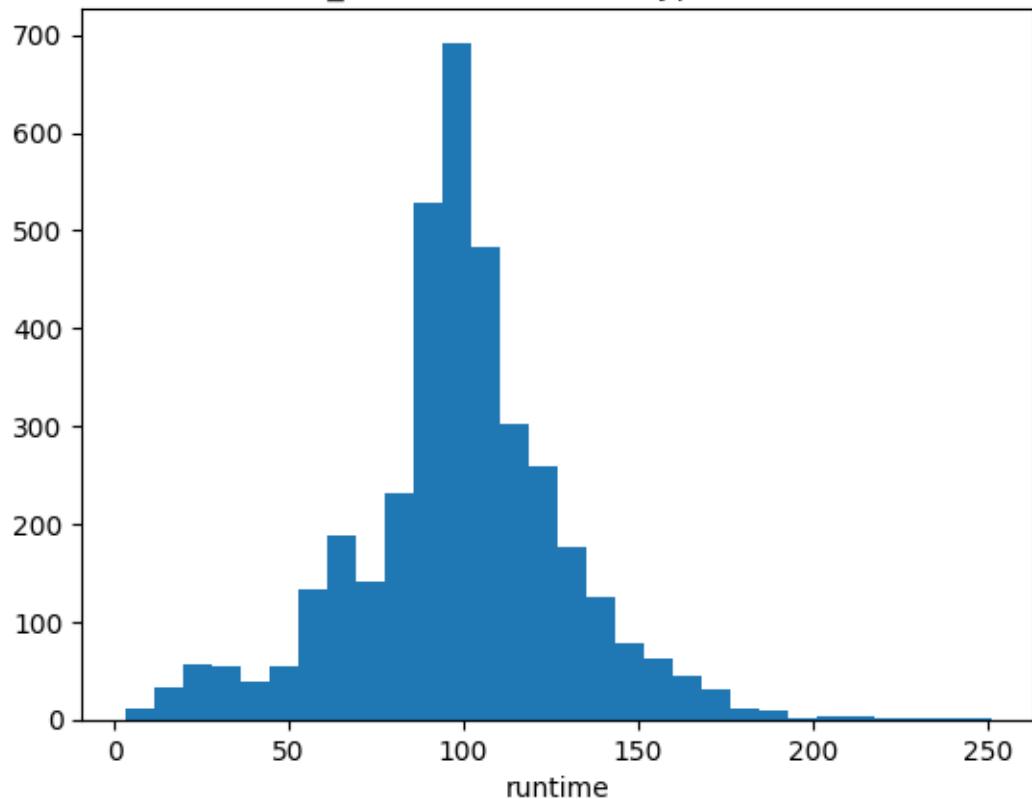
data.netflix — imdb_votes (type=MOVIE)



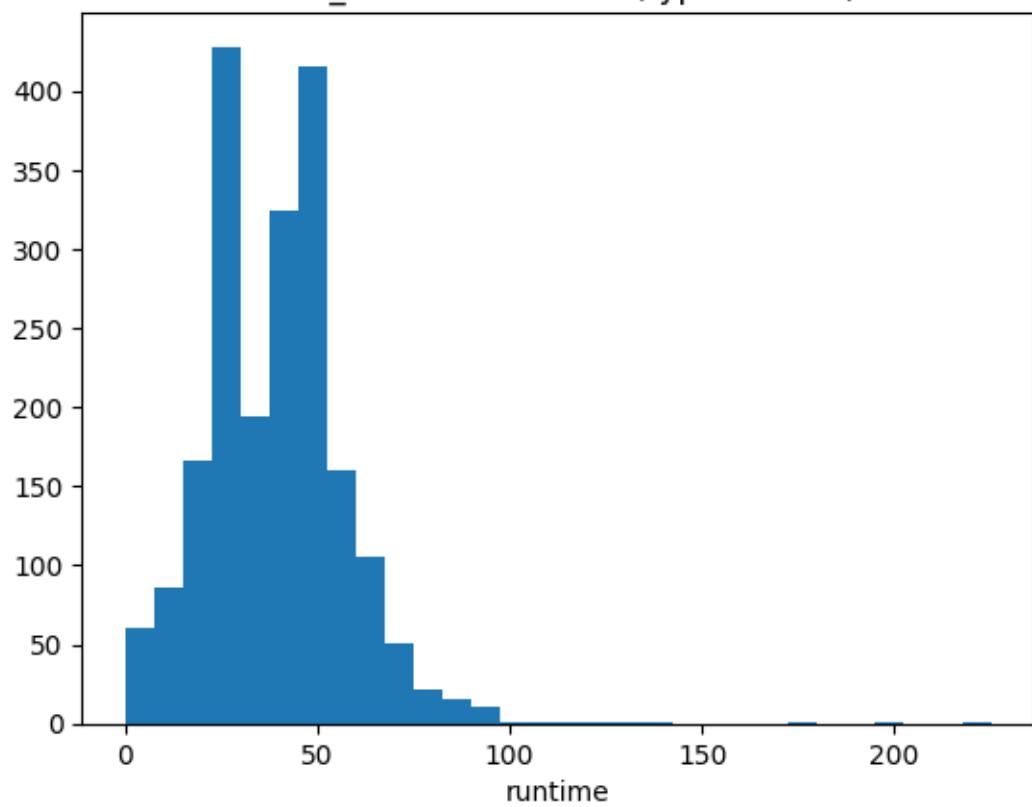
data.netflix — imdb_votes (type=SHOW)



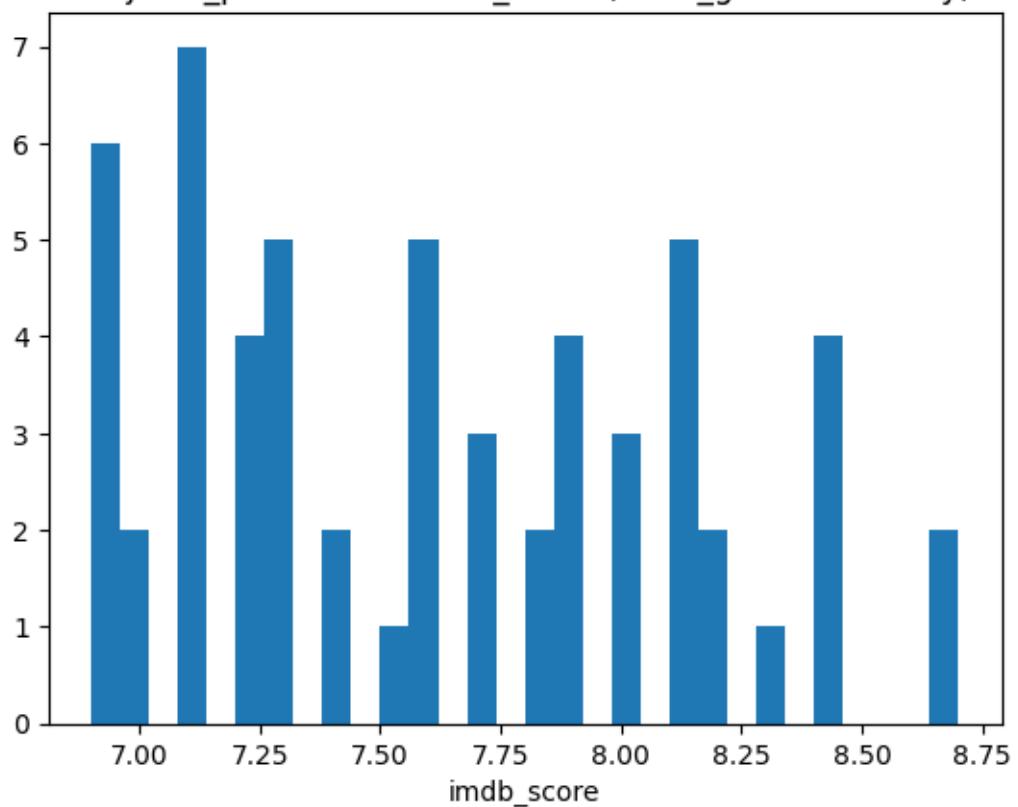
data.netflix — runtime (type=MOVIE)



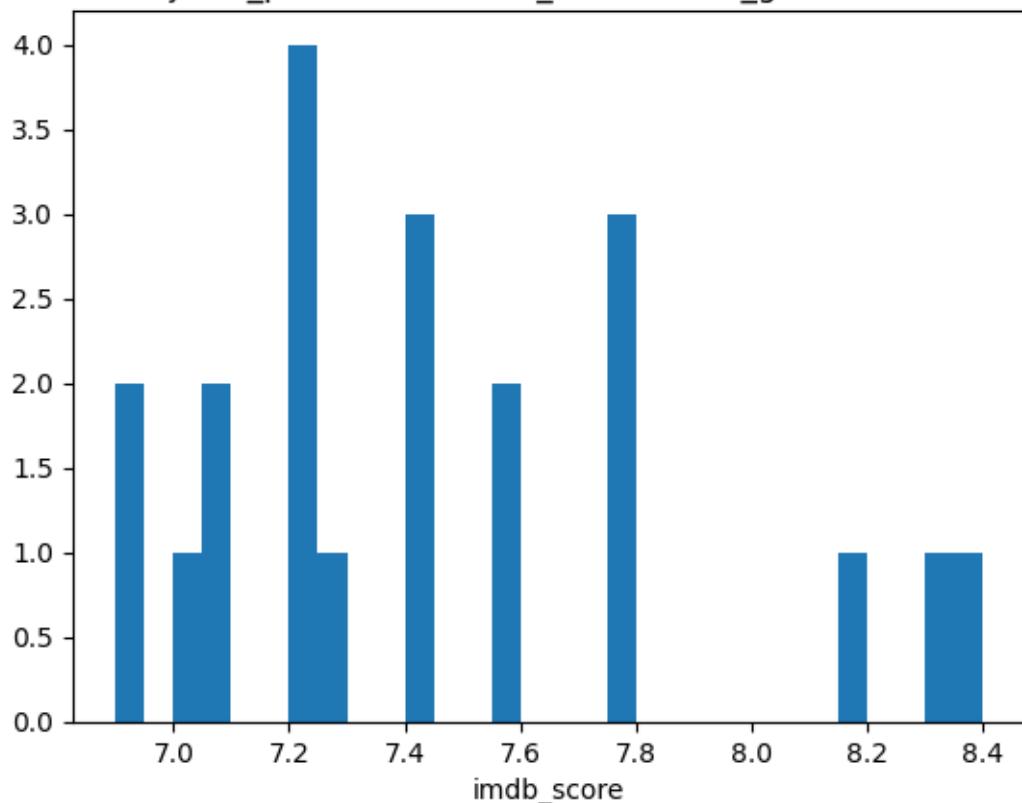
data_netflix — runtime (type=SHOW)



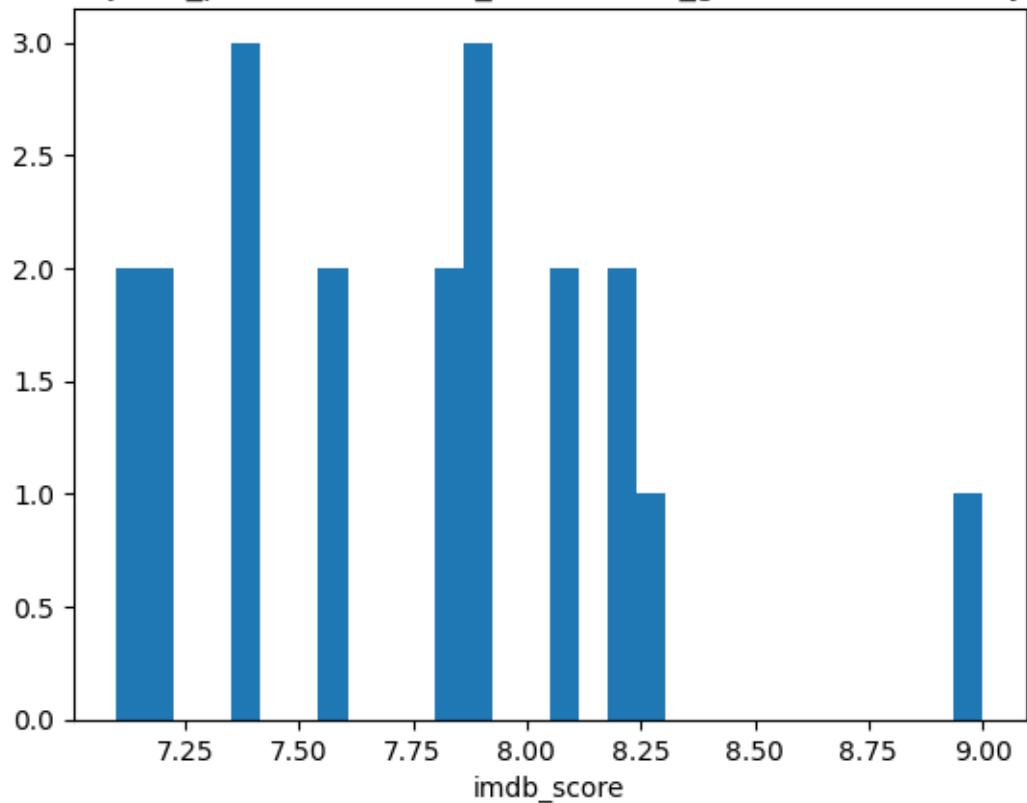
mejores_peliculas — imdb_score (main_genre=comedy)



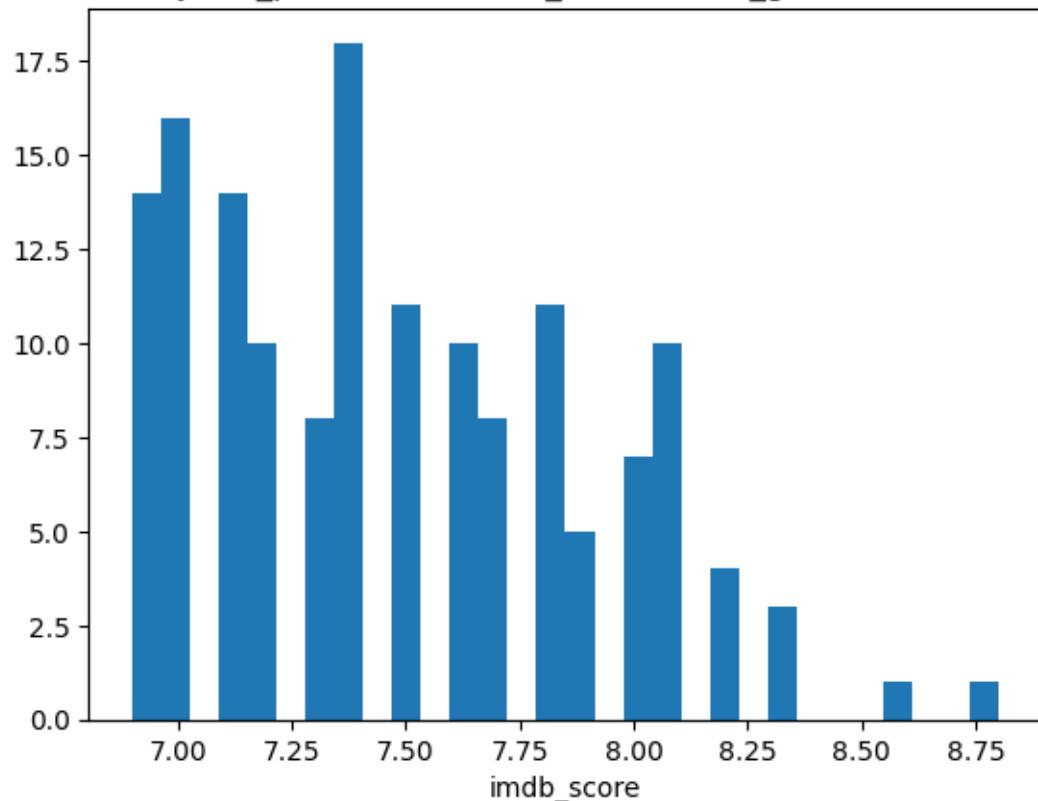
mejores_peliculas — imdb_score (main_genre=crime)



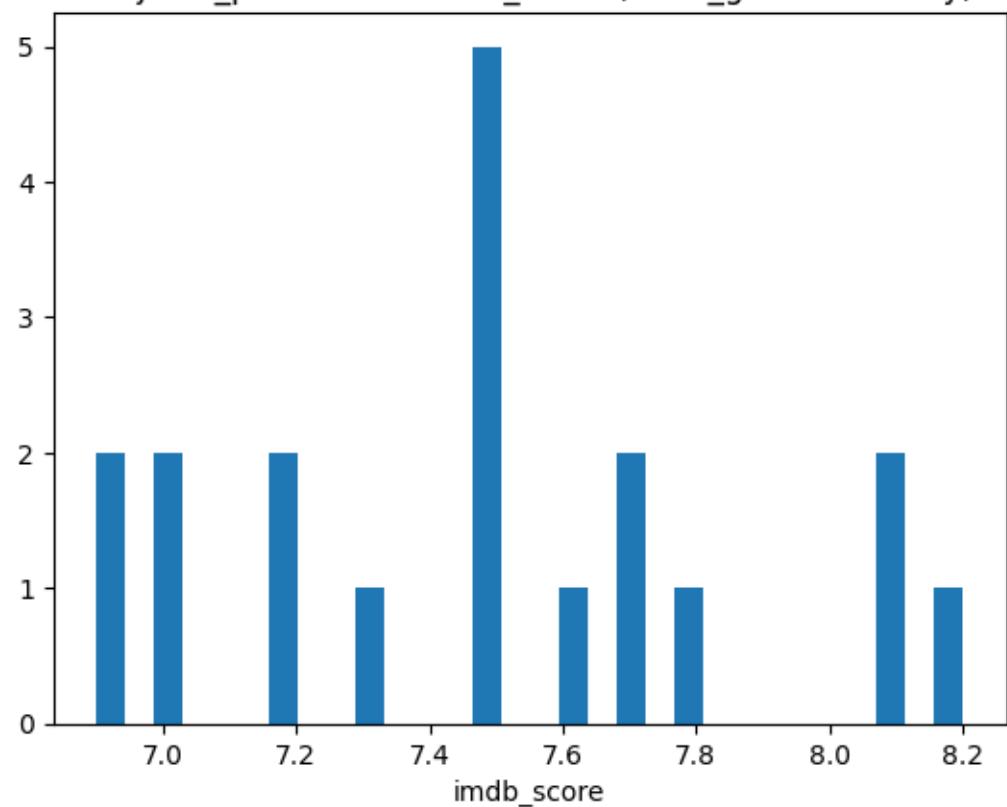
mejores_peliculas — imdb_score (main_genre=documentary)



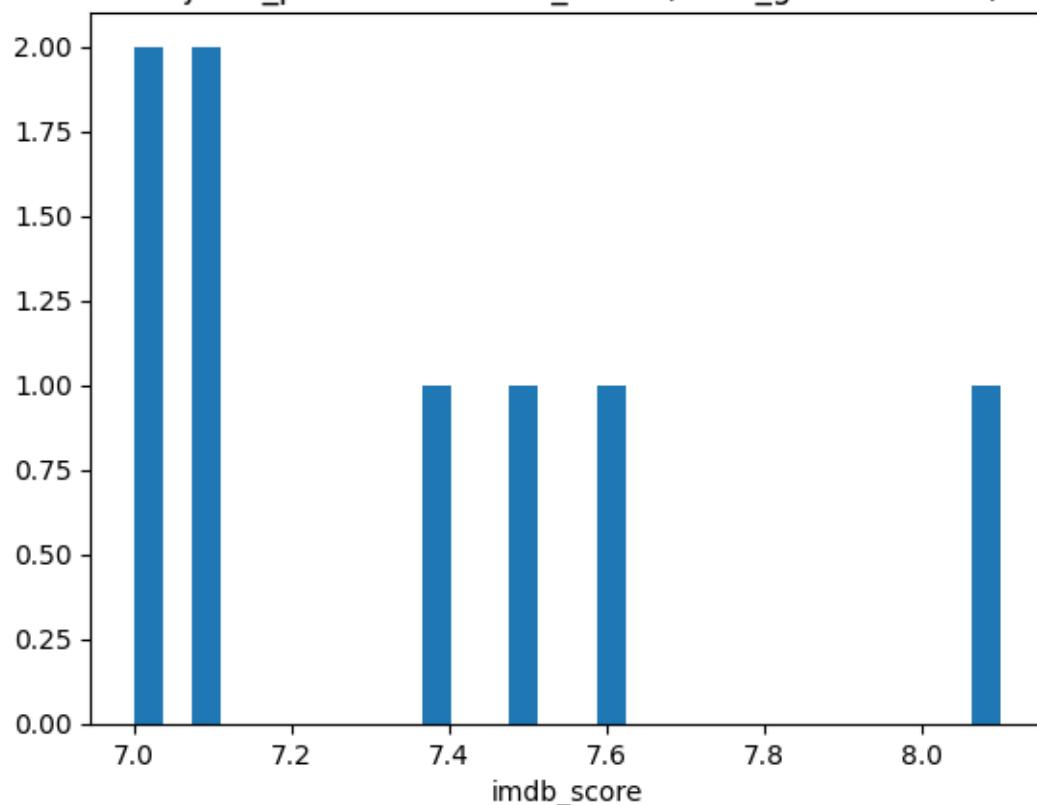
mejores_peliculas — imdb_score (main_genre=drama)



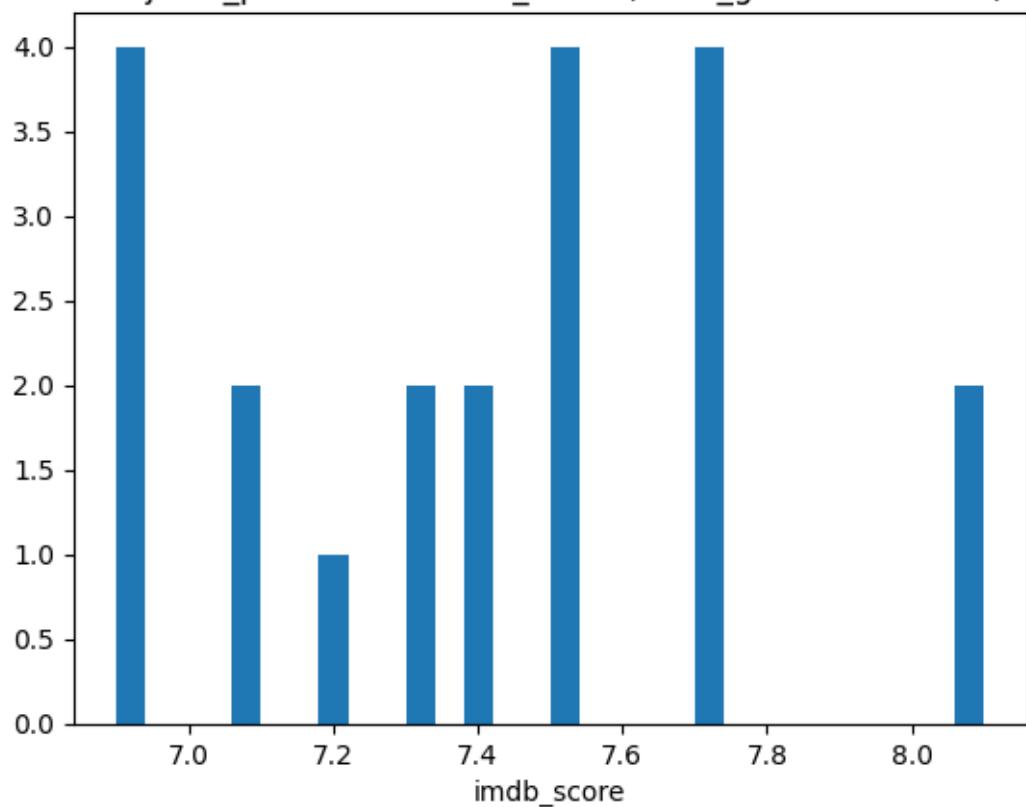
mejores_peliculas — imdb_score (main_genre=fantasy)



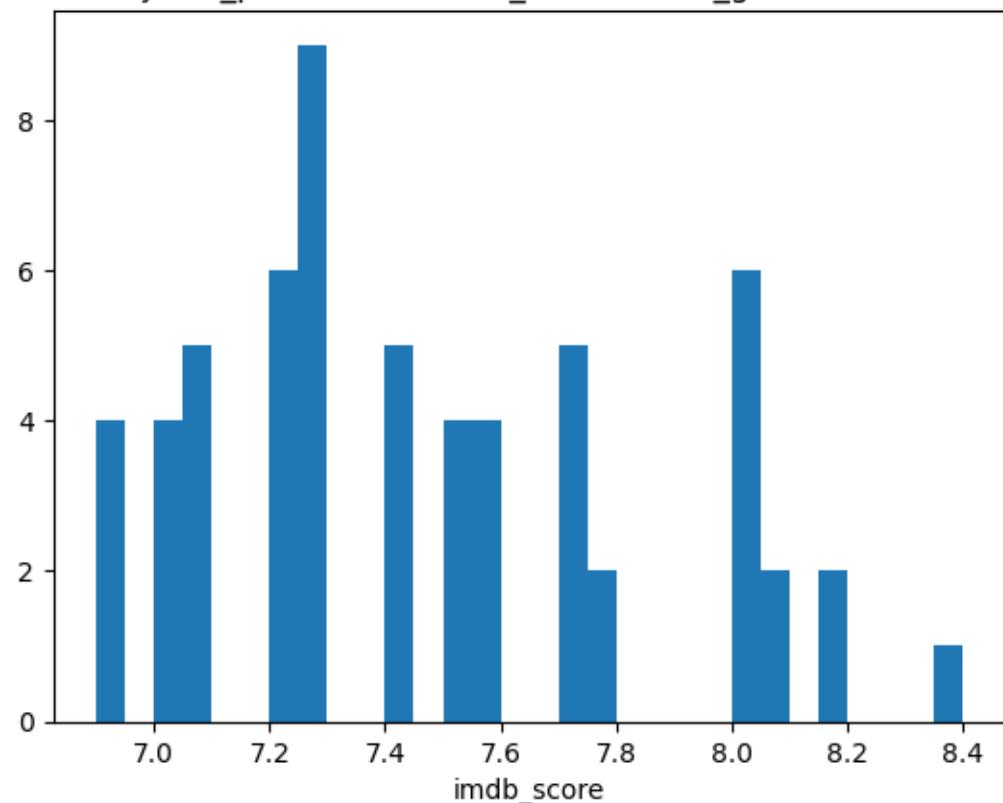
mejores_peliculas — imdb_score (main_genre=horror)



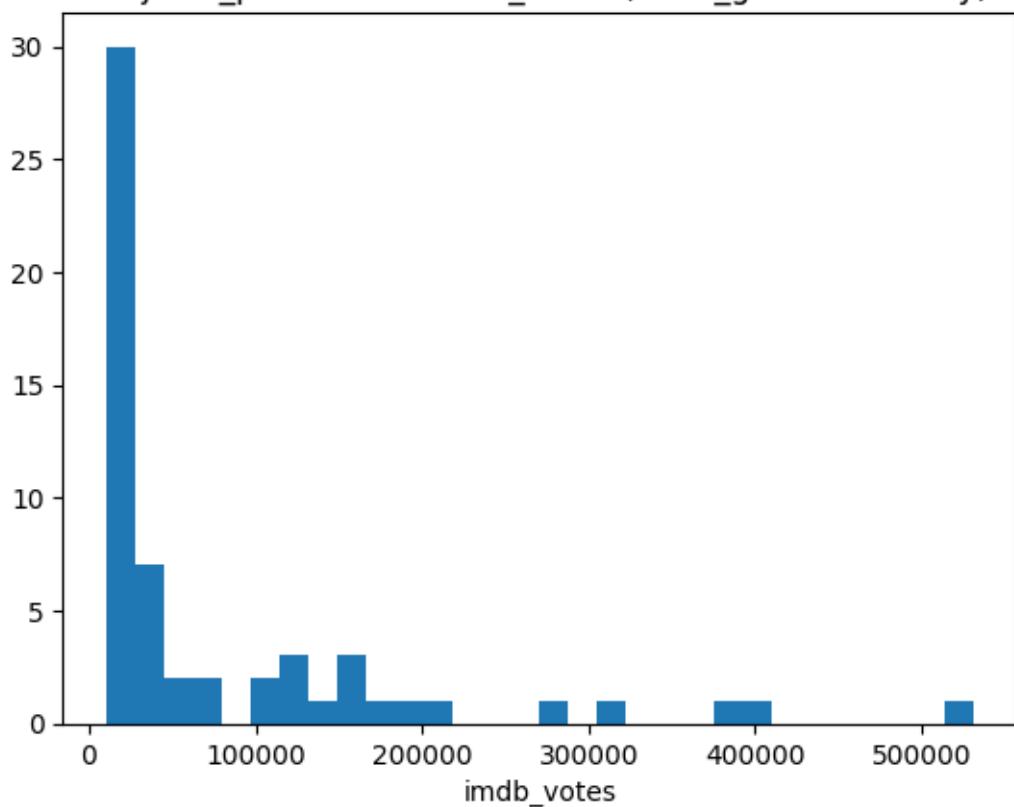
mejores_peliculas — imdb_score (main_genre=romance)



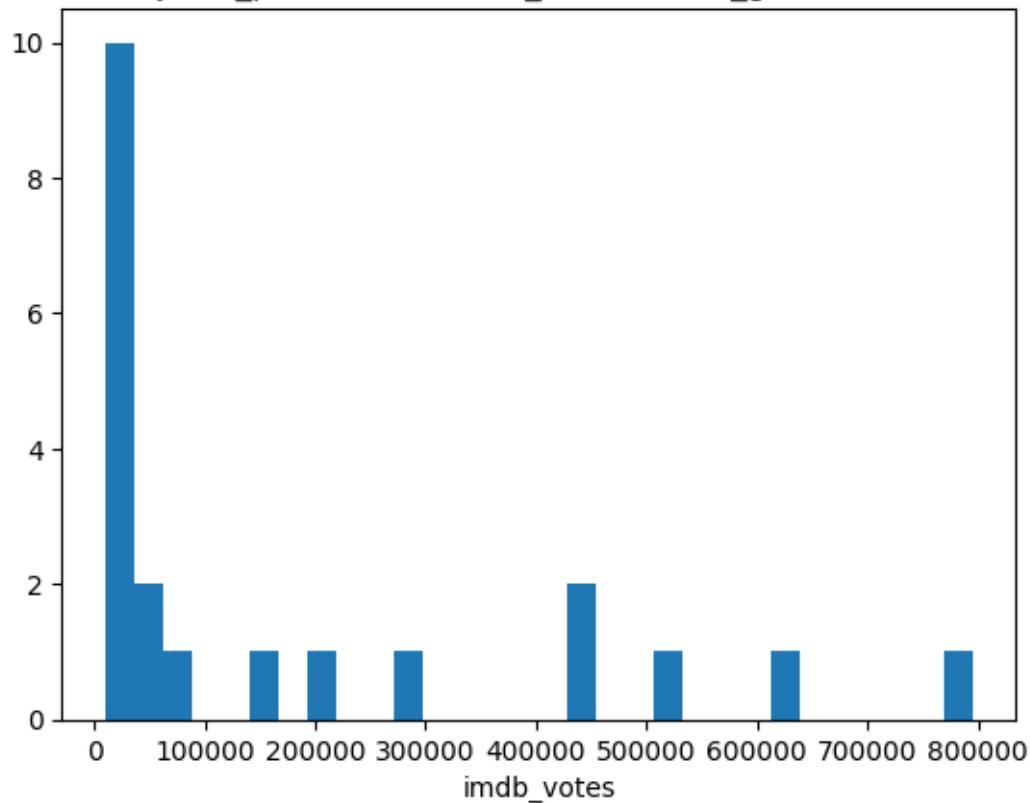
mejores_peliculas — imdb_score (main_genre=thriller)



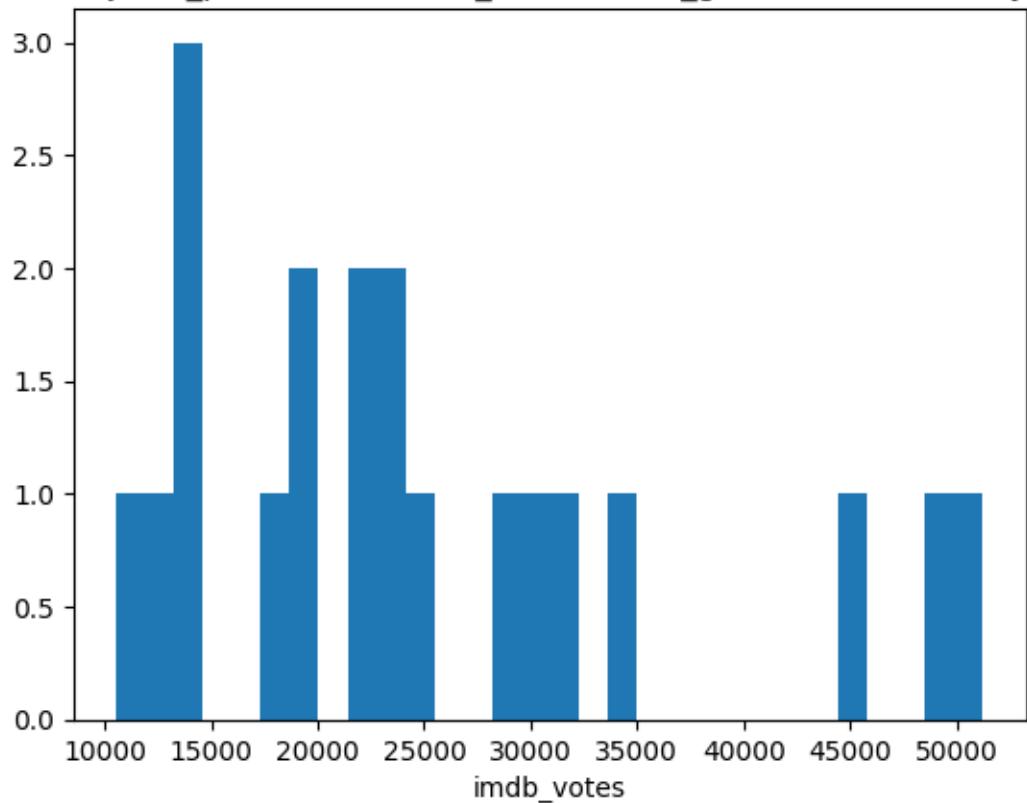
mejores_peliculas — imdb_votes (main_genre=comedy)



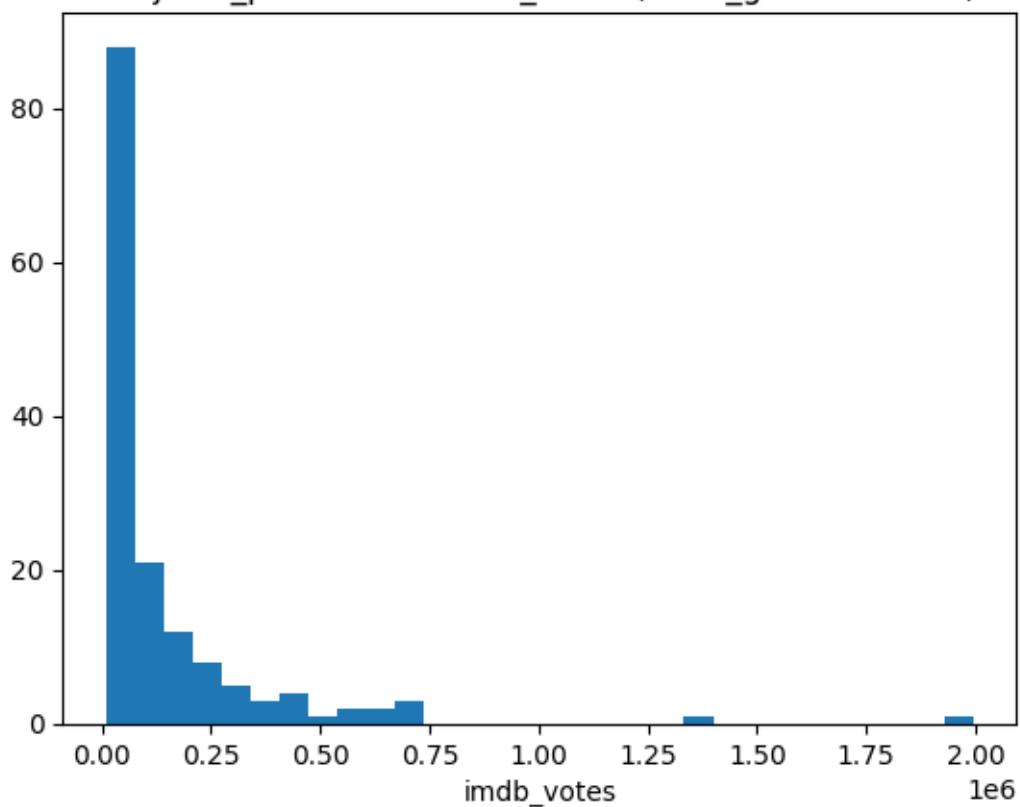
mejores_peliculas — imdb_votes (main_genre=crime)



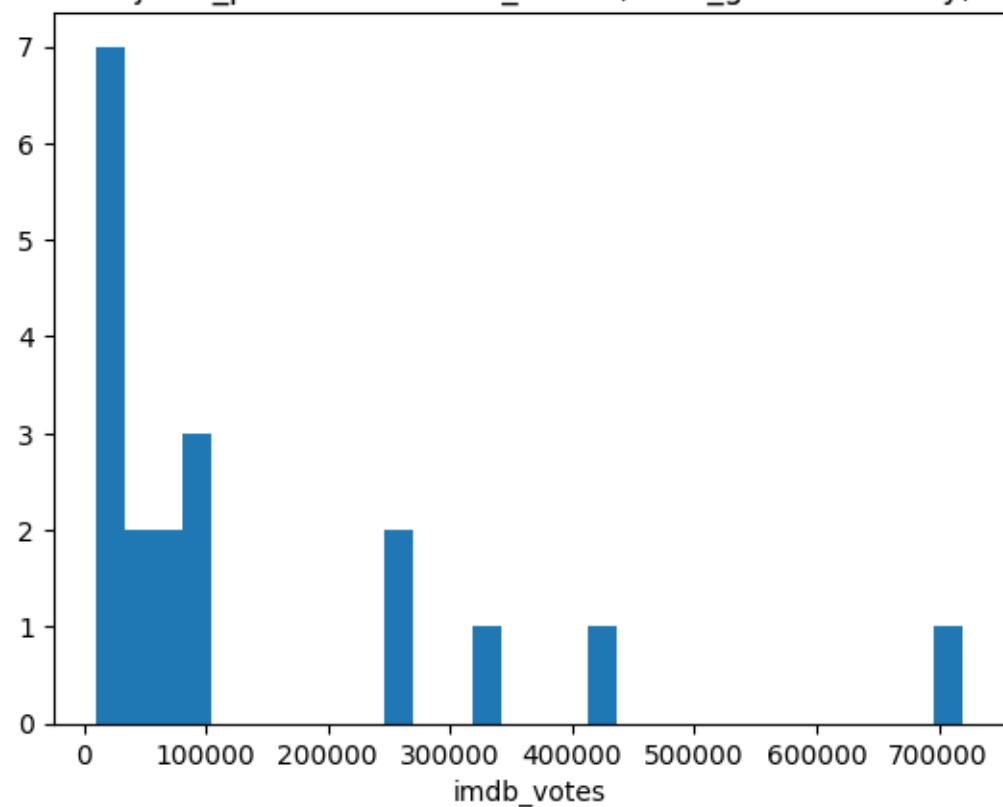
mejores_peliculas — imdb_votes (main_genre=documentary)



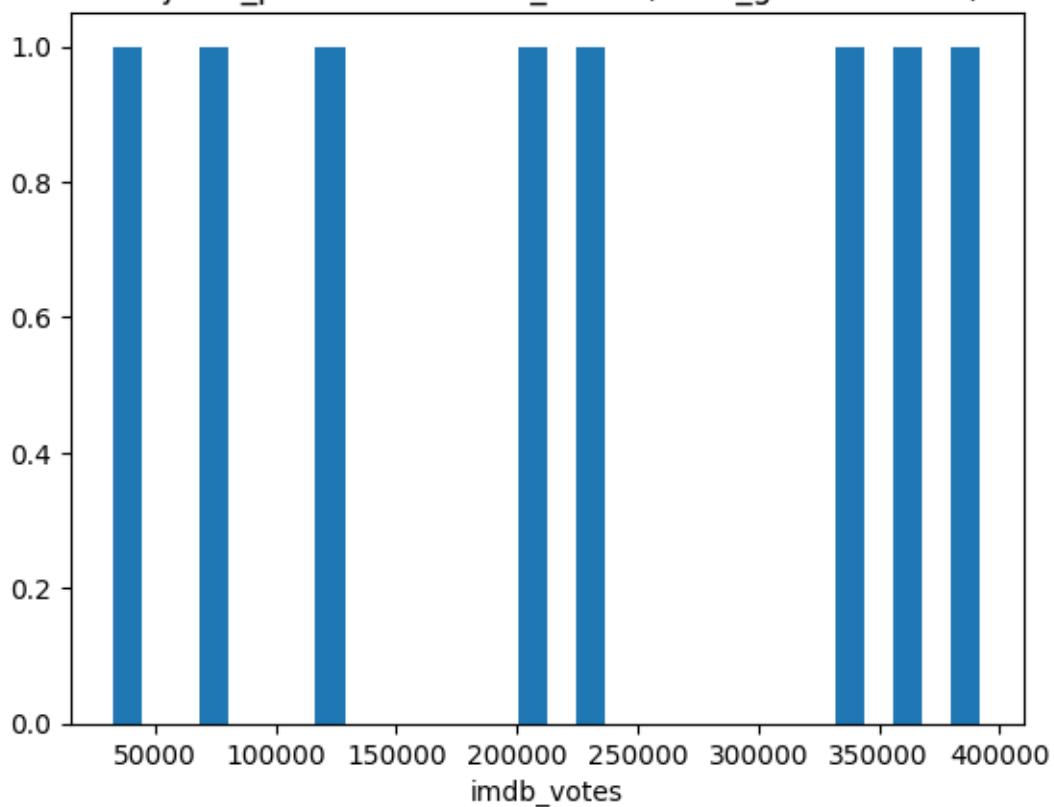
mejores_peliculas — imdb_votes (main_genre=drama)



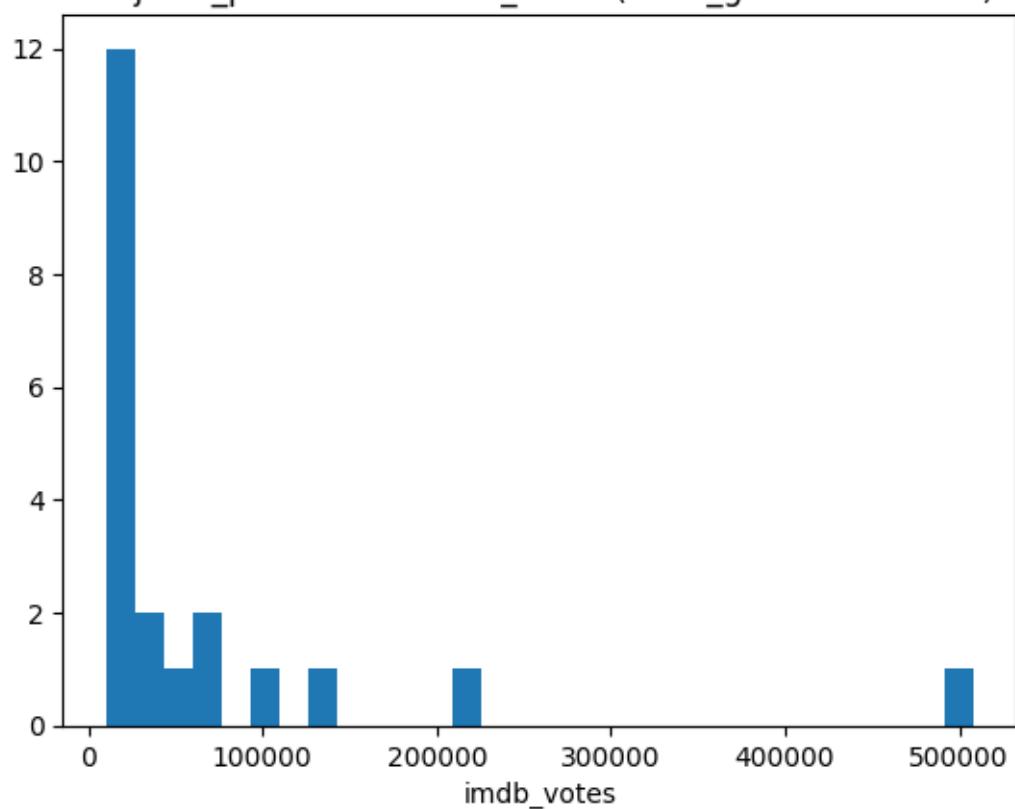
mejores_peliculas — imdb_votes (main_genre=fantasy)



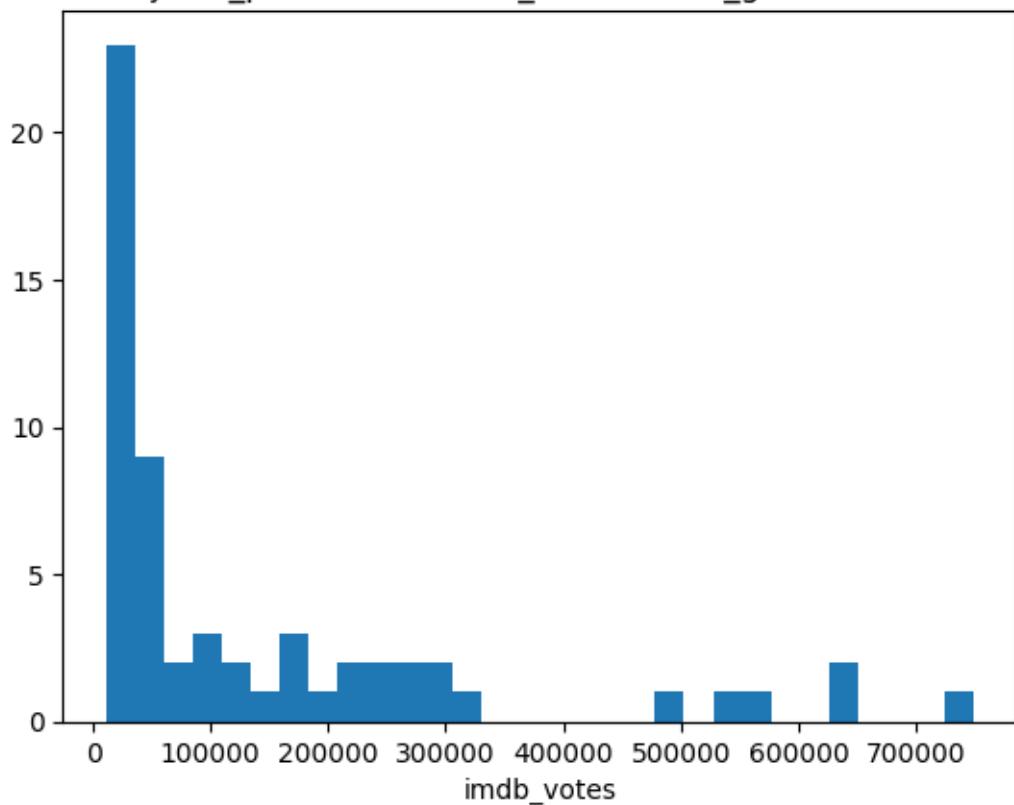
mejores_peliculas — imdb_votes (main_genre=horror)



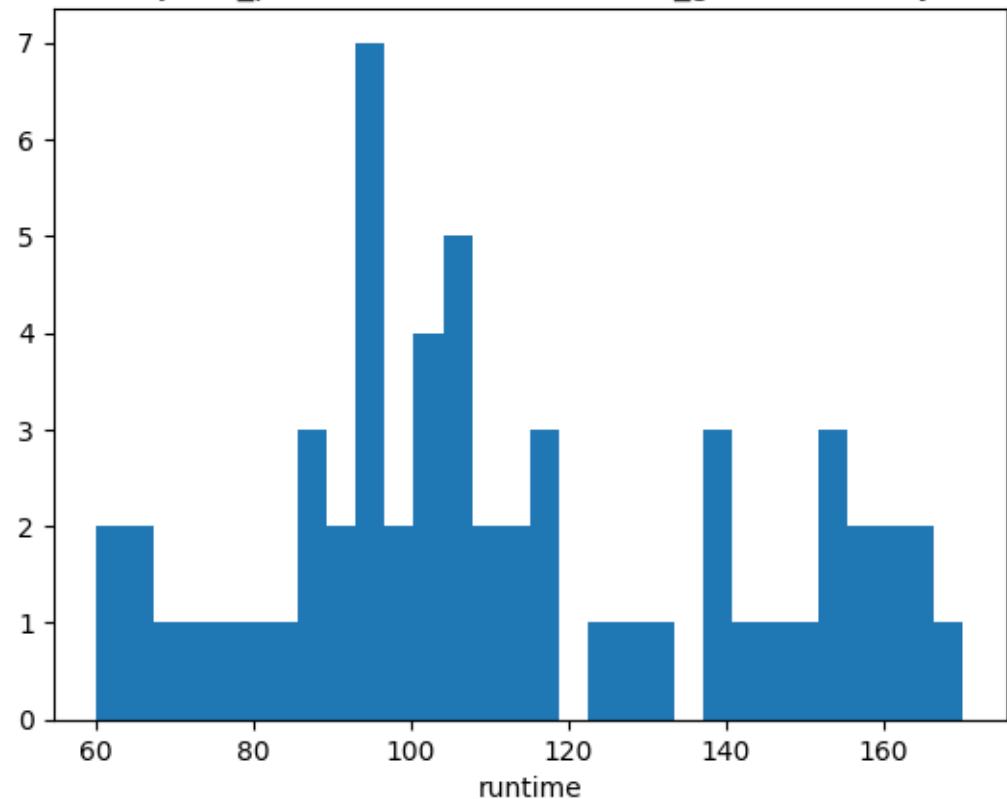
mejores_peliculas — imdb_votes (main_genre=romance)



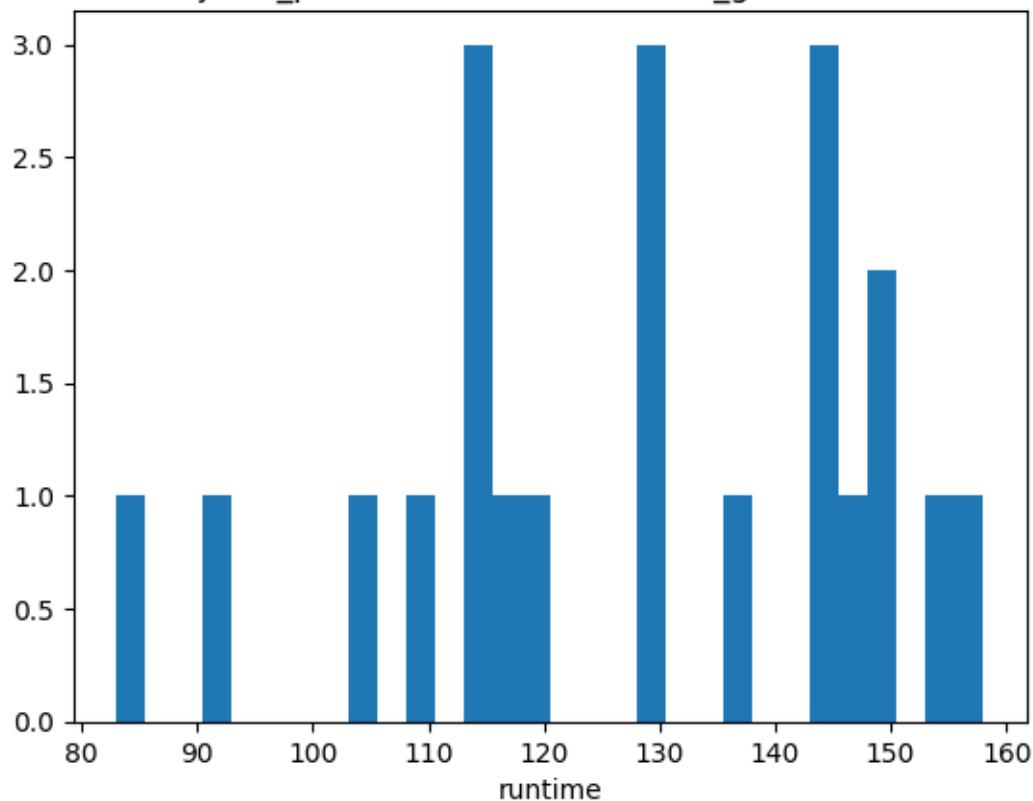
mejores_peliculas — imdb_votes (main_genre=thriller)



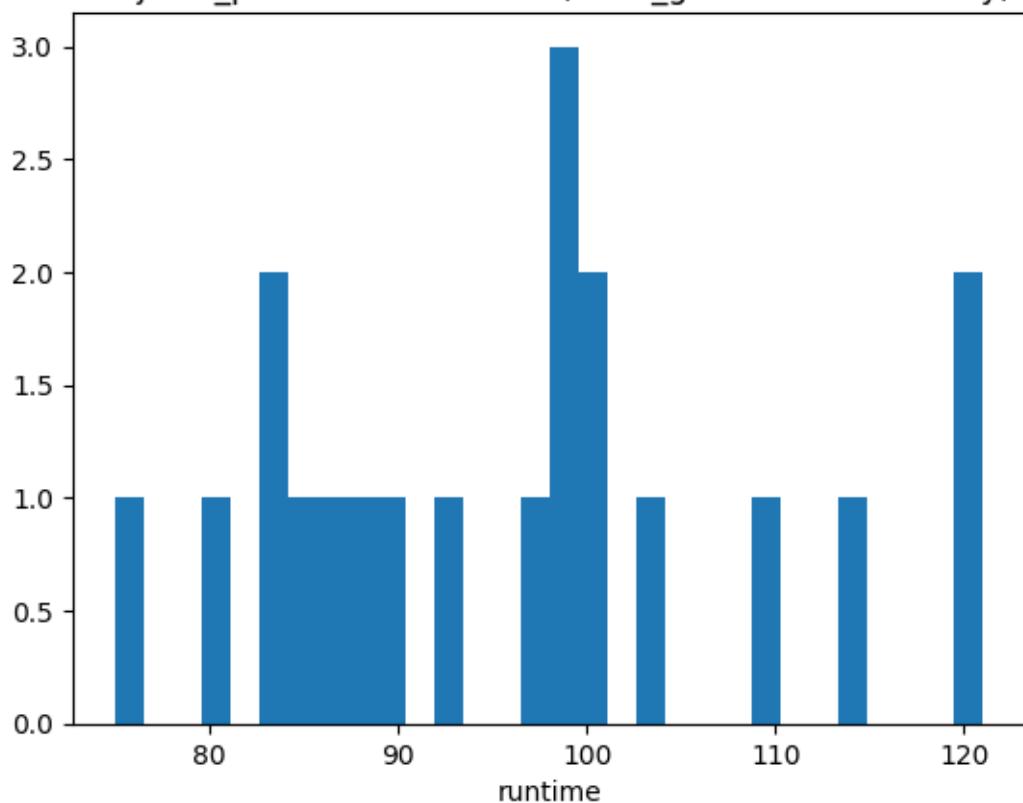
mejores_peliculas — runtime (main_genre=comedy)



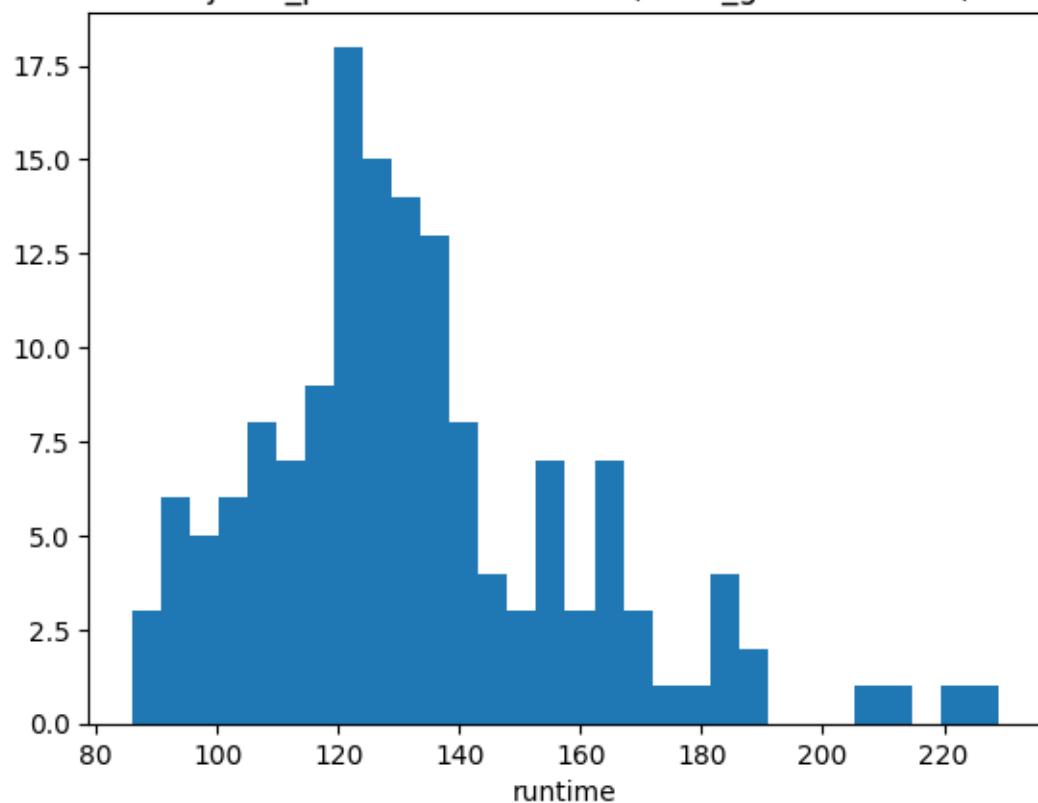
mejores_peliculas — runtime (main_genre=crime)



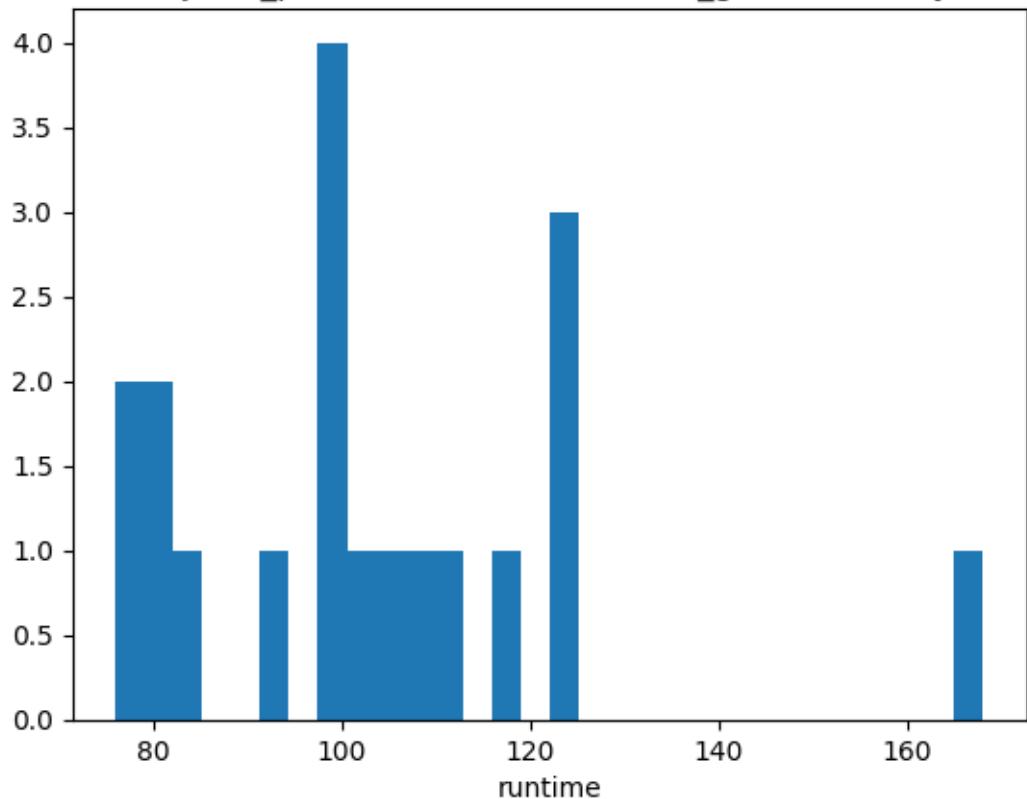
mejores_peliculas — runtime (main_genre=documentary)



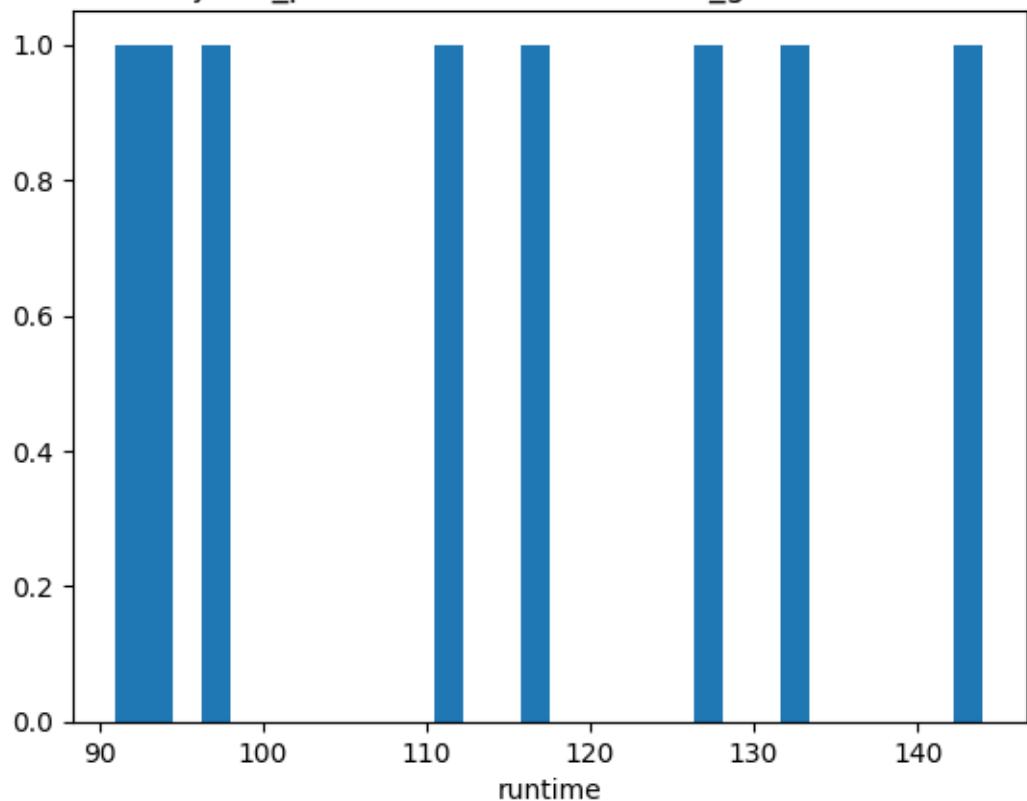
mejores_peliculas — runtime (main_genre=drama)



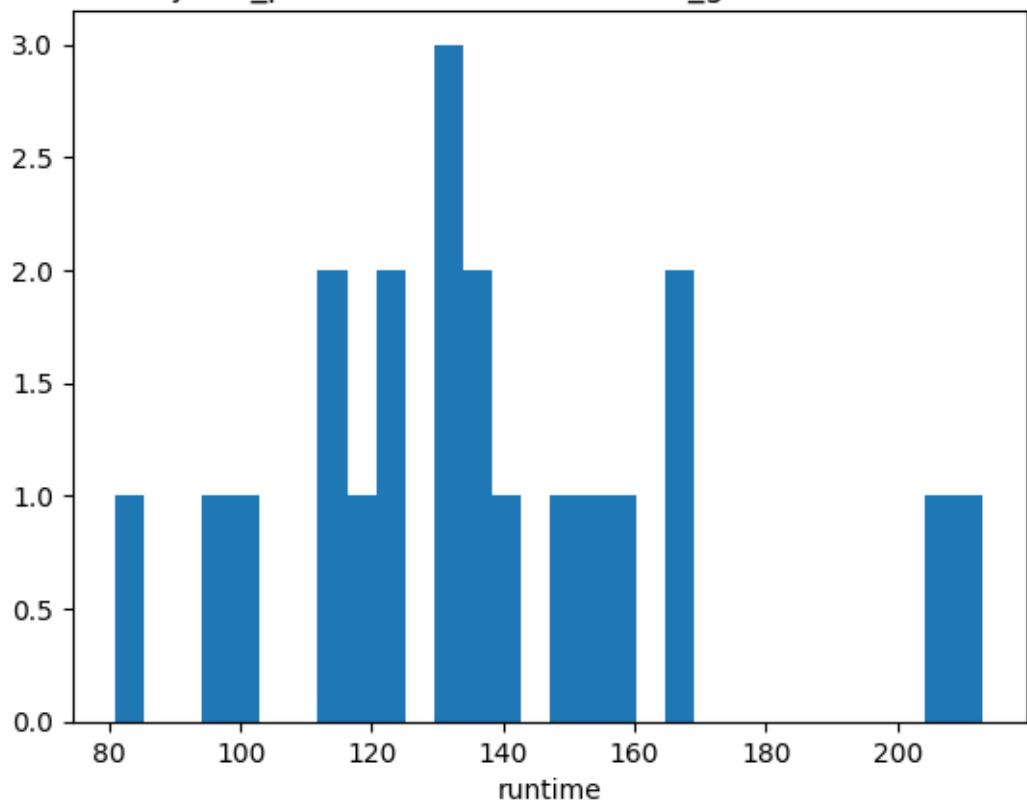
mejores_peliculas — runtime (main_genre=fantasy)



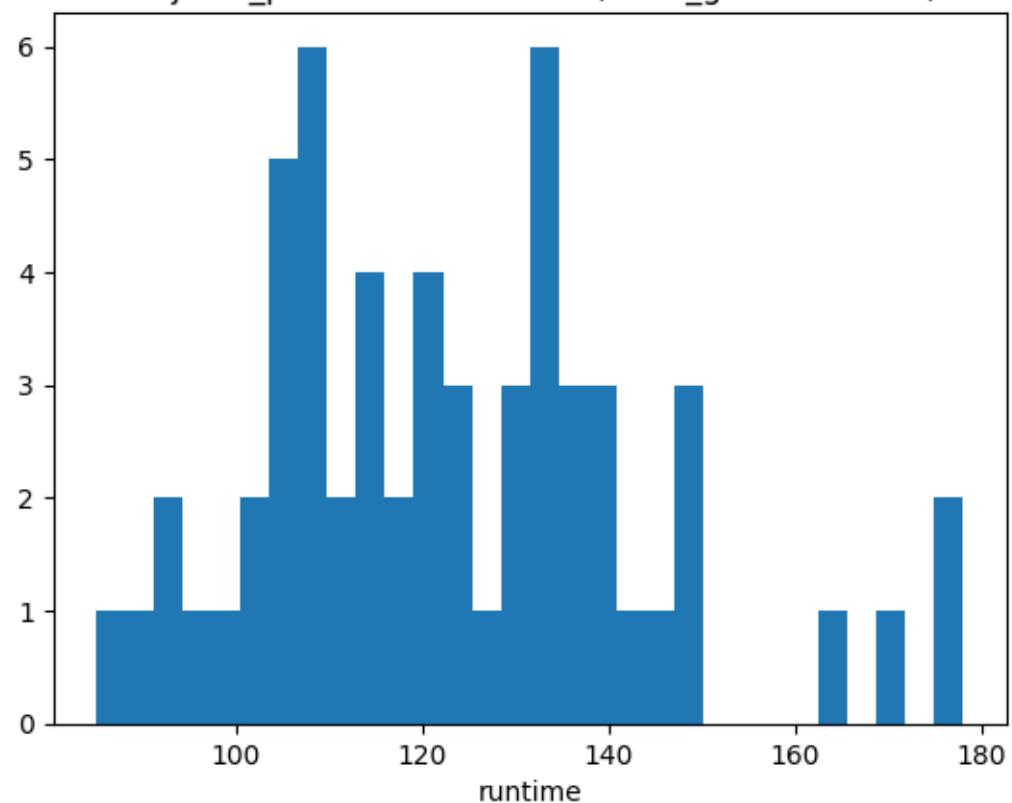
mejores_peliculas — runtime (main_genre=horror)



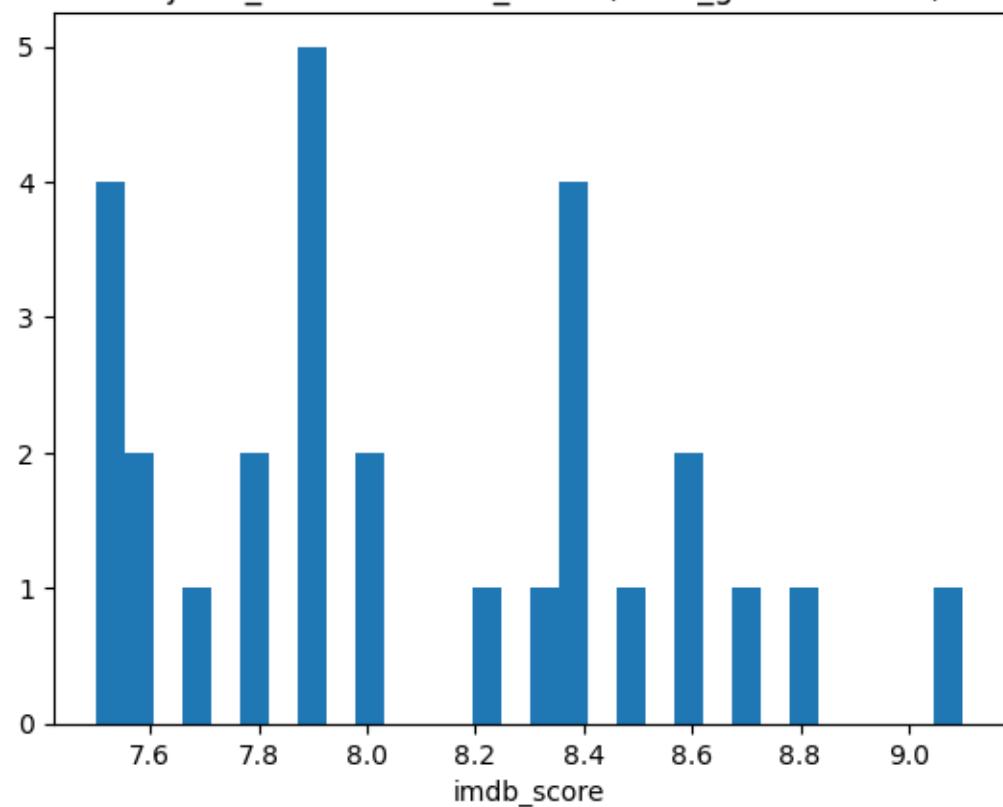
mejores_peliculas — runtime (main_genre=romance)



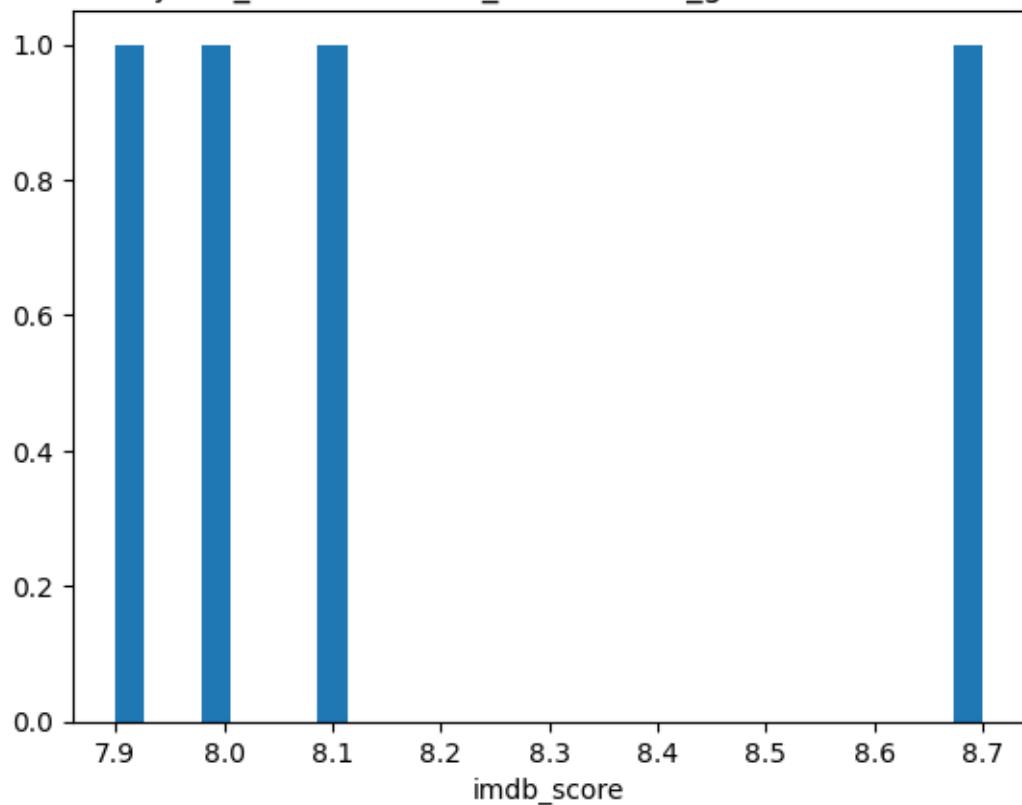
mejores_peliculas — runtime (main_genre=thriller)



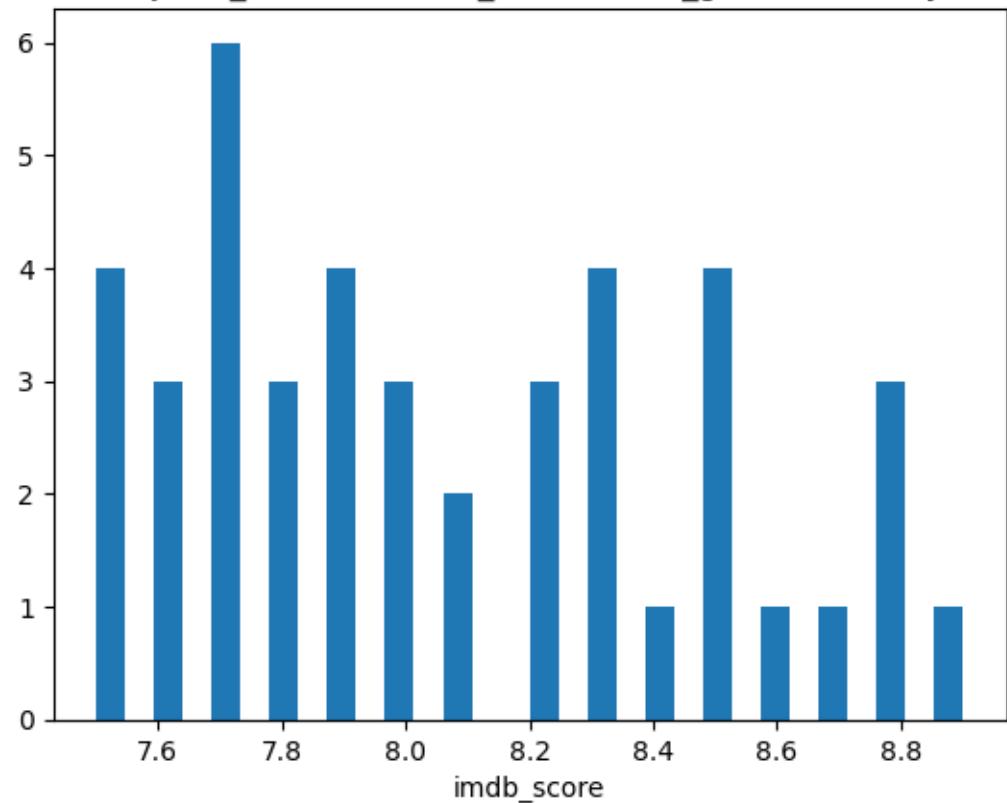
mejores_shows — imdb_score (main_genre=action)



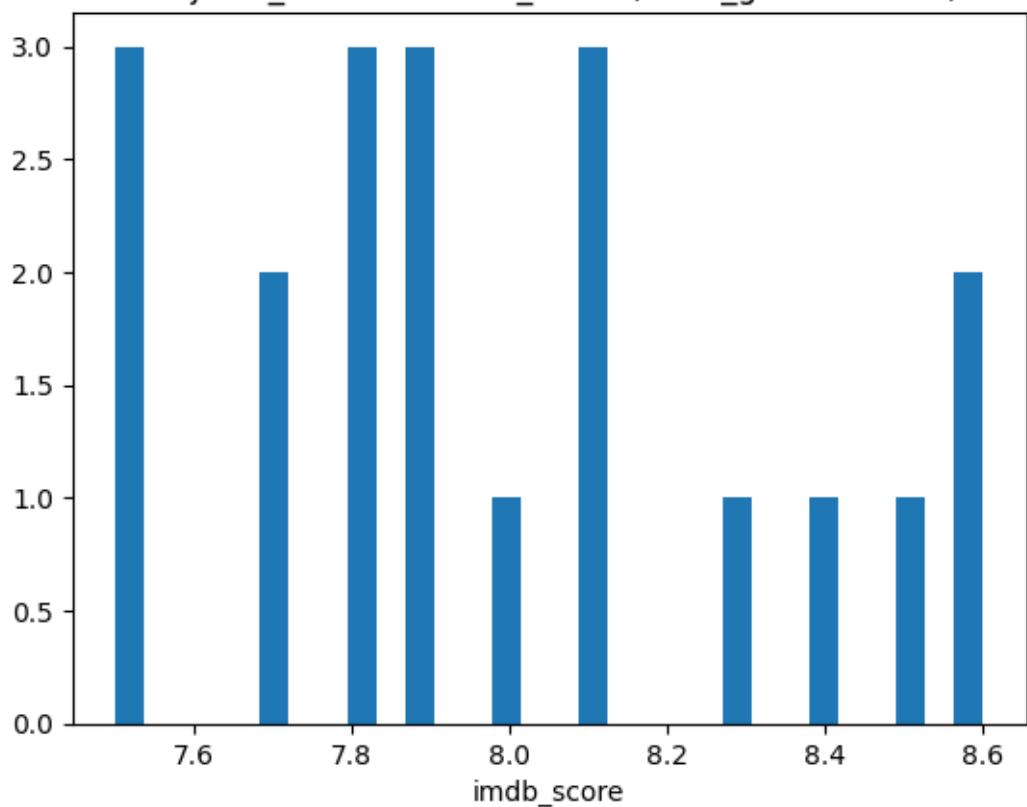
mejores_shows — imdb_score (main_genre=animation)



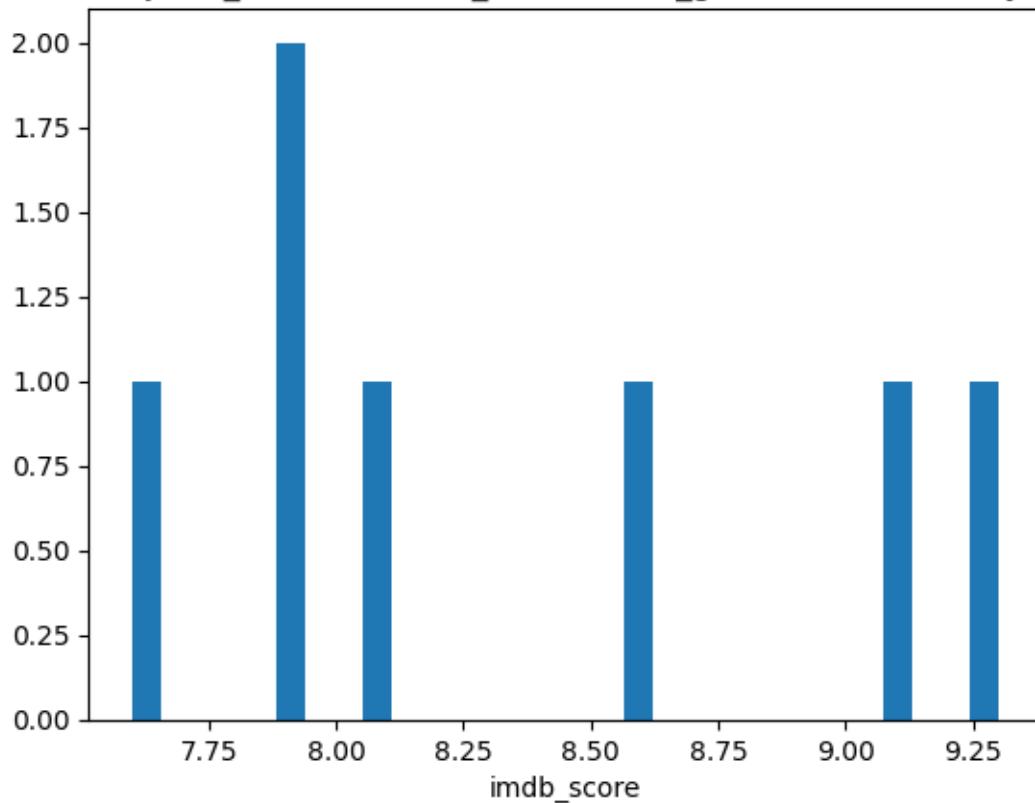
mejores_shows — imdb_score (main_genre=comedy)



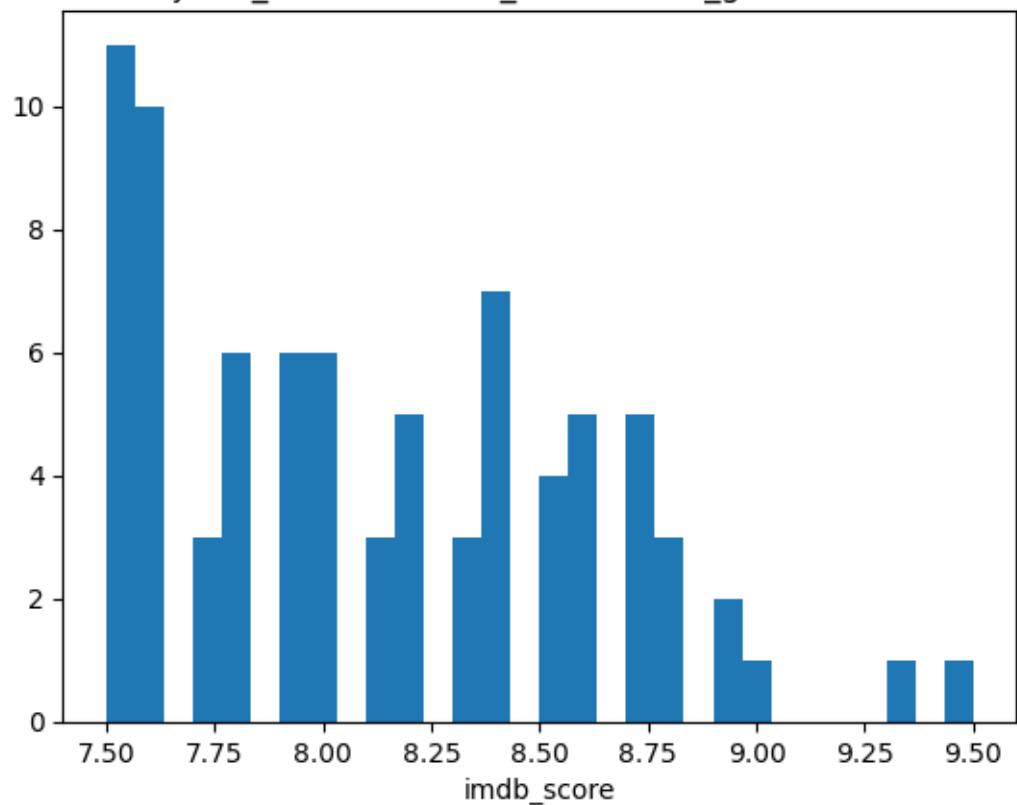
mejores_shows — imdb_score (main_genre=crime)



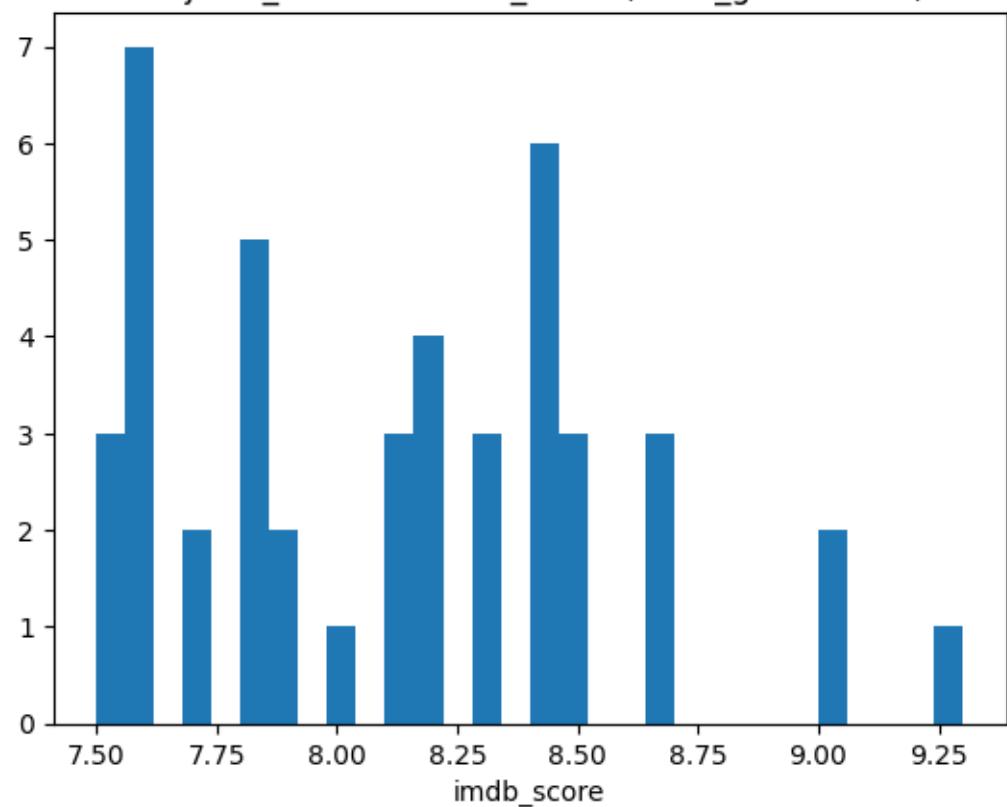
mejores_shows — imdb_score (main_genre=documentary)



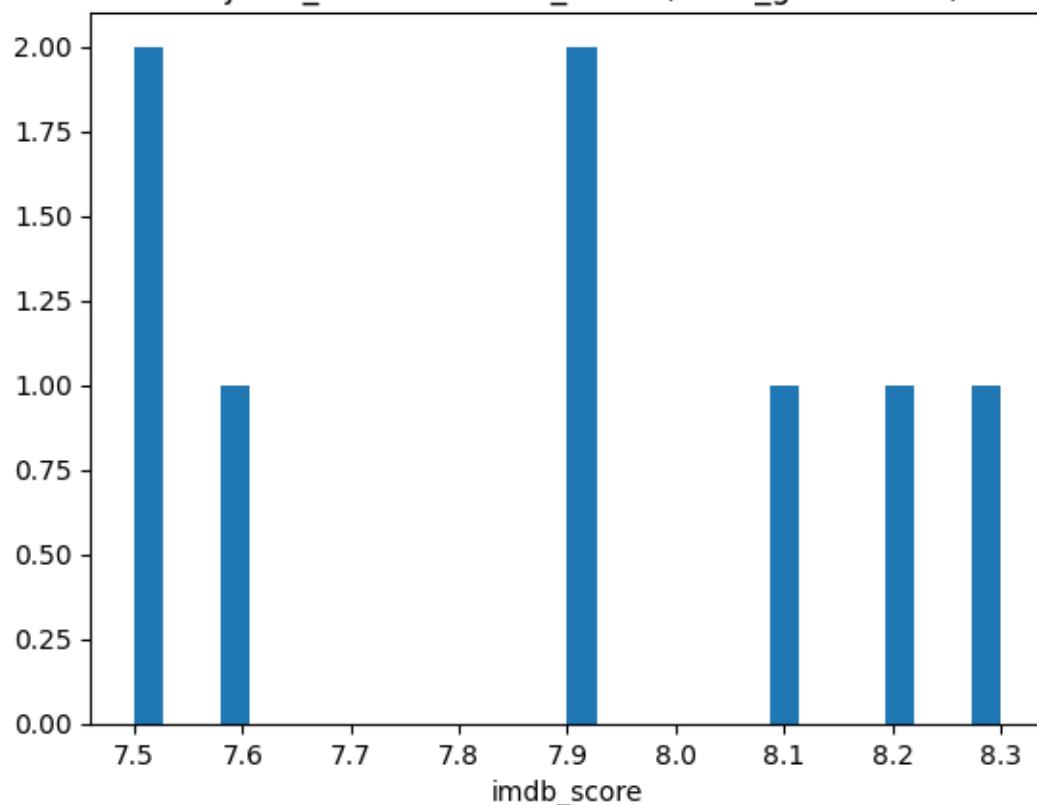
mejores_shows — imdb_score (main_genre=drama)



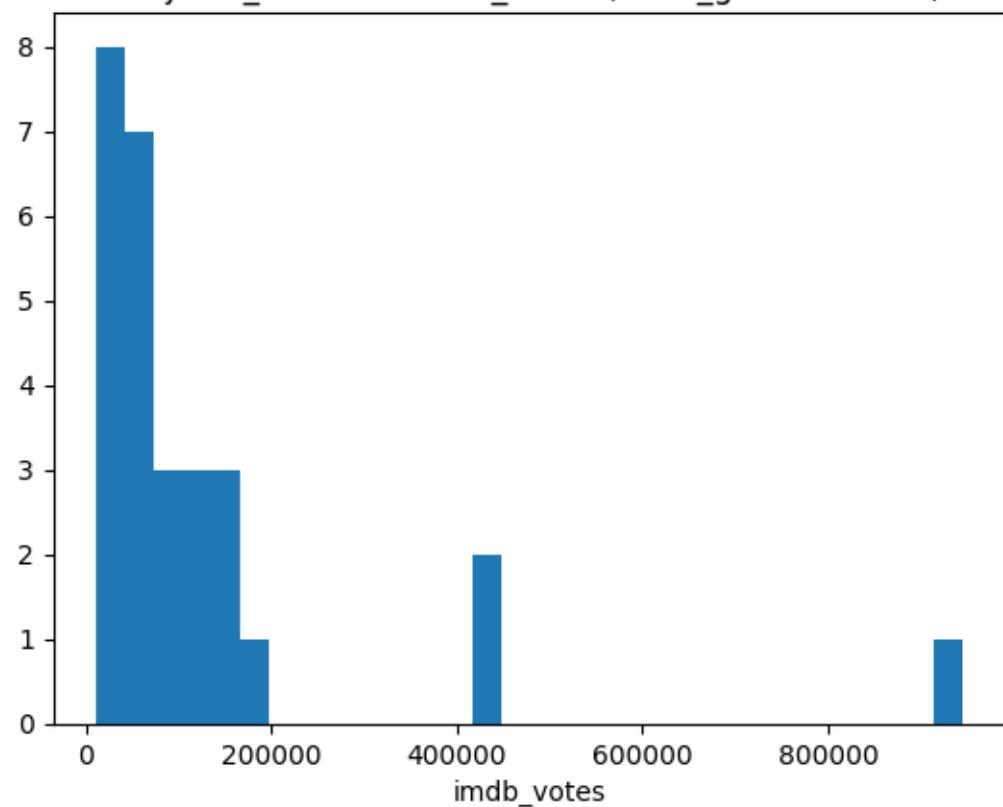
mejores_shows — imdb_score (main_genre=scifi)



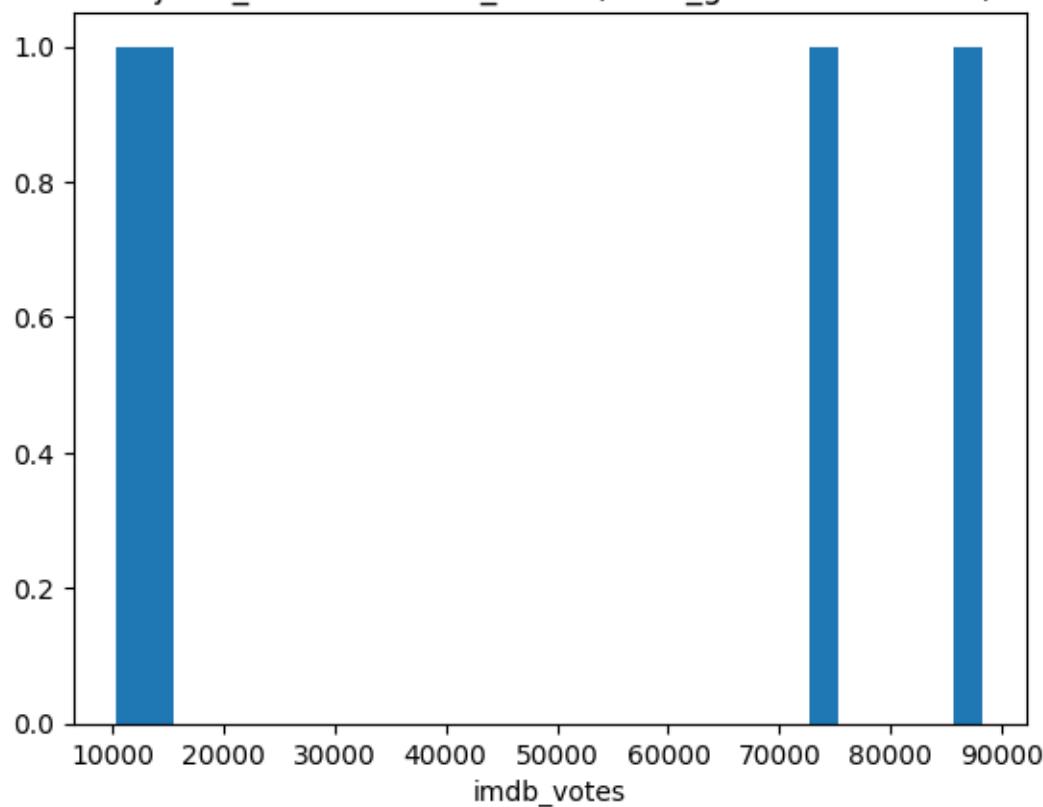
mejores_shows — imdb_score (main_genre=war)



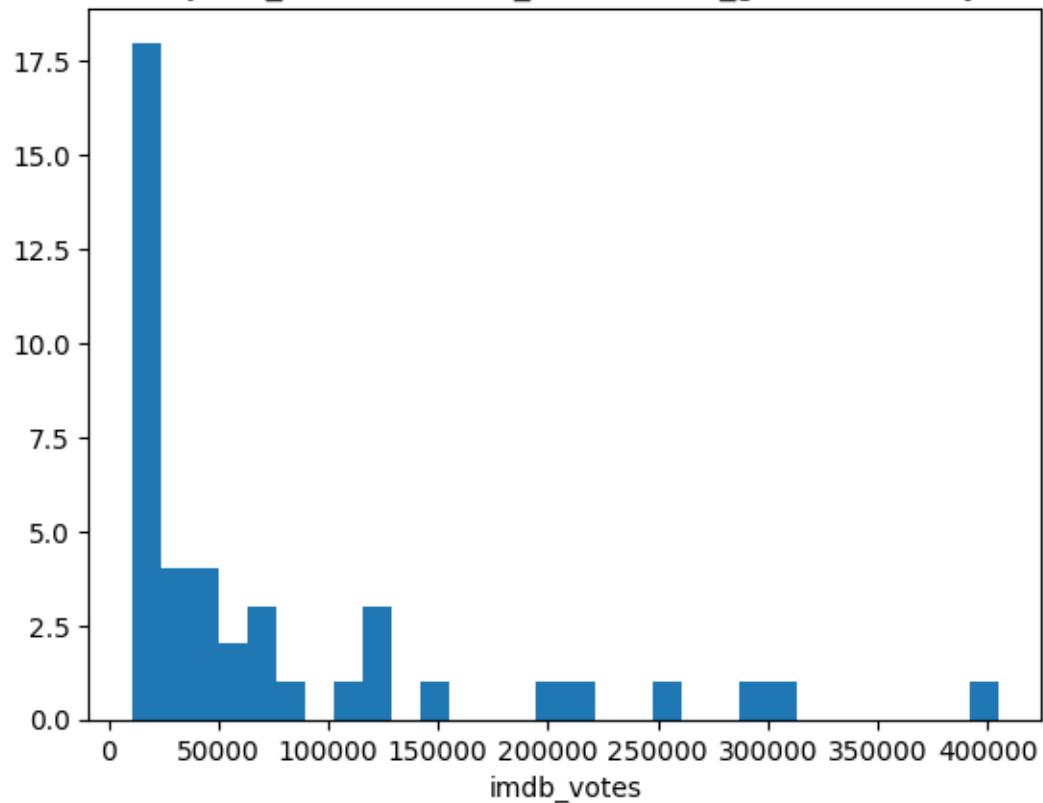
mejores_shows — imdb_votes (main_genre=action)



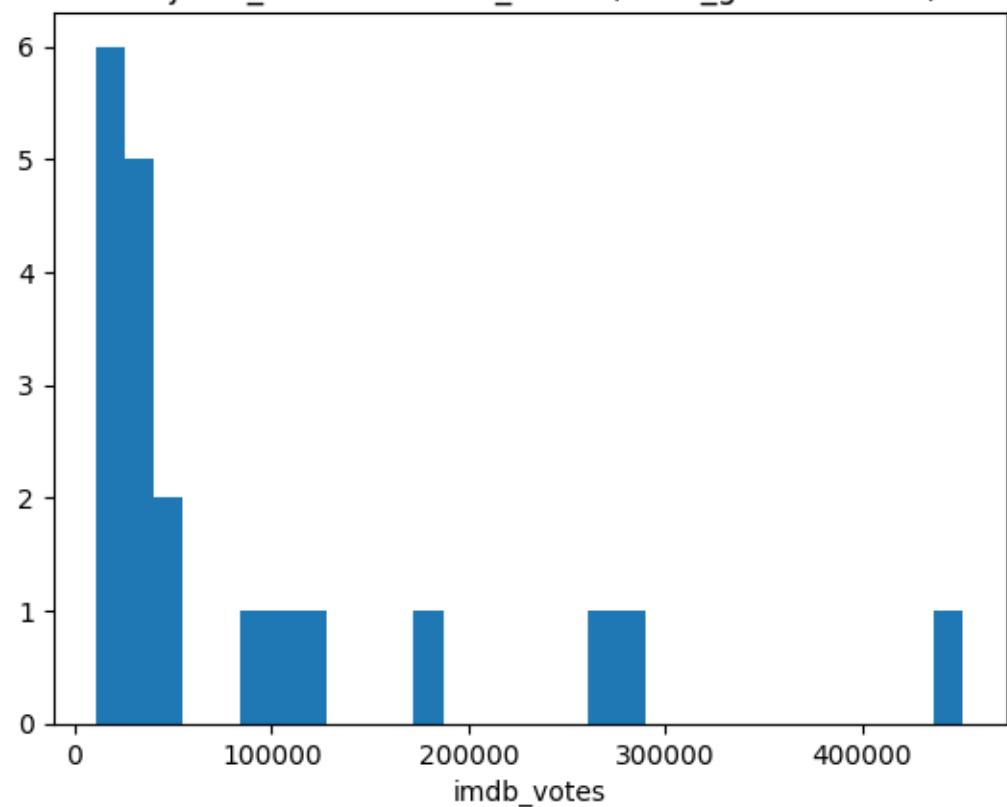
mejores_shows — imdb_votes (main_genre=animation)



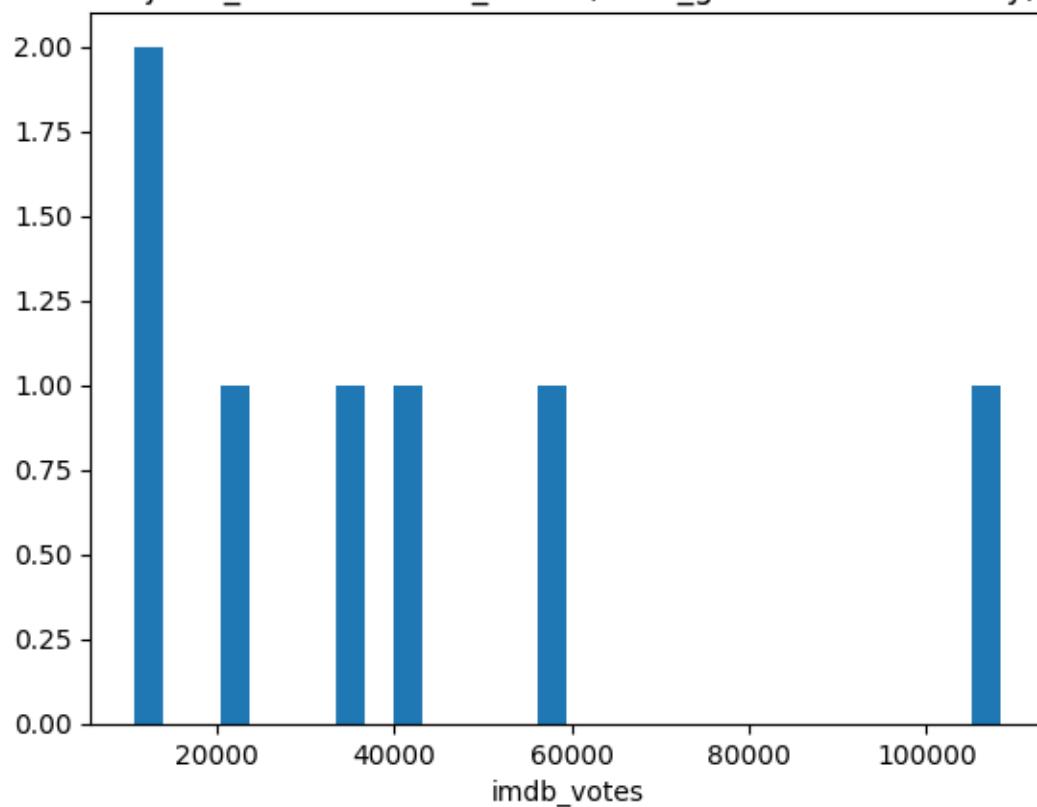
mejores_shows — imdb_votes (main_genre=comedy)



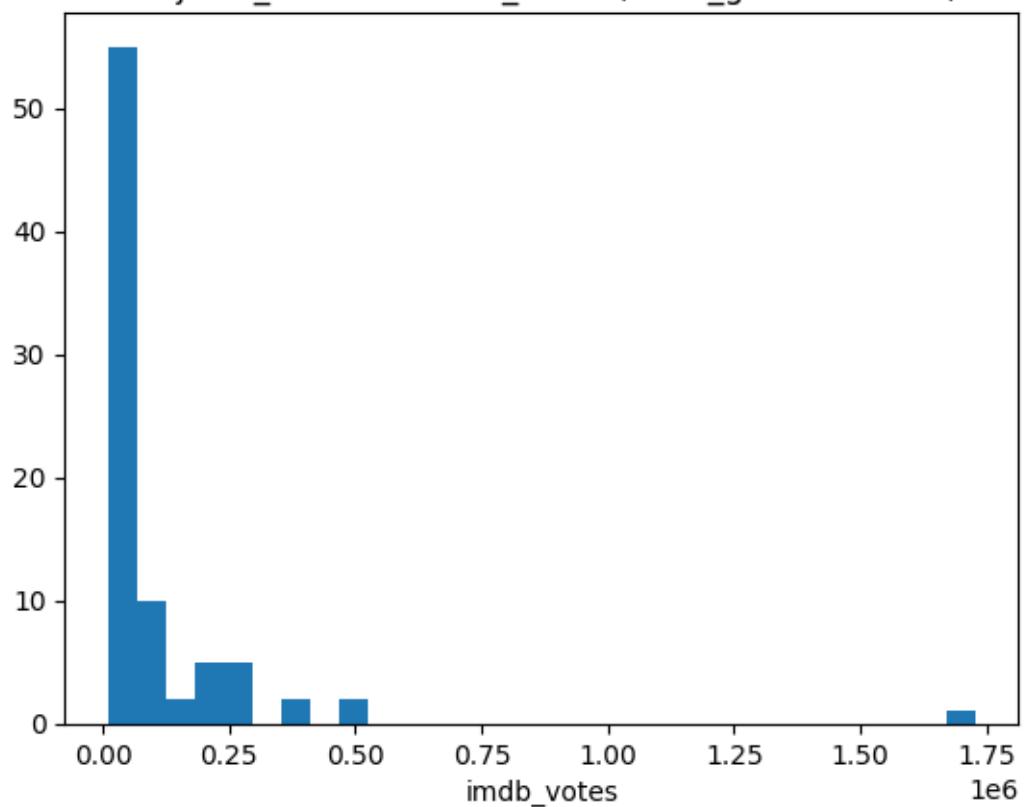
mejores_shows — imdb_votes (main_genre=crime)



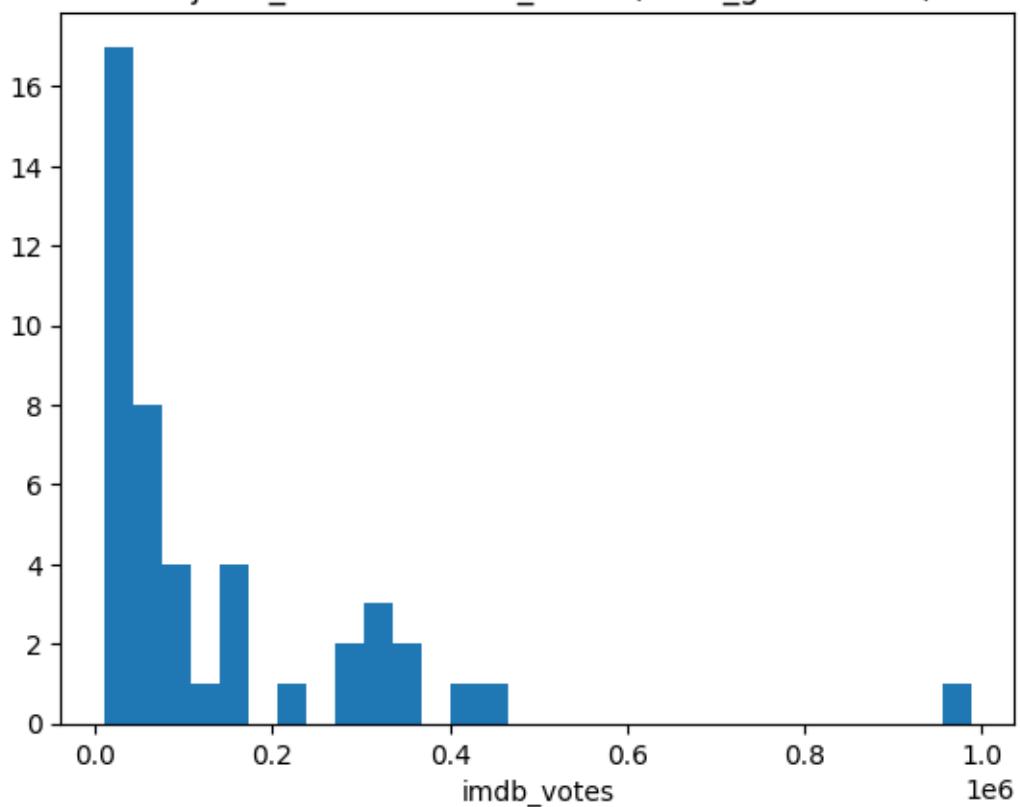
mejores_shows — imdb_votes (main_genre=documentary)



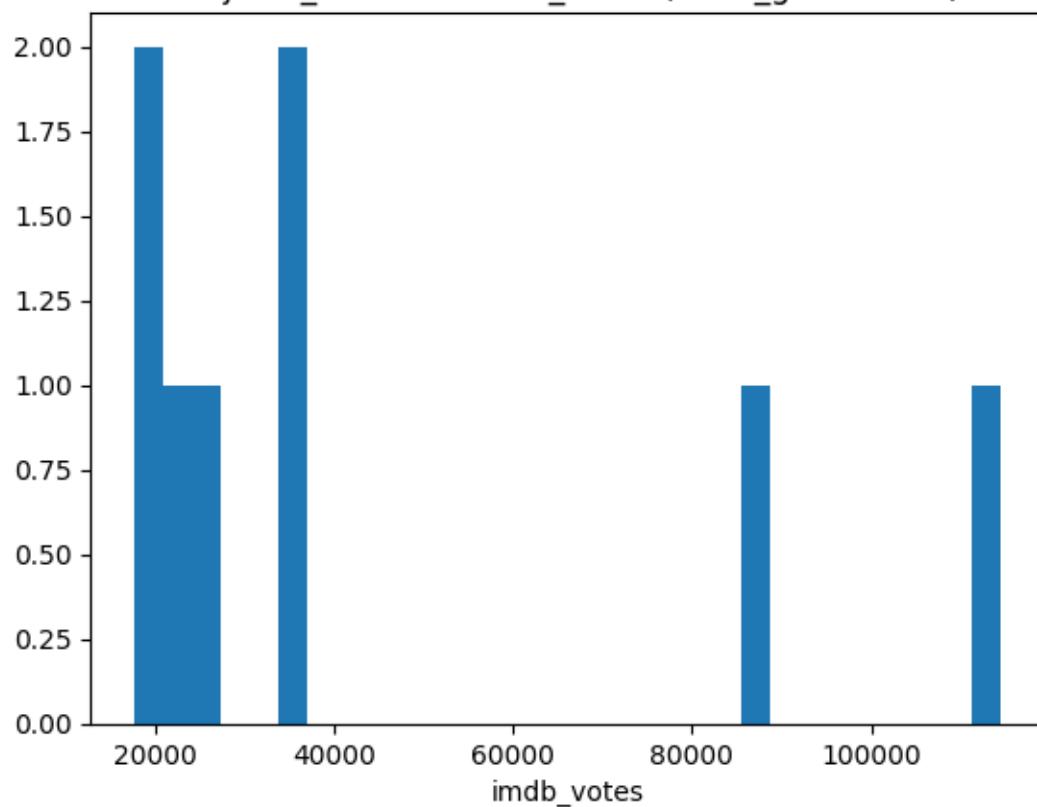
mejores_shows — imdb_votes (main_genre=drama)



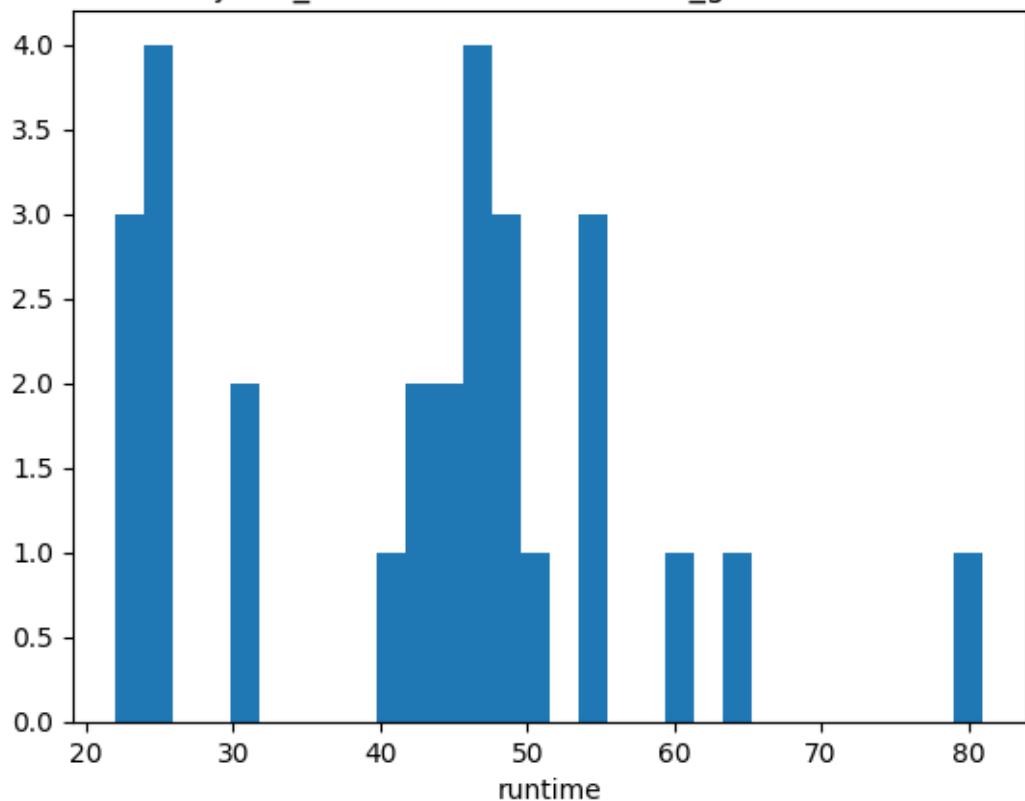
mejores_shows — imdb_votes (main_genre=scifi)



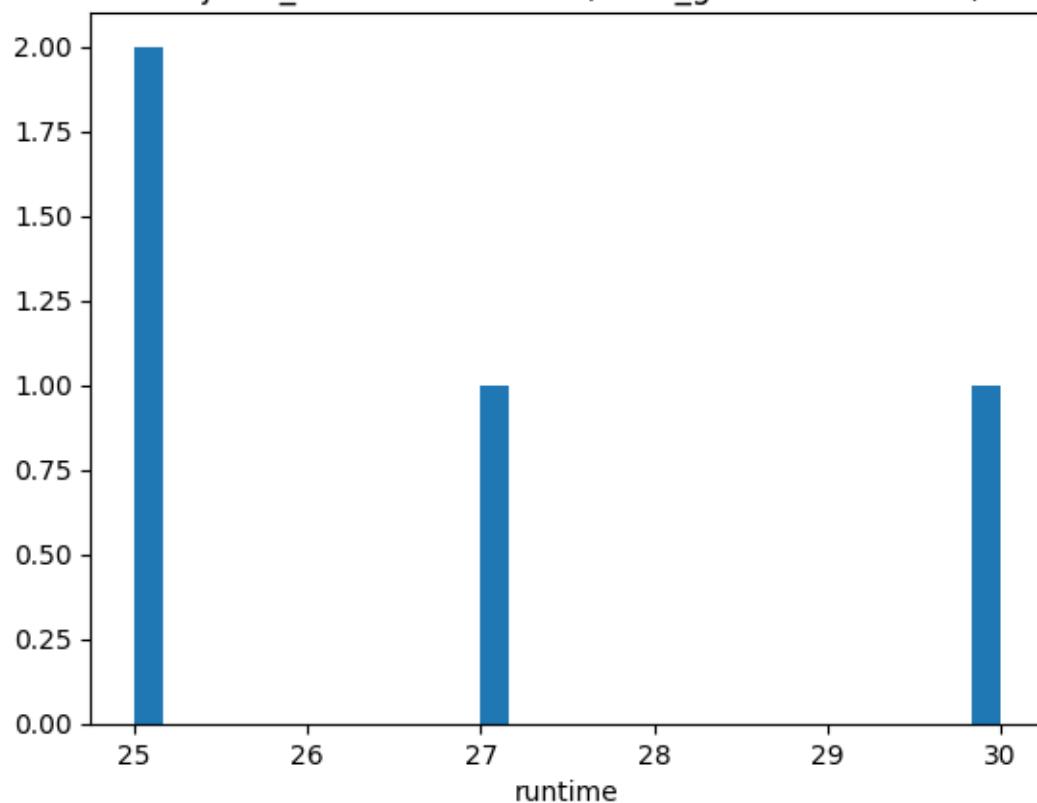
mejores_shows — imdb_votes (main_genre=war)



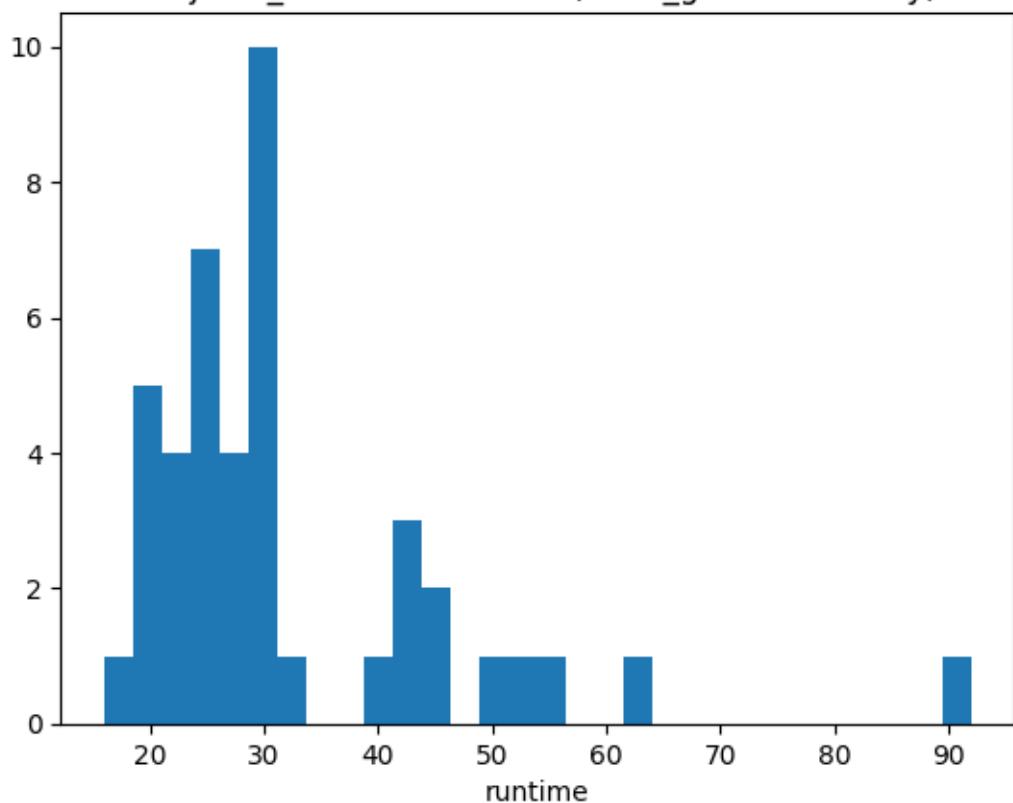
mejores_shows — runtime (main_genre=action)



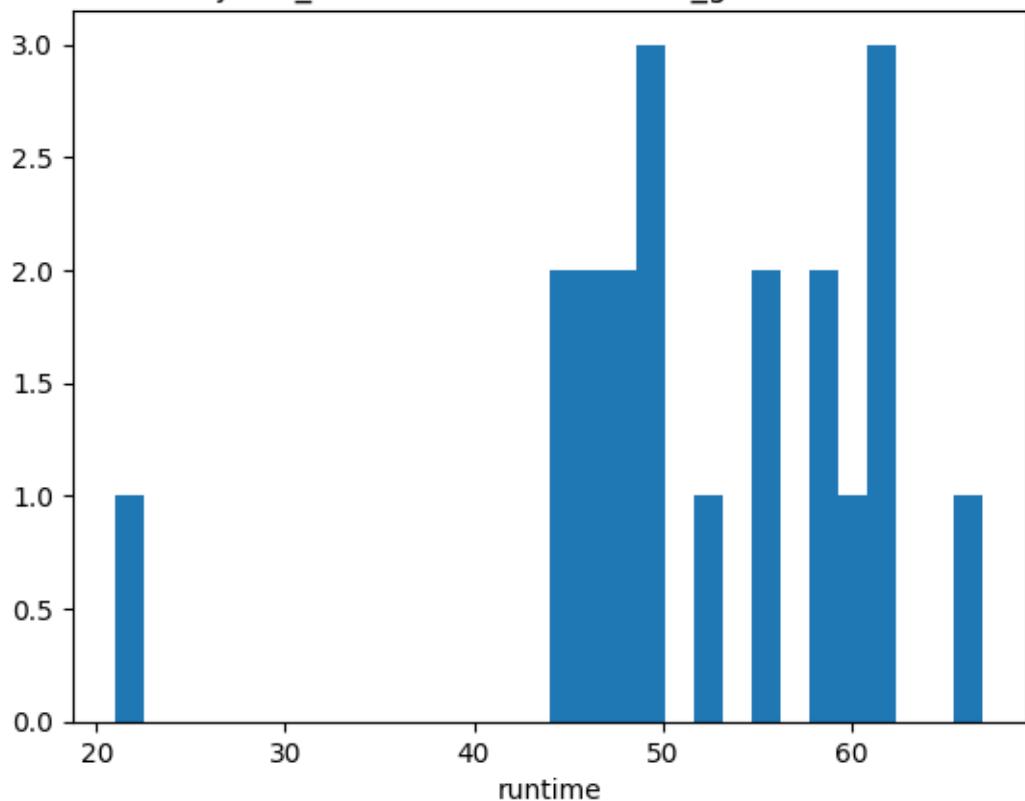
mejores_shows — runtime (main_genre=animation)



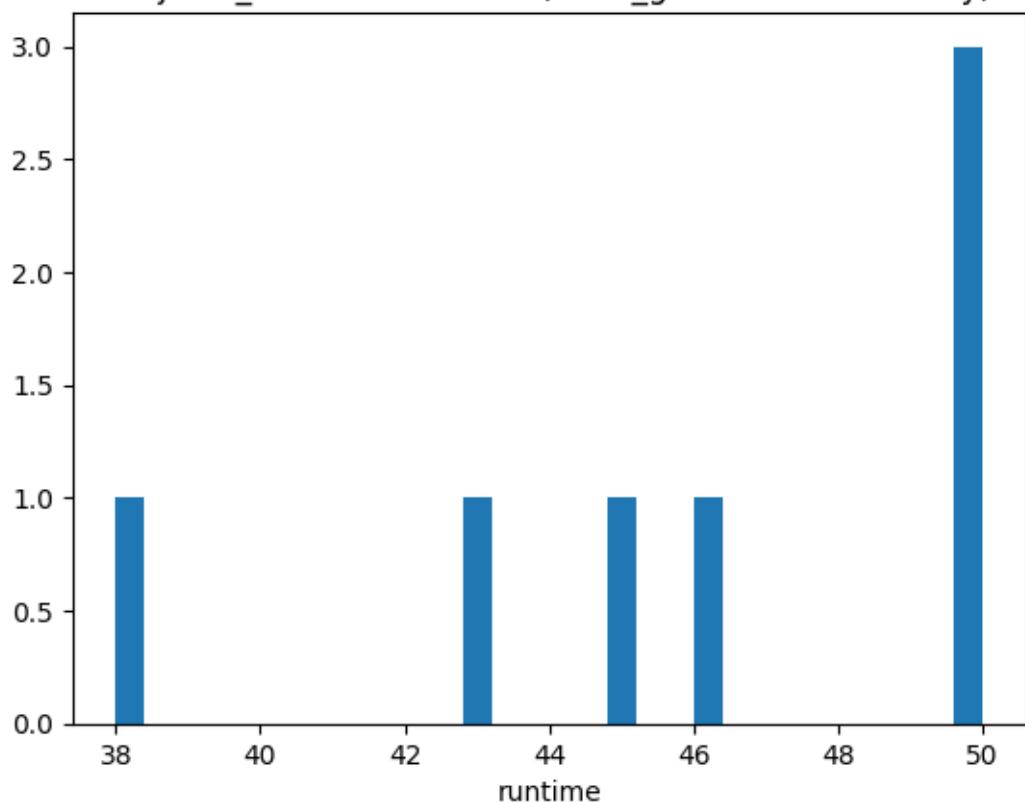
mejores_shows — runtime (main_genre=comedy)



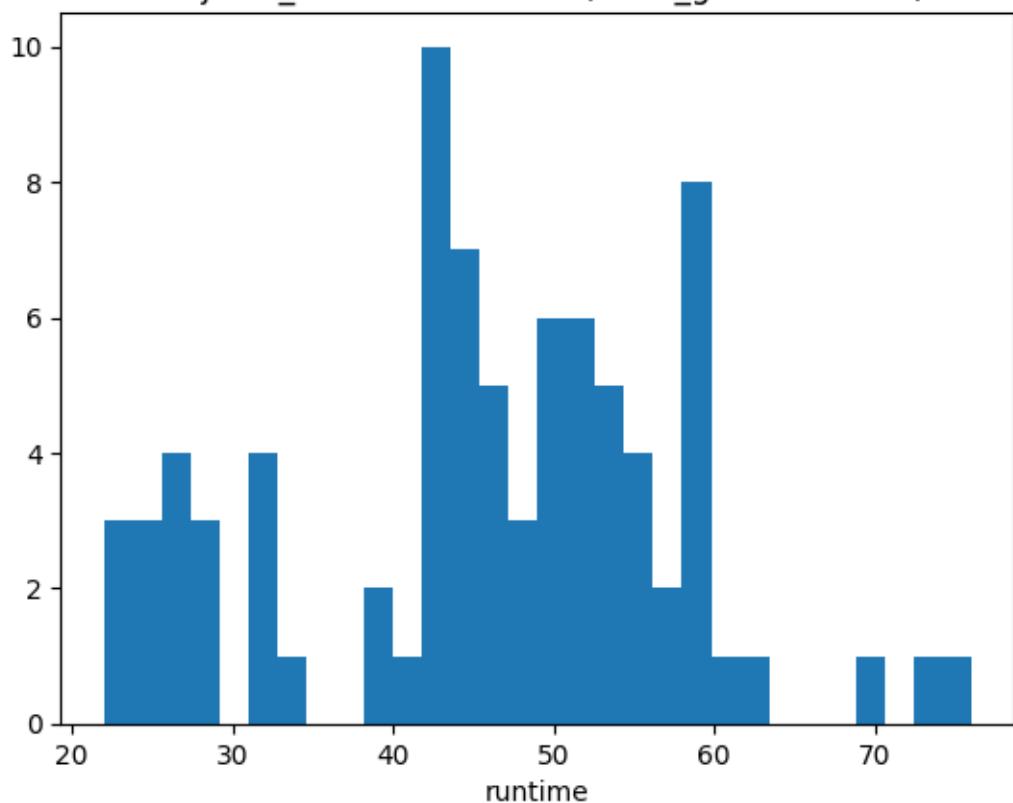
mejores_shows — runtime (main_genre=crime)



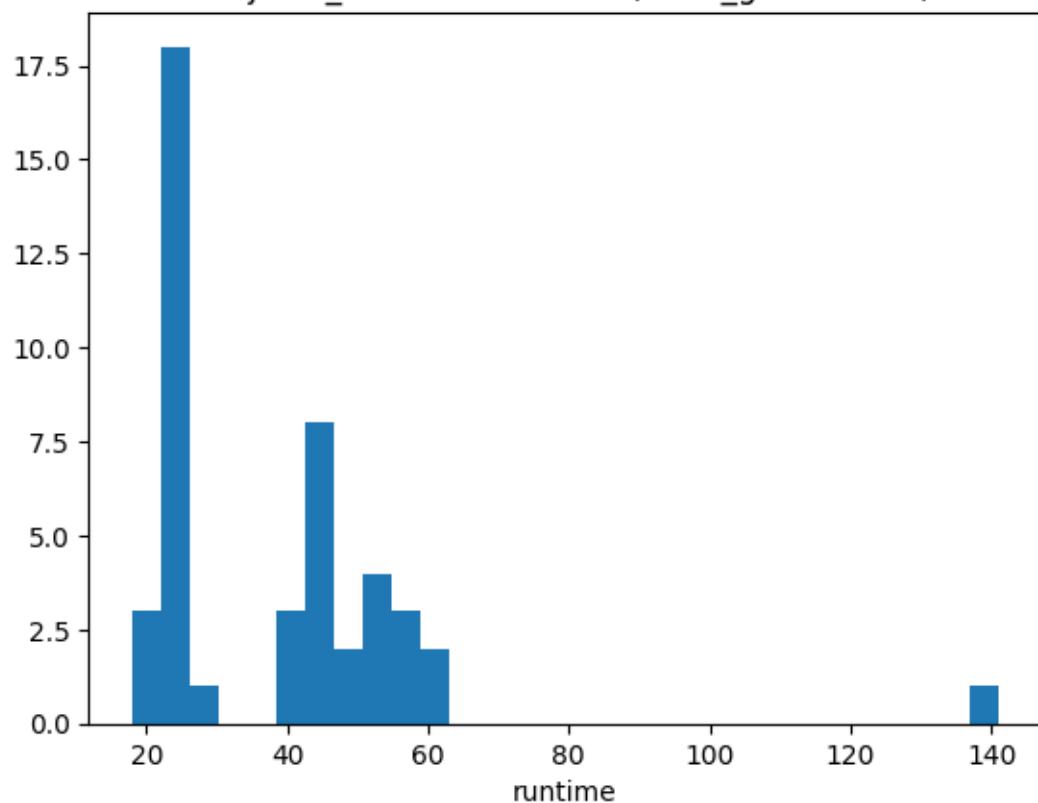
mejores_shows — runtime (main_genre=documentary)

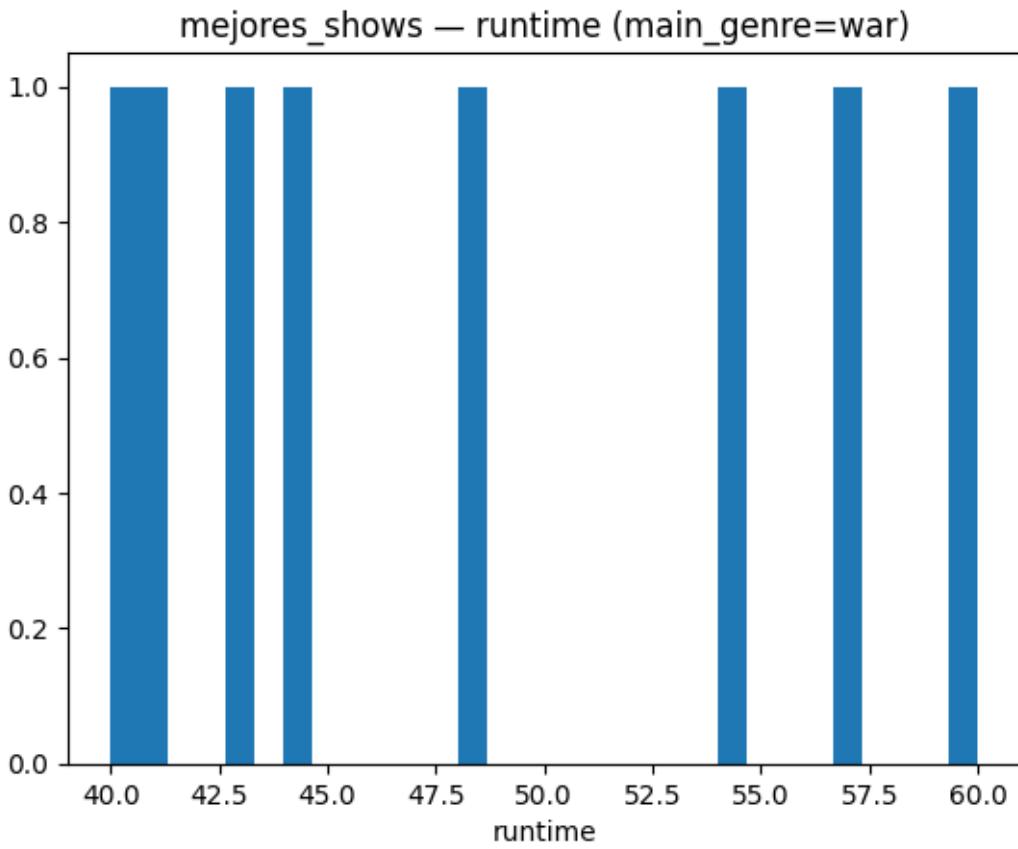


mejores_shows — runtime (main_genre=drama)



mejores_shows — runtime (main_genre=scifi)





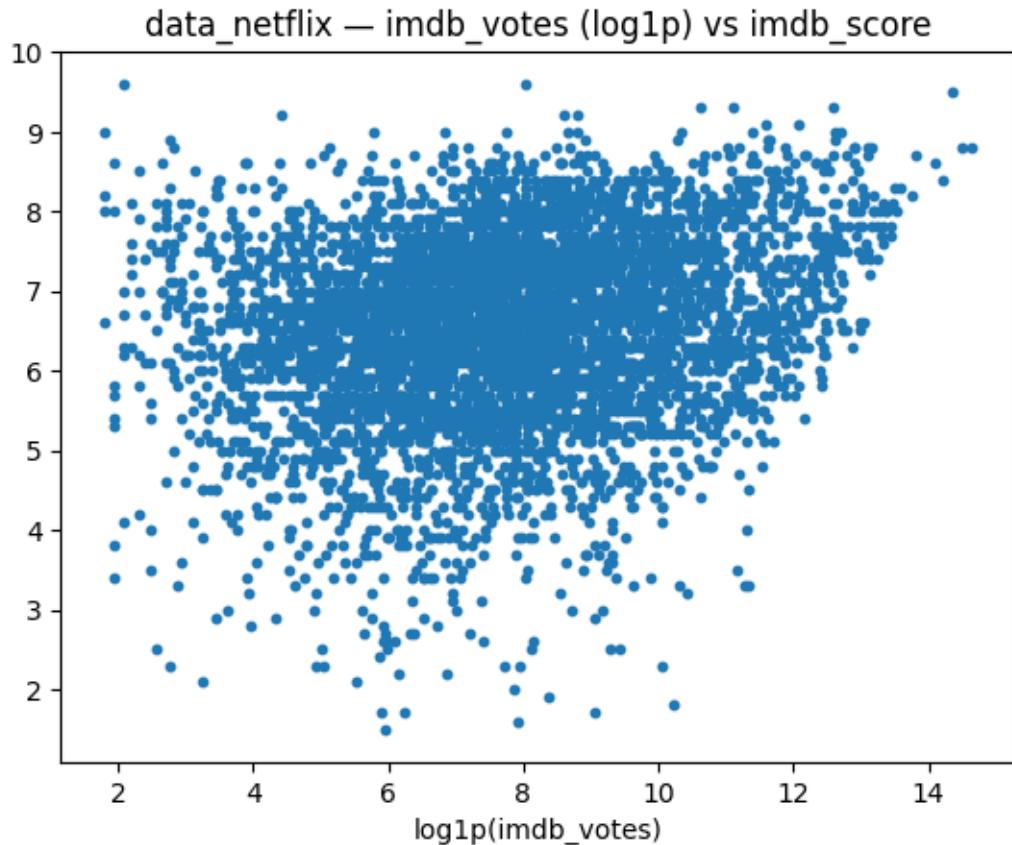
Comentarios del punto 6) - **Correlación:** relación **positiva pero moderada** entre `imdb_votes` y `imdb_score`; no basta con “muchos votos” para tener alto score. - Estratificados: los **SHOWS** tienden a promedios más altos (**7.02**) que MOVIES (**6.27**); por género se observan diferencias claras.

1.7 7) Dispersión `imdb_votes` vs `imdb_score` (log1p en votos)

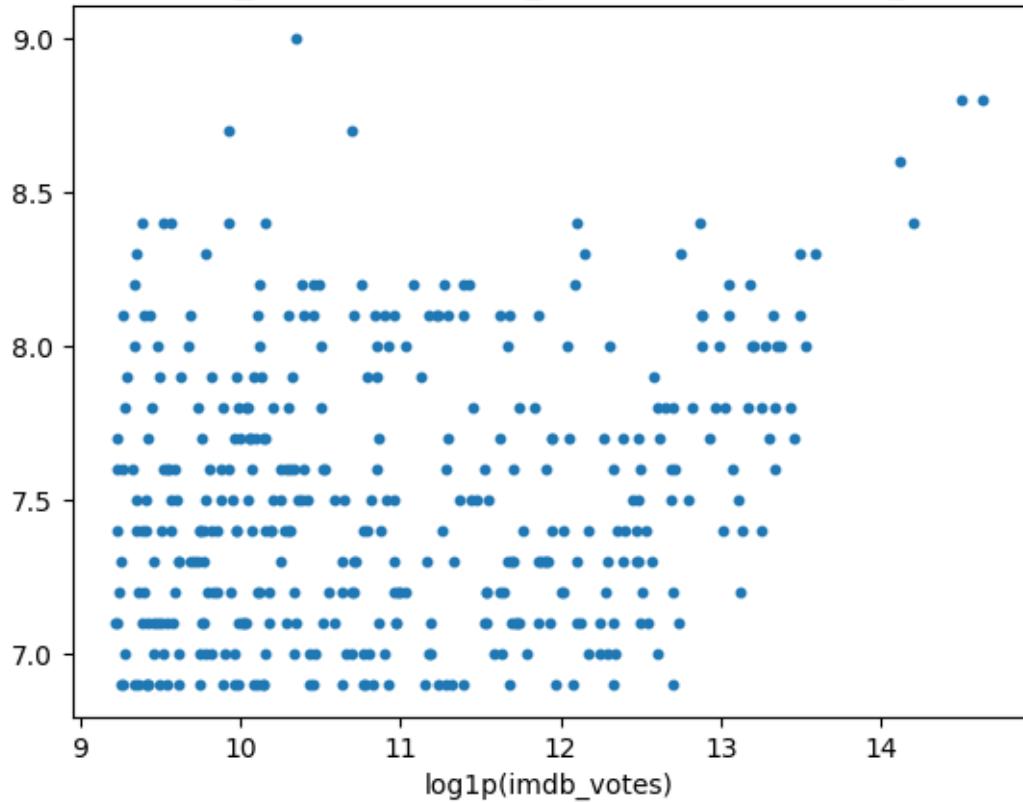
Muestreo si hay demasiados puntos para mantener legibilidad.

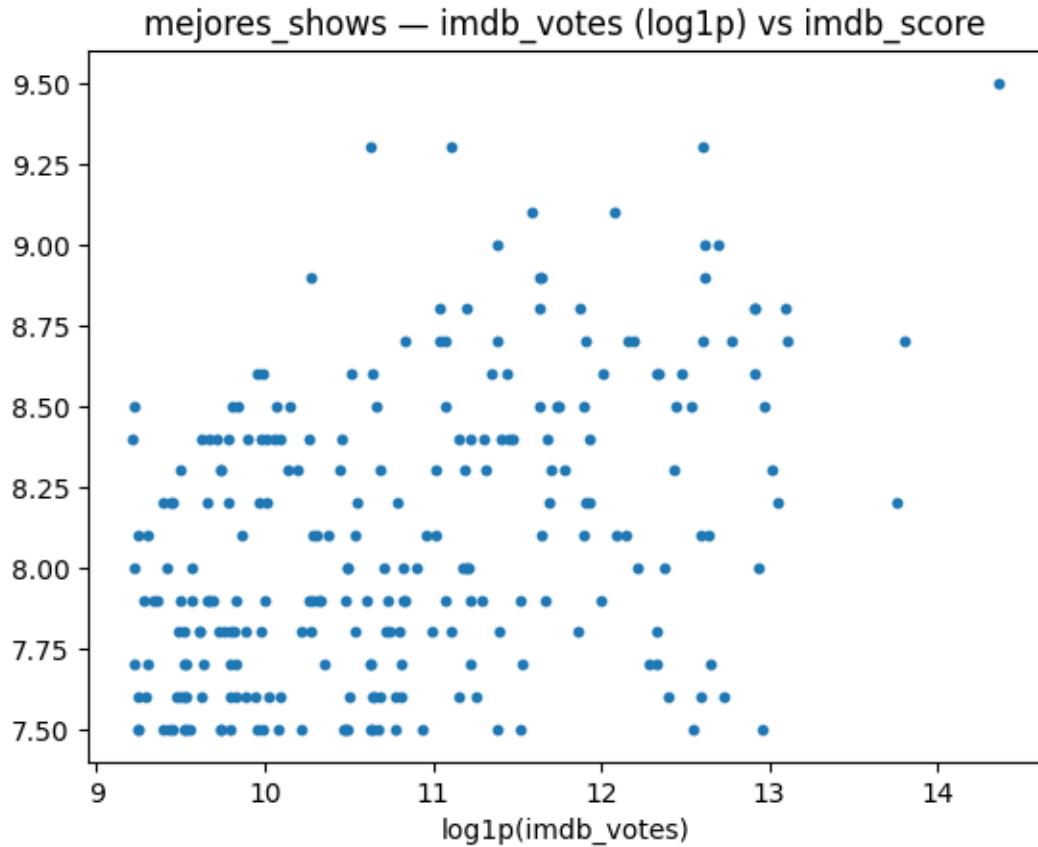
```
[29]: for nombre, df in vistas.items():
    if "imdb_votes" not in df.columns or "imdb_score" not in df.columns:
        continue
    d = pd.DataFrame({
        "imdb_votes": pd.to_numeric(df["imdb_votes"], errors="coerce"),
        "imdb_score": pd.to_numeric(df["imdb_score"], errors="coerce"),
    }).dropna()
    d = d[d["imdb_votes"] >= 0]
    if d.empty: continue
    if len(d) > 20000: d = d.sample(20000, random_state=42)
    x = np.log1p(d["imdb_votes"].values); y = d["imdb_score"].values
```

```
fig, ax = plt.subplots(); ax.scatter(x, y, s=10)
ax.set_title(f"{nombre} - imdb_votes (log1p) vs imdb_score"); ax.
set_xlabel("log1p(imdb_votes)")
mostrar_fig(fig, carpeta_plots / f"{nombre}_scatter_votes_vs_score.png")
```



mejores_peliculas — imdb_votes (log1p) vs imdb_score





Comentarios del punto 7) - Dispersión `log1p(votes)` vs `score` evidencia **pocos mega-hits** (altísimos votos) y gran masa de títulos medianos. - Recomendación: usar **escala log** o **winsorizar** votos para modelos/visualizaciones estables.

1.8 8) Donantes por llave (cruda vs normalizada)

Compara cobertura de donantes con `title+release_year` cruda vs normalizada.

```
[30]: def cobertura_donantes_por_llave(base, pools, col, usar_norm=False):
    llave = ["title_norm", "release_year"] if usar_norm else
    ["title", "release_year"]
    if not set(llave+[col]).issubset(base.columns):
        return {"faltantes_en_base":0, "con_donante":0, "pct_con_donante":0.0}
    miss = base[base[col].isna() & base[llave[0]].notna() & base[llave[1]].
    ~notna()][llave].drop_duplicates()
    if miss.empty:
        return {"faltantes_en_base":0, "con_donante":0, "pct_con_donante":0.0}
    bolsa = []
    for d in pools:
        if set(llave+[col]).issubset(d.columns):
```

```

        tmp = d[llave+[col]].dropna(subset=[col]).drop_duplicates(llave)
        bolsa.append(tmp)

    if not bolsa:
        return {"faltantes_en_base":len(miss), "con_donante":0, "pct_con_donante":0.0}
    bolsa = pd.concat(bolsa, ignore_index=True).drop_duplicates(llave)
    m = miss.merge(bolsa, on=llave, how="left")
    con = int(m[col].notna().sum()); total = len(miss)
    return {"faltantes_en_base": total, "con_donante": con, "pct_con_donante": round(con/total*100,2)}

if "data.netflix" in vistas:
    pools = [vistas[k] for k in vistas if k != "data.netflix"]
    for c in ["imdb_score","imdb_votes","runtime"]:
        print(f"\n==== data.netflix - donantes de {c} (llave cruda) ===")
        display(pd.Series(cobertura_donantes_por_llave(vistas["data.netflix"], pools, col=c, usar_norm=False)))
        print(f"==== data.netflix - donantes de {c} (llave NORMALIZADA) ===")
        display(pd.Series(cobertura_donantes_por_llave(vistas["data.netflix"], pools, col=c, usar_norm=True)))

```

```

==== data.netflix - donantes de imdb_score (llave cruda) ===
faltantes_en_base      522.0
con_donante            0.0
pct_con_donante       0.0
dtype: float64

==== data.netflix - donantes de imdb_score (llave NORMALIZADA) ===
faltantes_en_base      520.0
con_donante            0.0
pct_con_donante       0.0
dtype: float64

==== data.netflix - donantes de imdb_votes (llave cruda) ===
faltantes_en_base      538.0
con_donante            0.0
pct_con_donante       0.0
dtype: float64

==== data.netflix - donantes de imdb_votes (llave NORMALIZADA) ===
faltantes_en_base      536.0
con_donante            0.0
pct_con_donante       0.0
dtype: float64

```

```

==== data.netflix - donantes de runtime (llave cruda) ====
faltantes_en_base      0.0
con_donante            0.0
pct_con_donante       0.0
dtype: float64

==== data.netflix - donantes de runtime (llave NORMALIZADA) ====
faltantes_en_base      0.0
con_donante            0.0
pct_con_donante       0.0
dtype: float64

```

Comentarios del punto 8) - **Imputación cruzada** entre bases: 0% de donantes para `imdb_score/imdb_votes` tanto con llave **cruda** como **normalizada**. - Implicación: `mejores_no_cubre` faltantes de `data.netflix`; será clave un **fallback por género** (mediana) o **enriquecimiento externo/fuzzy matching**.

1.9 9) Patrones de faltantes por segmento

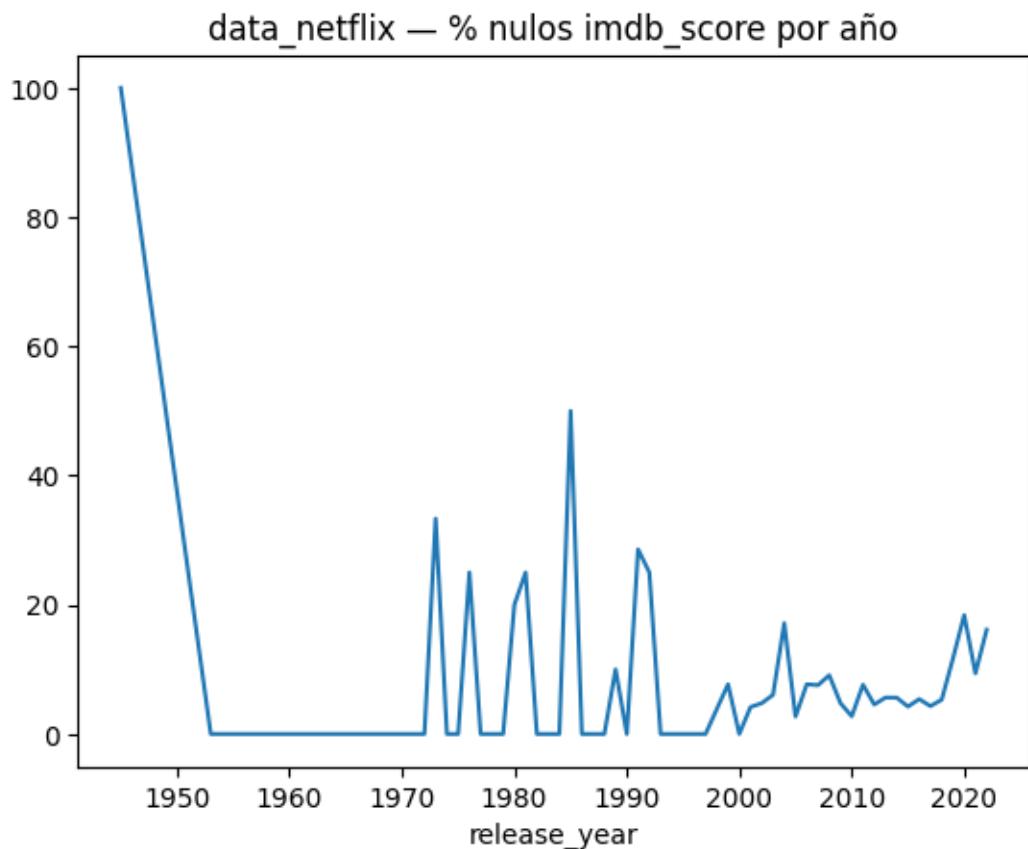
% de nulos por `main_genre` y por año (si existe).

```
[31]: def faltantes_por_categoria(df, col_target, col_cat, top=12):
    if col_target not in df.columns or col_cat not in df.columns:
        return None
    d = df[[col_target, col_cat]].copy()
    d[col_cat] = d[col_cat].fillna("desconocido").astype(str).str.strip()
    d["miss"] = d[col_target].isna()
    t = d.groupby(col_cat)[["miss"]].mean().sort_values(ascending=False).head(top)
    return (t*100).round(2).rename("pct_nulos")

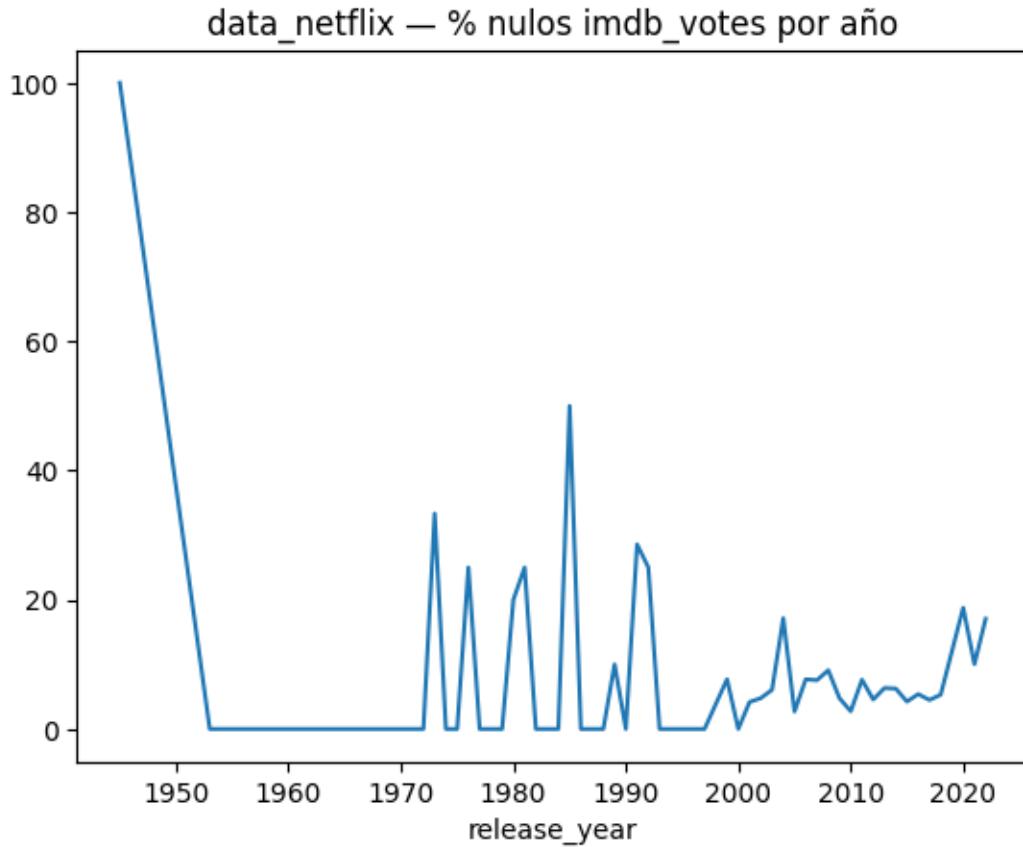
if "data.netflix" in vistas:
    dn = vistas["data.netflix"].copy()
    for col in ["imdb_score", "imdb_votes"]:
        if col in dn.columns:
            print(f"\n==== data.netflix - % nulos de {col} por main_genre ====")
            r = faltantes_por_categoria(dn, col, "main_genre", top=12)
            if r is not None:
                display(r.to_frame())
            if "release_year" in dn.columns:
                d2 = dn[[col, "release_year"]].dropna(subset=["release_year"]).
                    copy()
                d2["miss"] = d2[col].isna()
                g = d2.groupby("release_year")["miss"].mean().mul(100).round(2)
                if not g.empty:
                    fig, ax = plt.subplots(); ax.plot(g.index, g.values)
                    ax.set_title(f"data.netflix - % nulos {col} por año"); ax.
                    set_xlabel("release_year")
```

```
mostrar_fig(fig, carpeta_plots /  
            ↪f"data.netflix_pct_nulos_{col}_por_anio.png")
```

==== data.netflix - % nulos de imdb_score por main_genre ===



==== data.netflix - % nulos de imdb_votes por main_genre ===



Comentarios del punto 9) - Los **faltantes** de `imdb_score/imdb_votes` no son uniformes: varían por **género** y por **año**. - Esto habilita una imputación **segmentada** (p. ej., por `main_genre` y/o `release_year`) más robusta que una global.

1.10 10) Outliers y robustos (IQR / p1-p99) + boxplots por género/tipo

Solo medición (no cambia datos).

```
[32]: def tabla_outliers(df, cols):
    d = {}
    for c in [x for x in cols if x in df.columns]:
        s = pd.to_numeric(df[c], errors="coerce").dropna()
        if s.empty:
            continue
        q1, q3 = s.quantile(0.25), s.quantile(0.75)
        iqr = q3 - q1
        p1, p99 = s.quantile(0.01), s.quantile(0.99)
        d[c] = {
            "count": int(s.size), "mean": s.mean(), "std": s.std(),
            "q1": q1, "median": s.median(), "q3": q3, "iqr": iqr,
```

```

        "p1": p1, "p99": p99
    }
    return pd.DataFrame(d).round(3).T

metricas_out = ["imdb_score", "imdb_votes", "runtime", "seasons"]
for nombre, df in vistas.items():
    print(f"\n== {nombre.upper()} - estadísticos robustos (global) ===")
    display(tabla_outliers(df, metricas_out))
    if "type" in df.columns:
        for t, g in df.groupby("type", dropna=False):
            print(f"\n{nombre} - {t}: estadísticos robustos")
            display(tabla_outliers(g, metricas_out))

for nombre, df in vistas.items():
    if "main_genre" not in df.columns: continue
    top_gen = df["main_genre"].fillna("desconocido").value_counts().head(8).index.tolist()
    for c in [x for x in ["imdb_score", "runtime", "imdb_votes"] if x in df.columns]:
        datos, labels = [], []
        for gen in top_gen:
            vals = pd.to_numeric(df.loc[df["main_genre"]==gen, c], errors="coerce").dropna().values
            if len(vals)>0: datos.append(vals); labels.append(gen)
        if not datos: continue
        fig, ax = plt.subplots(); ax.boxplot(datos, labels=labels, vert=True, showfliers=True)
        ax.set_title(f"{nombre} - {c} por main_genre (Top 8)"); ax.set_xlabel("main_genre")
        plt.xticks(rotation=45, ha="right"); mostrar_fig(fig, carpeta_plots / f"{nombre}_{c}_boxplot_genre.png")

```

== DATA_NETFLIX - estadísticos robustos (global) ==

	count	mean	std	q1	median	q3	iqr	\
imdb_score	5283.0	6.533	1.161	5.8	6.6	7.4	1.6	
imdb_votes	5267.0	23407.195	87134.316	521.0	2279.0	10144.0	9623.0	
runtime	5806.0	77.644	39.474	44.0	84.0	105.0	61.0	
seasons	2047.0	2.166	2.636	1.0	1.0	2.0	1.0	

	p1	p99
imdb_score	3.20	8.70
imdb_votes	14.00	392545.14
runtime	6.05	170.00
seasons	1.00	12.00

data_netflix - MOVIE: estadísticos robustos

	count	mean	std	q1	median	q3	iqr	\
imdb_score	3407.0	6.267	1.117	5.6	6.4	7.1	1.5	
imdb_votes	3391.0	26683.217	94710.021	573.0	2632.0	12281.0	11708.0	
runtime	3759.0	98.785	30.834	85.0	98.0	115.0	30.0	
	p1	p99						
imdb_score	3.0	8.4						
imdb_votes	17.0	435855.4						
runtime	17.0	175.0						

data_netflix - SHOW: estadísticos robustos

	count	mean	std	q1	median	q3	iqr	\
imdb_score	1876.0	7.017	1.080	6.4	7.2	7.80	1.40	
imdb_votes	1876.0	17485.558	71072.110	444.5	1782.0	7216.75	6772.25	
runtime	2047.0	38.821	18.591	25.0	41.0	49.00	24.00	
seasons	2047.0	2.166	2.636	1.0	1.0	2.00	1.00	
	p1	p99						
imdb_score	3.75	8.90						
imdb_votes	11.00	304097.75						
runtime	0.00	89.00						
seasons	1.00	12.00						

==== MEJORES_PELICULAS - estadísticos robustos (global) ===

	count	mean	std	q1	median	q3	\
imdb_score	387.0	7.509	0.442	7.1	7.4	7.8	
imdb_votes	387.0	136520.649	234211.422	20512.5	45200.0	153485.5	
runtime	387.0	123.395	28.372	103.5	122.0	139.0	
	iqr	p1	p99				
imdb_score	0.7	6.90	8.70				
imdb_votes	132973.0	10264.74	872333.72				
runtime	35.5	66.72	209.14				

==== MEJORES_SHOWS - estadísticos robustos (global) ===

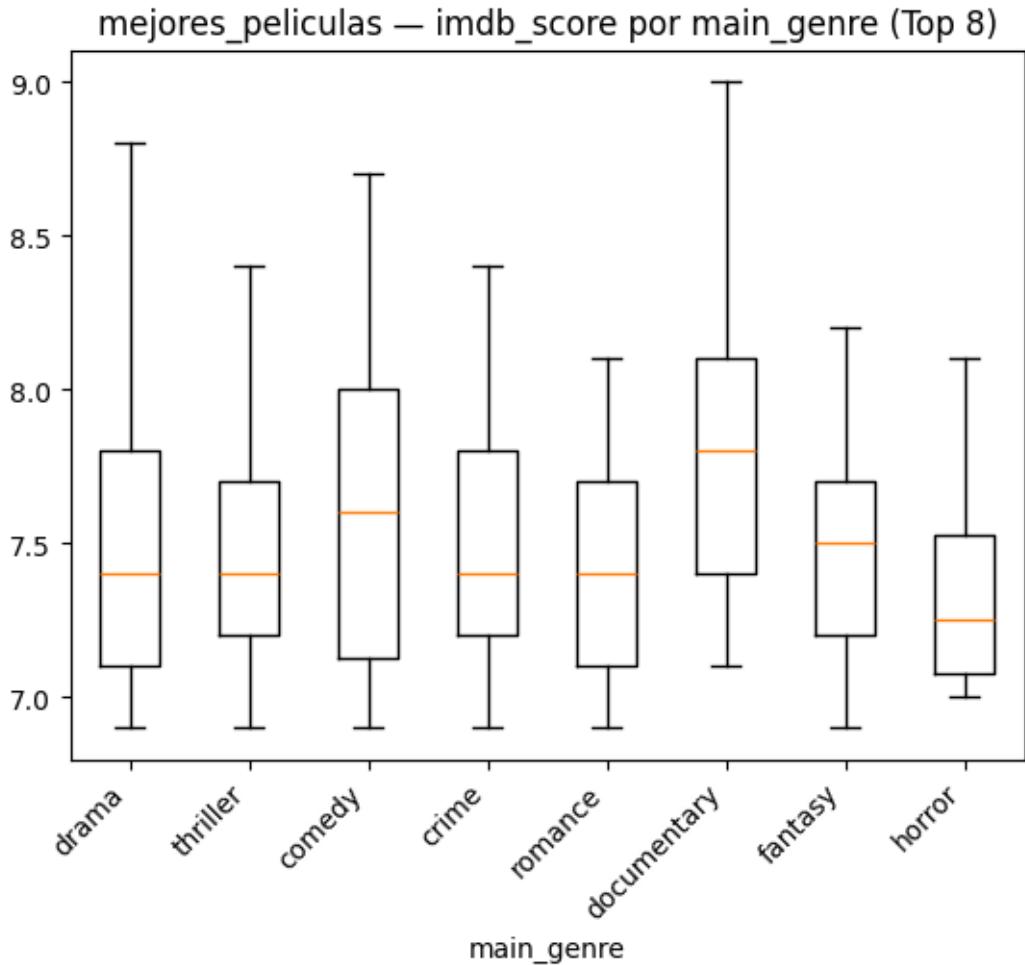
	count	mean	std	q1	median	q3	\
imdb_score	246.0	8.093	0.449	7.70	8.0	8.40	
imdb_votes	246.0	101966.789	168874.642	18553.25	41942.5	112811.75	
runtime	246.0	41.919	15.243	27.25	44.0	51.75	
seasons	246.0	3.650	3.192	1.00	3.0	5.00	
	iqr	p1	p99				
imdb_score	0.7	7.50	9.30				

```

imdb_votes 94258.5 10161.45 742160.15
runtime      24.5     20.45     78.75
seasons       4.0      1.00     16.65

C:\Users\mario\AppData\Local\Temp\ipykernel_25712\1450100210.py:35:
MatplotlibDeprecationWarning: The 'labels' parameter of boxplot() has been
renamed 'tick_labels' since Matplotlib 3.9; support for the old name will be
dropped in 3.11.
    fig, ax = plt.subplots(); ax.boxplot(datos, labels=labels, vert=True,
showfliers=True)

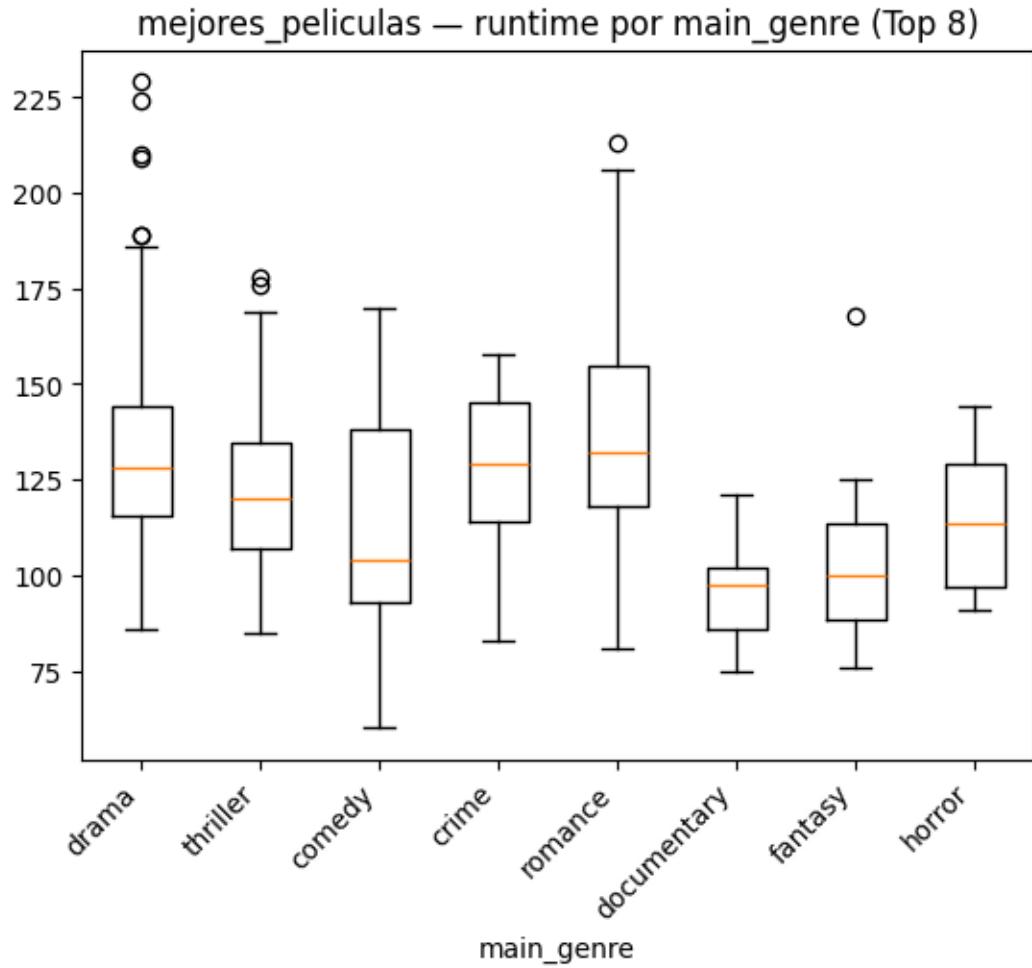
```



```

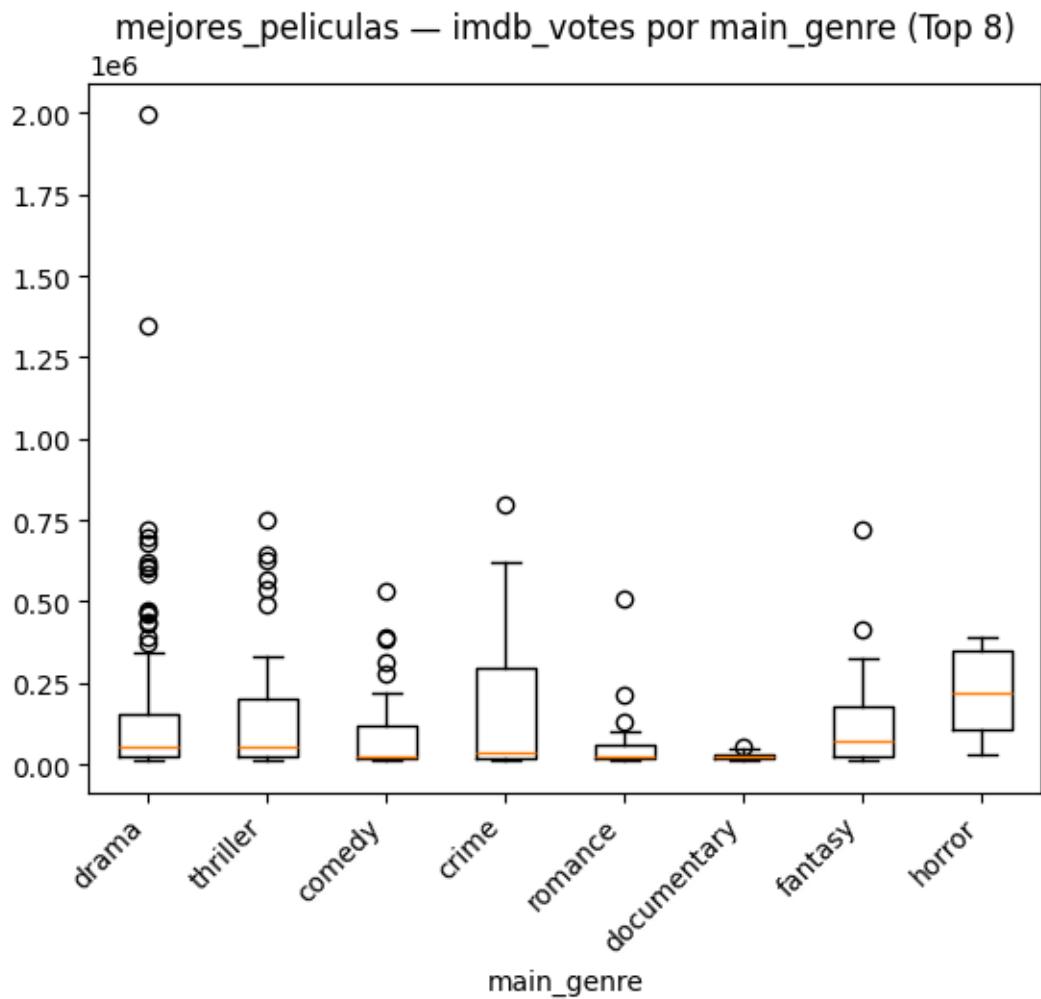
C:\Users\mario\AppData\Local\Temp\ipykernel_25712\1450100210.py:35:
MatplotlibDeprecationWarning: The 'labels' parameter of boxplot() has been
renamed 'tick_labels' since Matplotlib 3.9; support for the old name will be
dropped in 3.11.
    fig, ax = plt.subplots(); ax.boxplot(datos, labels=labels, vert=True,
showfliers=True)

```

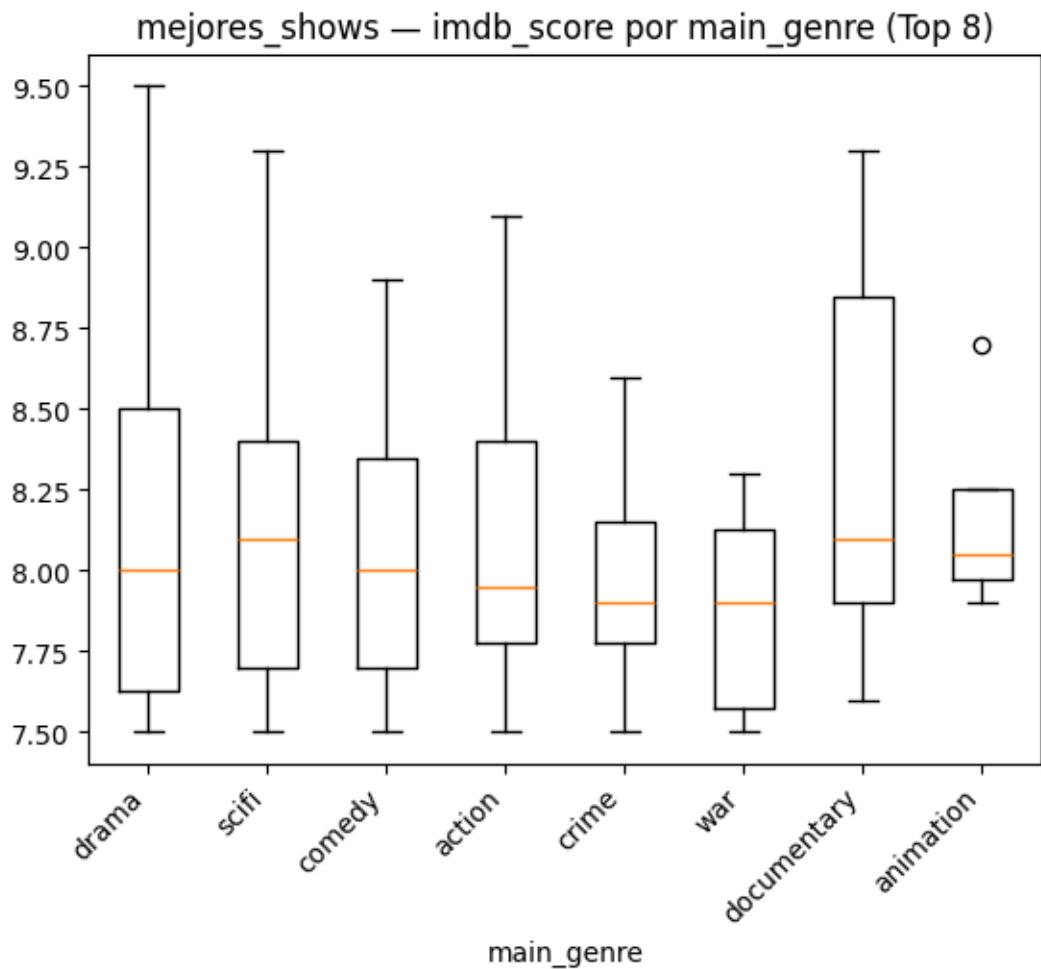


```
C:\Users\mario\AppData\Local\Temp\ipykernel_25712\1450100210.py:35:  
MatplotlibDeprecationWarning: The 'labels' parameter of boxplot() has been  
renamed 'tick_labels' since Matplotlib 3.9; support for the old name will be  
dropped in 3.11.
```

```
fig, ax = plt.subplots(); ax.boxplot(datos, labels=labels, vert=True,  
showfliers=True)
```



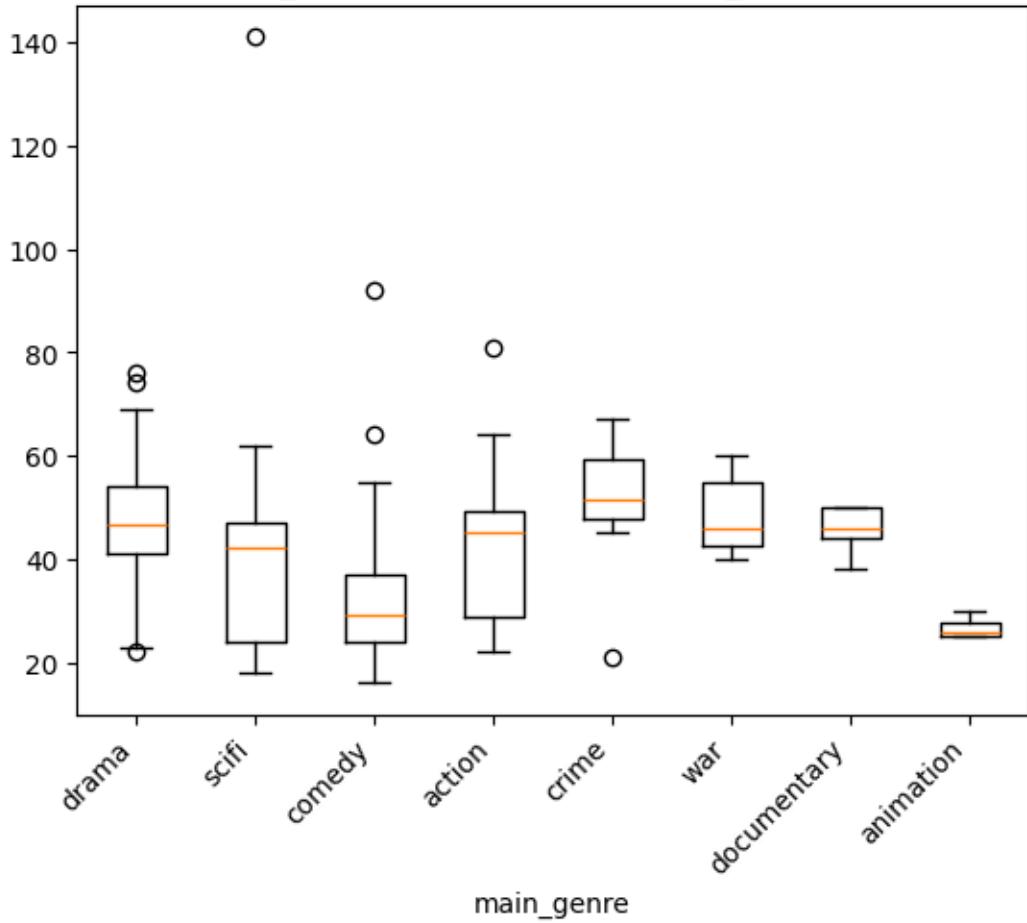
```
C:\Users\mario\AppData\Local\Temp\ipykernel_25712\1450100210.py:35:  
MatplotlibDeprecationWarning: The 'labels' parameter of boxplot() has been  
renamed 'tick_labels' since Matplotlib 3.9; support for the old name will be  
dropped in 3.11.  
fig, ax = plt.subplots(); ax.boxplot(datos, labels=labels, vert=True,  
showfliers=True)
```



```
C:\Users\mario\AppData\Local\Temp\ipykernel_25712\1450100210.py:35:  
MatplotlibDeprecationWarning: The 'labels' parameter of boxplot() has been  
renamed 'tick_labels' since Matplotlib 3.9; support for the old name will be  
dropped in 3.11.
```

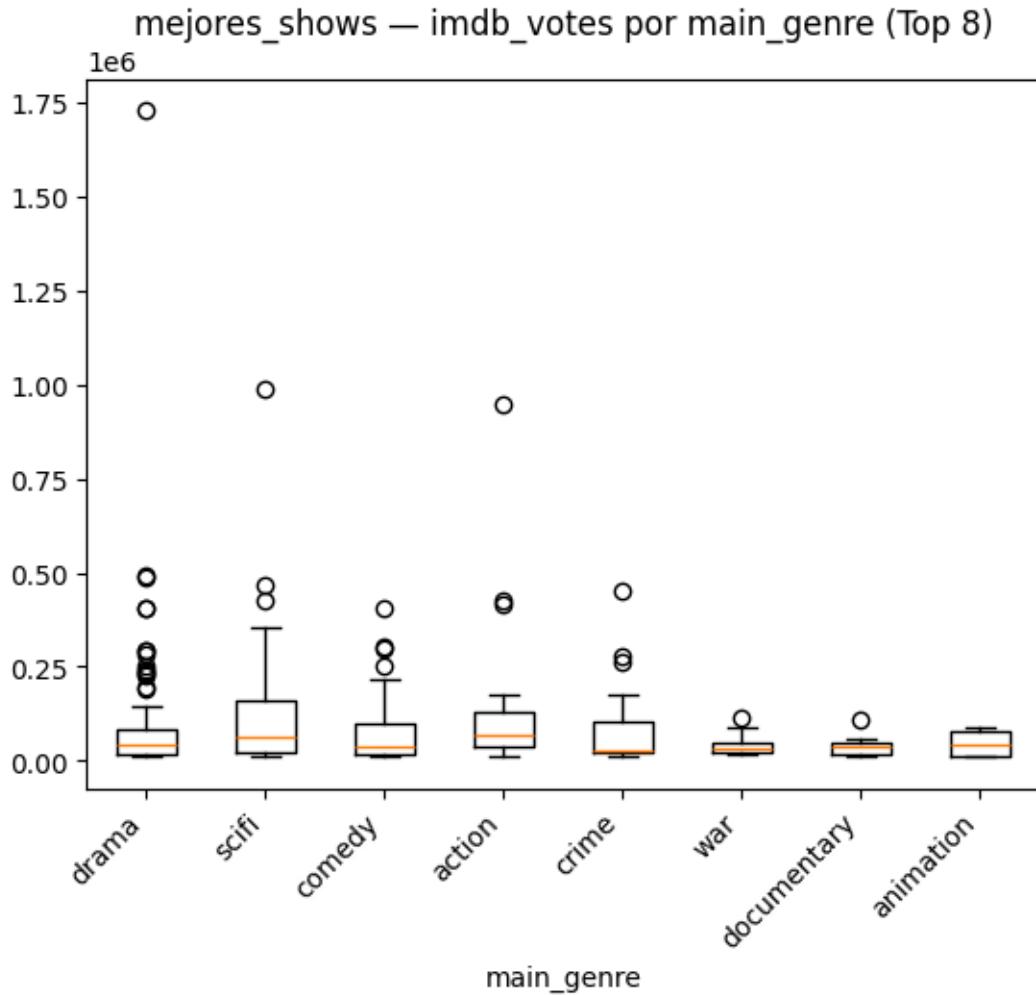
```
fig, ax = plt.subplots(); ax.boxplot(datos, labels=labels, vert=True,  
showfliers=True)
```

mejores_shows — runtime por main_genre (Top 8)



```
C:\Users\mario\AppData\Local\Temp\ipykernel_25712\1450100210.py:35:  
MatplotlibDeprecationWarning: The 'labels' parameter of boxplot() has been  
renamed 'tick_labels' since Matplotlib 3.9; support for the old name will be  
dropped in 3.11.
```

```
fig, ax = plt.subplots(); ax.boxplot(datos, labels=labels, vert=True,  
showfliers=True)
```



Comentarios del punto 10) - Colas/extremos: `imdb_votes` p90=48,469 / p99=392,545; `runtime` p99 170 min; `seasons` p99 12. - Sugerencia: establecer **reglas de outliers** (caps/winsorization) y validar `seasons` únicamente cuando `type="SHOW"`.

1.11 11) Cardinalidad y co-ocurrencias (explosión temporal)

Para `genres` y `production_countries` cuando vienen como listas en texto (solo medición).

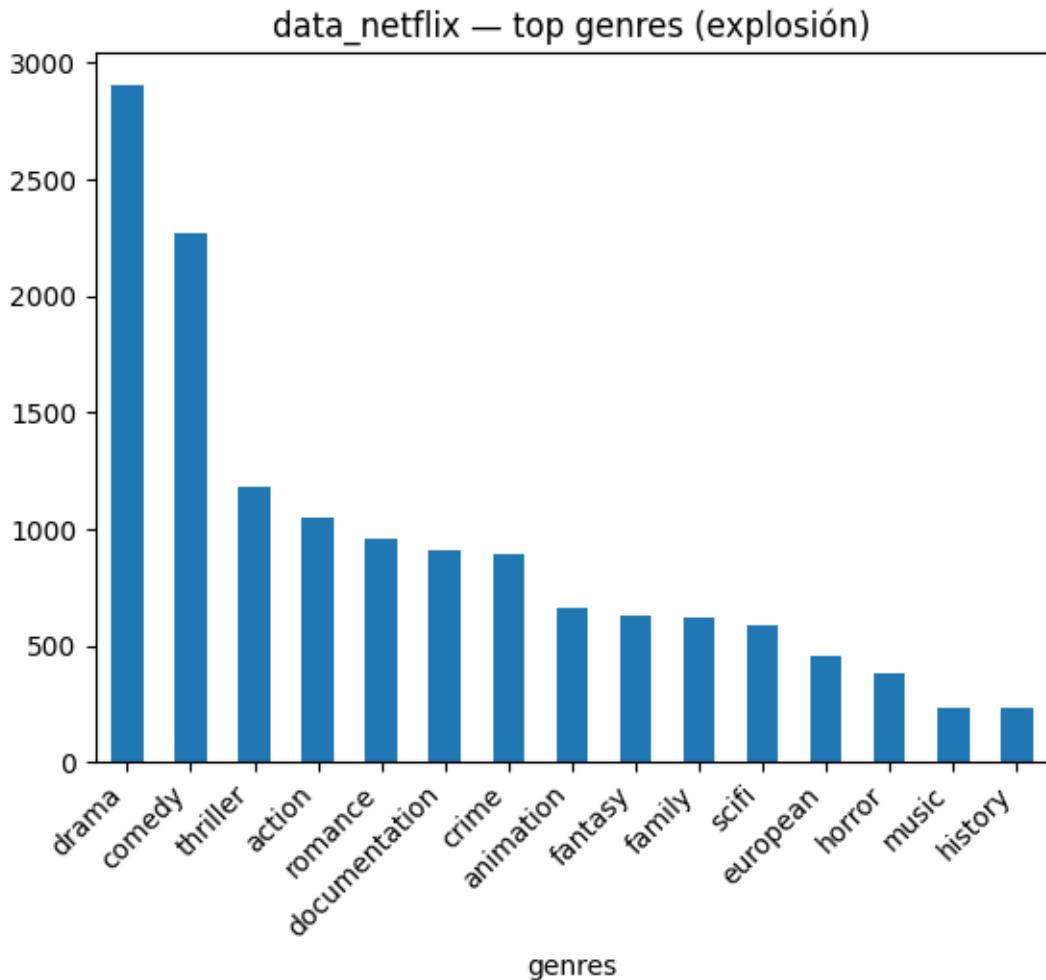
```
[33]: def parse_lista_seguro(x):
    if isinstance(x, list): return x
    s = str(x)
    if s.startswith("[") and s.endswith("]"):
        try:
            val = ast.literal_eval(s)
            if isinstance(val, list): return val
        except Exception:
```

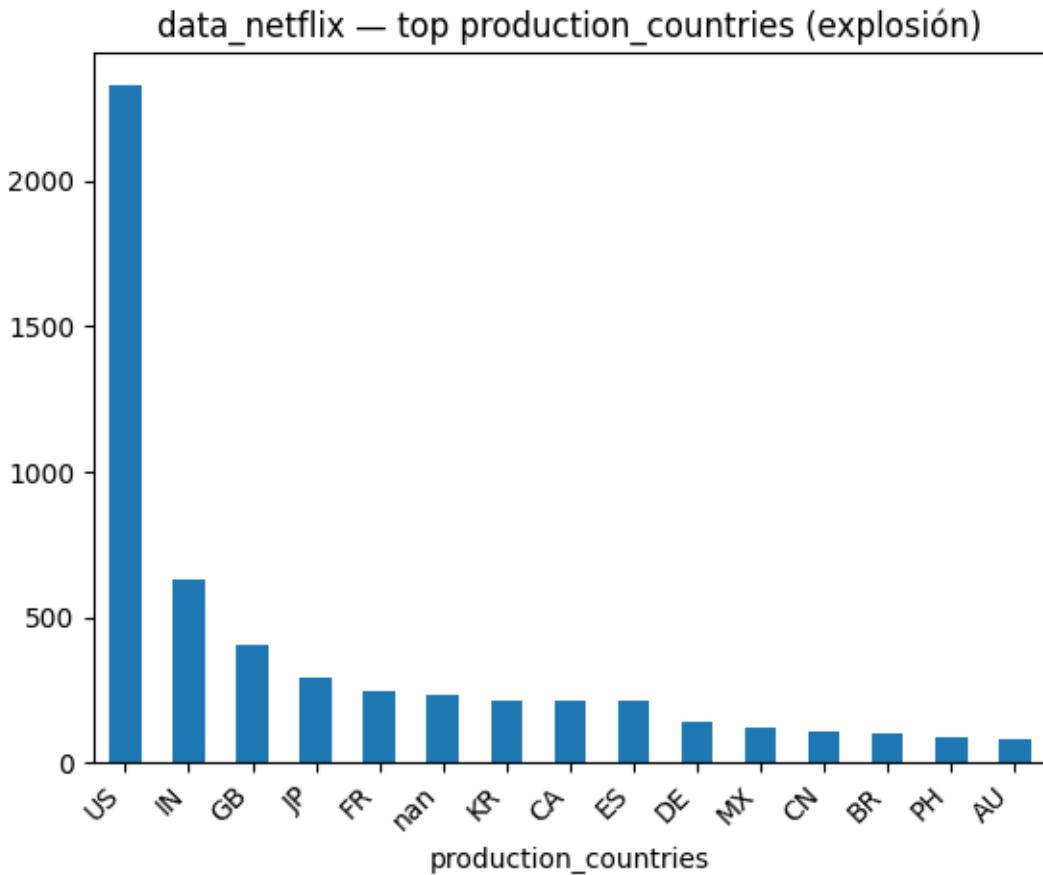
```

        pass
    return [x] if pd.notna(x) else []

if "data.netflix" in vistas:
    dn = vistas["data.netflix"].copy()
    for col in ["genres", "production_countries"]:
        if col not in dn.columns: continue
        tmp = dn[[col]].dropna().copy(); tmp[col] = tmp[col].
        ↪map(parse_lista_seguro)
        tmp = tmp.explode(col); tmp[col] = tmp[col].astype(str).str.strip()
        top = tmp[col].value_counts().head(15)
        if not top.empty:
            fig, ax = plt.subplots(); top.plot(kind="bar", ax=ax, ↪
        ↪title=f"data.netflix - top {col} (explosión)")
            plt.xticks(rotation=45, ha="right"); mostrar_fig(fig, carpeta_plots ↪
        ↪/ f"data.netflix_top_{col}_explosion.png")

```





Comentarios del punto 11) - **Cardinalidad** tras “explosión” de listas confirma que pocos géneros/países concentran la mayoría; hay **larga cola** de categorías. - Útil para **Top-N**, filtros y diseño de **dashboards** sin ruido de categorías muy raras.

1.12 12) Rendimiento (memoria) con categorías — medición en copia

No altera tus DataFrames reales; solo reporta ahorro potencial.

```
[34]: def memoria_en_mb(df):
    return round(df.memory_usage(deep=True).sum()/1024/1024, 3)

for nombre, df in vistas.items():
    base_mb = memoria_en_mb(df)
    cols_cat = [c for c in df.columns
                if ["type", "main_genre", "age_certification", "production_countries"] if c in df.columns]
    if not cols_cat: continue
    d2 = df.copy()
    for c in cols_cat: d2[c] = d2[c].astype("category")
```

```

mb2 = memoria_en_mb(d2); ahorro = round(100*(1 - mb2/base_mb), 2) if
↪base_mb>0 else 0
    print(f"{nombre}: memoria {base_mb} MB → {mb2} MB (ahorro {ahorro}%) ↪
↪[candidatas: {cols_cat}]")

```

data_netflix: memoria 2.565 MB → 1.933 MB (ahorro 24.64%) [candidatas: ['type', 'production_countries']]
mejores_peliculas: memoria 0.089 MB → 0.067 MB (ahorro 24.72%) [candidatas: ['main_genre']]
mejores_shows: memoria 0.058 MB → 0.044 MB (ahorro 24.14%) [candidatas: ['main_genre']]

Comentarios del punto 12) - Conversión a **category** (en copia) reduce **memoria** significativamente en **type**, **main_genre**, **age_certification**, **production_countries**. - Beneficio en performance para ETL y BI, sin cambiar la semántica de los datos.

1.13 13) Coherencias adicionales

`seasons` solo en SHOW, patrón `imdb_id, release_year` año actual.

```
[35]: anio_actual = datetime.now().year
def chequeos_coherencia(df):
    out = {}
    if {"type", "seasons"}.issubset(df.columns):
        bad = df[pd.to_numeric(df["seasons"], errors="coerce").notna() &
↪(df["type"] != "SHOW")]
        out["seasons_con_type_distinto_de_SHOW"] = len(bad)
    if "imdb_id" in df.columns:
        patt = re.compile(r"^\tt\d+$", flags=re.I)
        inv = df[df["imdb_id"].notna() & ~df["imdb_id"].astype(str).str.
↪match(patt)]
        out["imdb_id_patron_invalido"] = len(inv)
    if "release_year" in df.columns:
        fut = df[pd.to_numeric(df["release_year"], errors="coerce").notna() &
↪(pd.to_numeric(df["release_year"], errors="coerce") > anio_actual)]
        out["release_year_en_futuro"] = len(fut)
    return pd.Series(out)

for nombre, df in vistas.items():
    s = chequeos_coherencia(df)
    if s is not None and not s.empty:
        print(f"\n==== {nombre.upper()} - coherencias ===")
        s.to_frame("conteo")
```

==== DATA_NETFLIX - coherencias ===

	conteo
seasons_con_type_distinto_de_SHOW	0

```

imdb_id_patron_invalido          0
release_year_en_futuro           0

==== MEJORES_PELICULAS - coherencias ===

            conteo
release_year_en_futuro          0

==== MEJORES_SHOWS - coherencias ===

            conteo
release_year_en_futuro          0

```

Comentarios del punto 13) - **Coherencias**: validar que `seasons` solo aparezca en `SHOW`, patrón `imdb_id (^tt\d+$)` y `release_year` año actual. - Cualquier violación detectada debe traducirse en **reglas de limpieza** explícitas en el ETL.

1.14 14) Observaciones finales

- Cobertura y calidad base
 - `data.netflix`: **5,806** filas; **0** duplicados exactos.
 - Faltantes: `imdb_score` **9.01%**, `imdb_votes` **9.28%**, `runtime` **0.00%**, `seasons` **64.74%**, `age_certification` **44.95%**, `imdb_id` **7.65%**.
- Desempeño por tipo
 - IMDb promedio: **SHOW 7.02** vs **MOVIE 6.27** → las series tienden a estar **mejor valoradas**.
- Colas pesadas y outliers
 - Votos muy sesgados: **p90=48,469**, **p99=392,545** → usar **escala log** o **winsorizar**.
 - Runtime con extremos: **p99 170 min** → considerar **cap**/tratamiento especial.
 - Seasons (donde aplica): **p99 12** → validar coherencia con `type="SHOW"`.
- Actores
 - **77,213** registros.
 - `character` con **9,627** nulos → imputar con “**desconocido**”.
 - `person_id` con **77,213** no nulos → **conservar** para trazabilidad/BI.
- Imputación cruzada (entre bases)
 - `imdb_score` (en `data.netflix`): faltantes **522** → **0%** con donante (llave **cruda**); faltantes **520** → **0%** con donante (llave **normalizada**).
 - `imdb_votes`: faltantes **538** → **0%** con donante (cruda); faltantes **536** → **0%** con donante (normalizada).
 - `runtime`: **sin faltantes**.
 - **Conclusión**: las bases `mejores_` **no** cubren los vacíos de `data.netflix`; aplicar **fallback por género (medianas)** o considerar **enriquecimiento externo/fuzzy matching**.

```
[ ]: !jupyter nbconvert --to pdf EDA.netflix.ipynb
```

```
[NbConvertApp] Converting notebook EDA.netflix_4.ipynb to pdf
C:\Users\mario\AppData\Local\ Packages\PythonSoftwareFoundation.Python.3.11_qbz5n
2kfra8p0\LocalCache\local-packages\Python311\site-
```

```
packages\nbformat\__init__.py:96: MissingIDFieldWarning: Cell is missing an id  
field, this will become a hard error in future nbformat versions. You may want  
to use `normalize()` on your notebooks before validations (available since  
nbformat 5.1.4). Previous versions of nbformat are fixing this issue  
transparently, and will stop doing so in the future.
```

```
validate(nb)  
[NbConvertApp] Support files will be in EDA.netflix_4_files\  
[NbConvertApp] Making directory .\EDA.netflix_4_files  
[NbConvertApp] Writing 146104 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 | b had problems, most likely because there were no  
citations  
[NbConvertApp] PDF successfully created  
[NbConvertApp] Writing 1662112 bytes to EDA.netflix_4.pdf
```