# 28. Matplotlib: grafiklar chizish



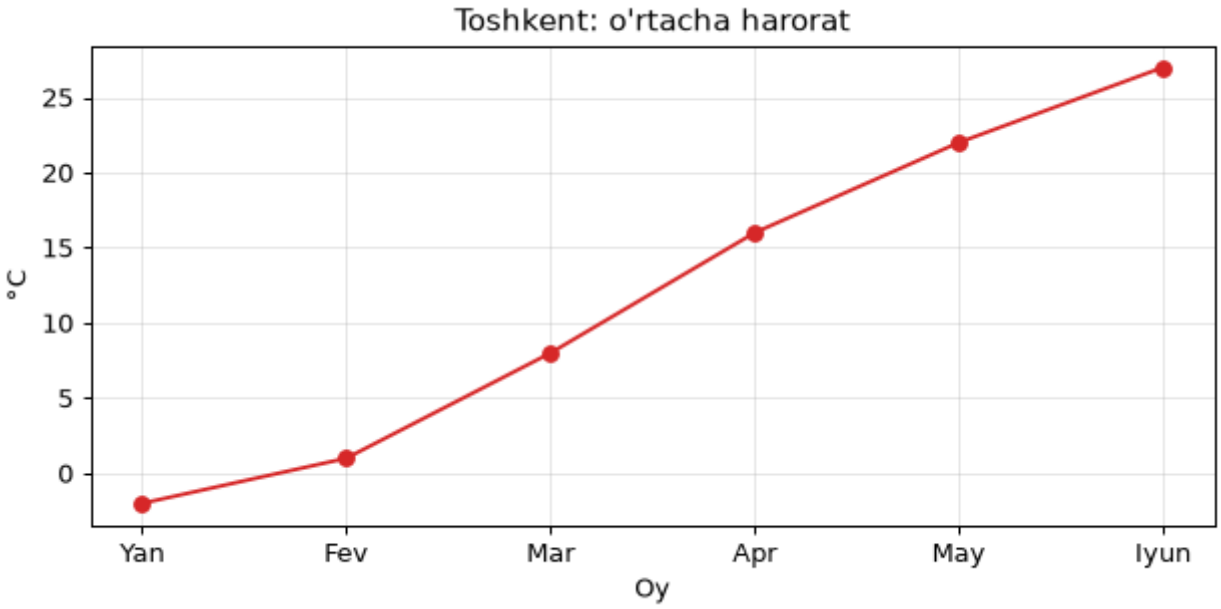

Raqamlar jadvalidan ko'ra grafik tezroq tushuniladi: o'sish, taqqoslash, ulushlar bir qarashda ko'rinadi. **Matplotlib** — Pythonda grafik chizishning eng mashhur kutubxonasi. Odatda uning `pyplot` qismi `plt` nomi bilan import qilinadi.

> **O'rnatish va ko'rish**
>
> O'rnatish: `pip install matplotlib`. Kompyuterda `plt.show()` grafik oynasini ochadi. Quyidagi misollar `plt.savefig()` bilan rasmga saqlanib, natijasi shu sahifada ko'rsatilgan. Saytdagi masalalarda esa grafik ma'lumotlari (nuqtalar, statistika) tekshiriladi.

## 1. Birinchi grafik: plot

```
import matplotlib
matplotlib.use("Agg")
import matplotlib.pyplot as plt

oylar = ["Yan", "Fev", "Mar", "Apr", "May", "Iyun"]
harorat = [-2, 1, 8, 16, 22, 27]

plt.figure(figsize=(7, 3.6))
plt.plot(oylar, harorat, marker="o", color="tab:red")
plt.title("Toshkent: o'rtacha harorat")
plt.xlabel("Oy")
plt.ylabel("°C")
plt.grid(alpha=0.3)
plt.tight_layout()
```

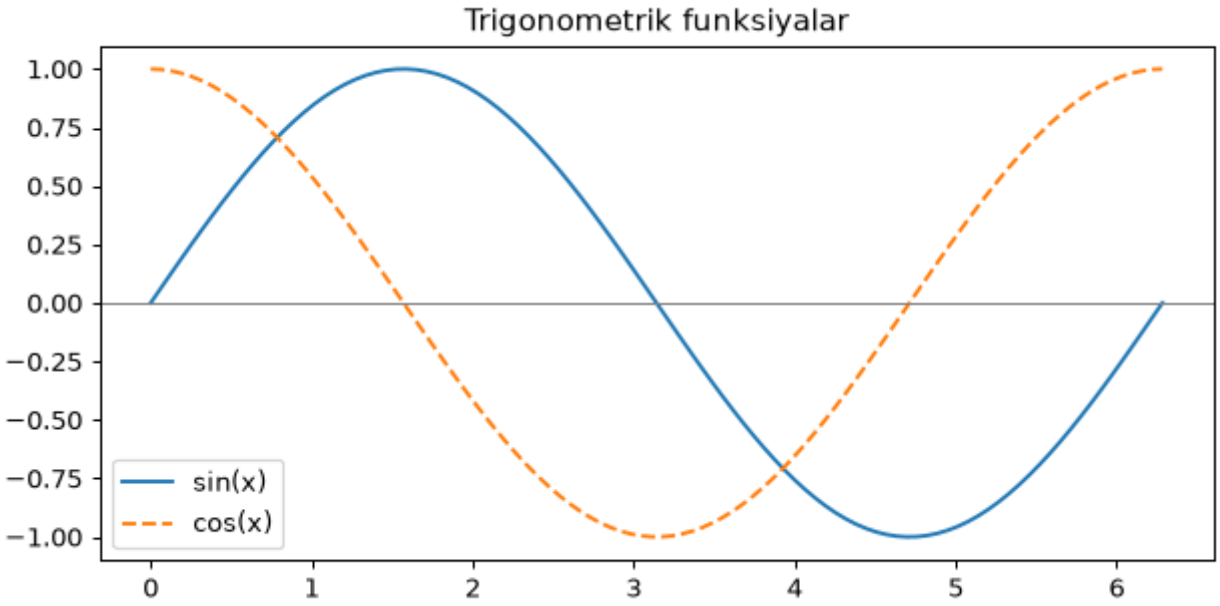
```
plt.savefig("grafik.png", dpi=90)
```




Asosiy qadamlar: ma'lumot → `plt.plot(x, y)` → sarlavha va o'q nomlari → `plt.show()` (yoki `savefig`).

## 2. Bir nechta chiziq va legenda

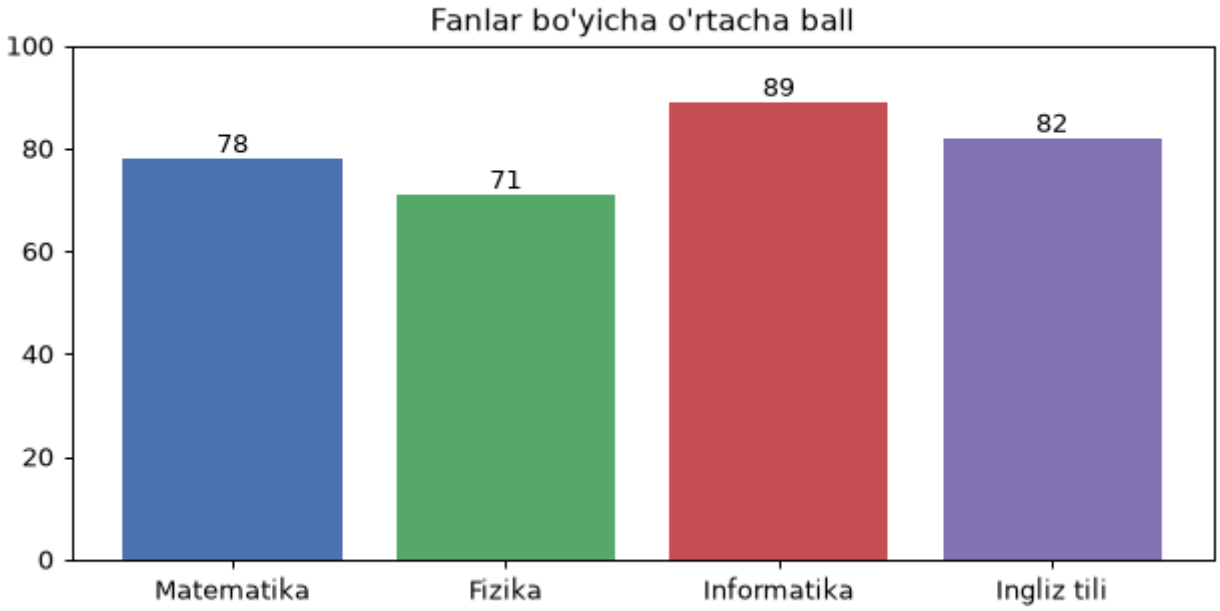
```
import matplotlib
matplotlib.use("Agg")
import matplotlib.pyplot as plt
import numpy as np

x = np.linspace(0, 2 * np.pi, 100)
plt.figure(figsize=(7, 3.6))
plt.plot(x, np.sin(x), label="sin(x)")
plt.plot(x, np.cos(x), "--", label="cos(x)")
plt.axhline(0, color="gray", linewidth=0.8)
plt.legend()
plt.title("Trigonometrik funksiyalar")
plt.tight_layout()
plt.savefig("sin.png", dpi=90)
```




| Uslub | Ma'nosi |
|---|---|
| `"-"` | uzluksiz chiziq |
| `"--"` | shtrix |
| `":"` | nuqtali |
| `marker="o"` | nuqtalarni belgilash |
| `color="tab:green"` | rang |
| `linewidth=2` | chiziq qalinligi |

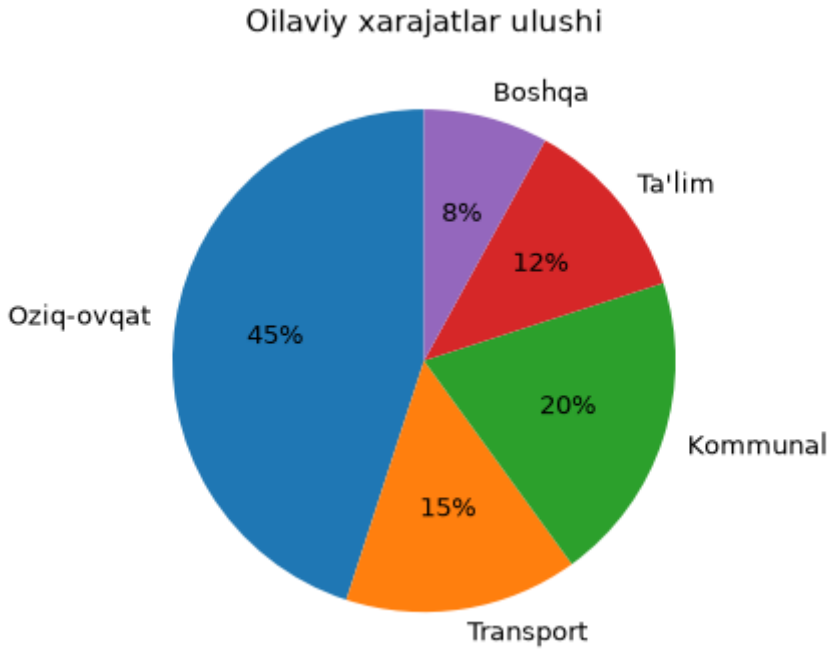
# 3. Ustunli diagramma: bar

```
import matplotlib
matplotlib.use("Agg")
import matplotlib.pyplot as plt

fanlar = ["Matematika", "Fizika", "Informatika", "Ingliz tili"]
ortacha = [78, 71, 89, 82]
plt.figure(figsize=(7, 3.6))
ustunlar = plt.bar(fanlar, ortacha, color=["#4C72B0", "#55A868", "#C44E52", "#
plt.bar_label(ustunlar)
plt.ylim(0, 100)
plt.title("Fanlar bo'yicha o'rtacha ball")
plt.tight_layout()
plt.savefig("bar.png", dpi=90)
```




## 4. Doiraviy diagramma: pie

```
import matplotlib
matplotlib.use("Agg")
import matplotlib.pyplot as plt

xarajat = {"Oziq-ovqat": 45, "Transport": 15, "Kommunal": 20, "Ta'lim": 12, "B
plt.figure(figsize=(5.5, 4))
plt.pie(xarajat.values(), labels=xarajat.keys(), autopct="%1.0f%%", startangle
plt.title("Oilaviy xarajatlar ulushi")
plt.tight_layout()
plt.savefig("pie.png", dpi=90)
```

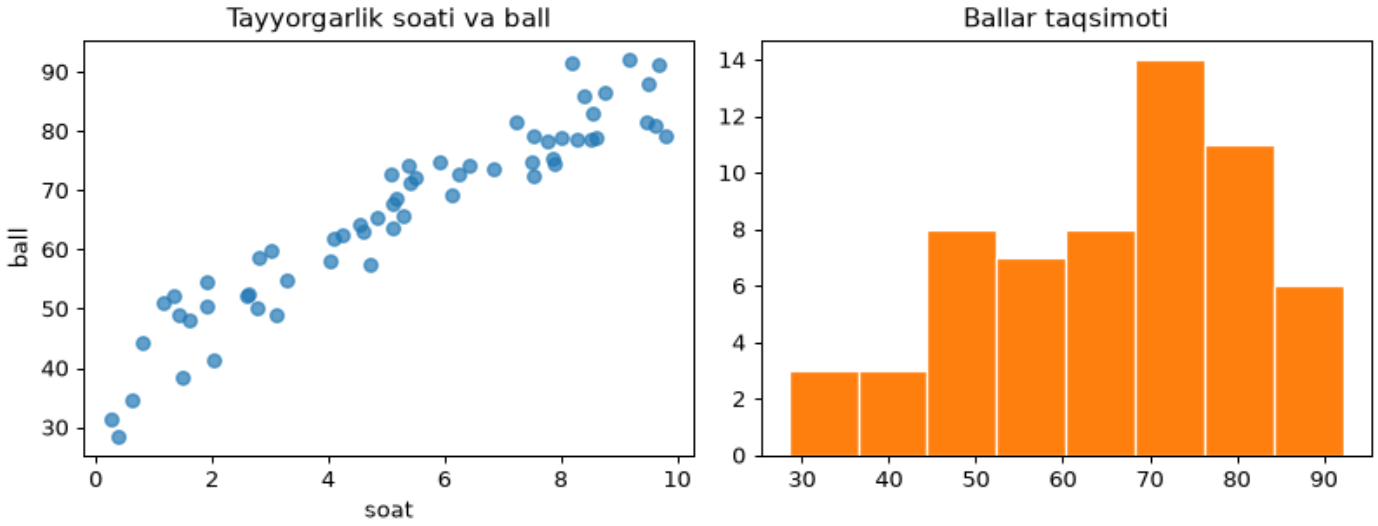



## 5. Nuqtalar (scatter) va gistogramma (hist)

```
import matplotlib
matplotlib.use("Agg")
import matplotlib.pyplot as plt
import numpy as np

rng = np.random.default_rng(1)
soat = rng.uniform(0, 10, 60)
ball = 40 + 5 * soat + rng.normal(0, 6, 60)

fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(9, 3.6))
ax1.scatter(soat, ball, alpha=0.7)
ax1.set_title("Tayyorgarlik soati va ball")
ax1.set_xlabel("soat"); ax1.set_ylabel("ball")
ax2.hist(ball, bins=8, color="tab:orange", edgecolor="white")
ax2.set_title("Ballar taqsimoti")
fig.tight_layout()
fig.savefig("scatter.png", dpi=90)
print("korrelyatsiya:", round(np.corrcoef(soat, ball)[0, 1], 2))
```

*Natija:*

```
korrelyatsiya: 0.95
```




`plt.subplots(qator, ustun)` bir rasmda bir nechta grafik (ax) beradi. Har biri uchun `set_title`, `set_xlabel` ishlatiladi.

# 6. Qaysi grafikni tanlash?

| Maqsad | Grafik |
|---|---|
| Vaqt bo'yicha o'zgarish (harorat, narx) | `plot` — chiziqli |
| Toifalarni taqqoslash (fanlar, viloyatlar) | `bar` — ustunli |
| Butunning ulushlari (budjet) | `pie` — doiraviy (5–6 qismdan oshmasin) |
| Ikki kattalik bog'liqligi | `scatter` — nuqtalar |
| Qiymatlar taqsimoti | `hist` — gistogramma |

# 7. Saqlash

```
import matplotlib
matplotlib.use("Agg")
import matplotlib.pyplot as plt
plt.plot([1, 2, 3], [2, 4, 1])
plt.savefig("natija.png", dpi=150)
import os
print(os.path.exists("natija.png"))
```

*Natija:*

```
True
```

`savefig` PNG, JPG, SVG, PDF formatlarida saqlaydi; `dpi` — sifat (piksel zichligi).

# 8. Xulosa

- `import matplotlib.pyplot as plt` → `plt.plot/bar/pie/scatter/hist` → `title, xlabel, ylabel, legend` → `show()` / `savefig()`.
- Bir rasmda bir nechta grafik — `fig, ax = plt.subplots(…)`.
- Grafik turini ma'lumot va maqsadga qarab tanlang.