INTELIGENTNI SISTEM ZA NAPOVED TEMPERATURE

Inženirstvo inteligentnih sistemov

NAMEN INTELIGENTNEGA SISTEMA

čim bolj natančno in neprekinjeno napovedovati temperaturo zraka v 5 izbranih krajih

 naslavlja problem negotovosti ljudi, kam iti, kaj početi in kako se obleči, saj na vse to močno vpliva zunanja temperatura zraka

končni uporabniki

širša javnost (kdorkoli načrtuje aktivnosti na prostem)

FUNKCIONALNOSTI

- samodejen neprekinjen potek dela:
 - zajem surovih podatkov
 - verzioniranje podatkov
 - predobdelava podatkov
 - validacija podatkov
 - testiranje podatkov (data drift)
 - shranjevanje podatkov v bazo
 - predobdelava podatkov v namen učenja LSTM modela
 - učenje in validacija modelov
 - evalvacija modelov
 - verzioniranje modelov
- evalvacija modelov v produkcijskem okolju
- zbiranje evalvacijskih metrik:
 - MAE, MSE, RMSE

- napoved temperature za 5 lokacija:
 - Lendava, Ptuj, Celje, Bovec in Črnomelj
- frekvenca zajemanja podatkov:
 - potek dela samodejno zagnan vsaki 2h
 - časovni žig podaktov vsakih 30min
- zajeti podatki:
 - ura in čas
 - temperatura
 - vlaga
 - hitrost vetra
 - zračni tlak
 - količina padavin
 - ..

UPORABLJENE TEHNOLOGIJE



- GitHub verzioniranje kode
- DagsHub + DVC verzioniranje podatkov
- MLflow verzioniranje modelov
- Docker kontejnerizacija
- Supabase podatkovna baza
- **PyTorch** strojno učenje
- Python + FastAPI backend API
- React + Vite + TypeScript frontend
- Railway produkcija



















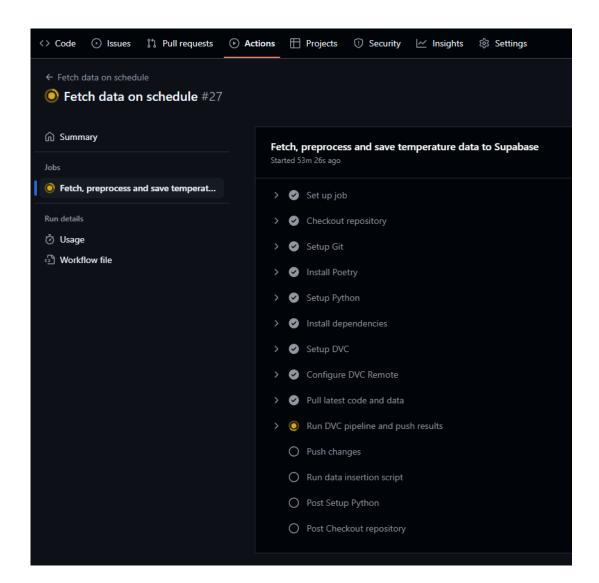




OMEJITVE IN TEŽAVE PRI IZDELAVI

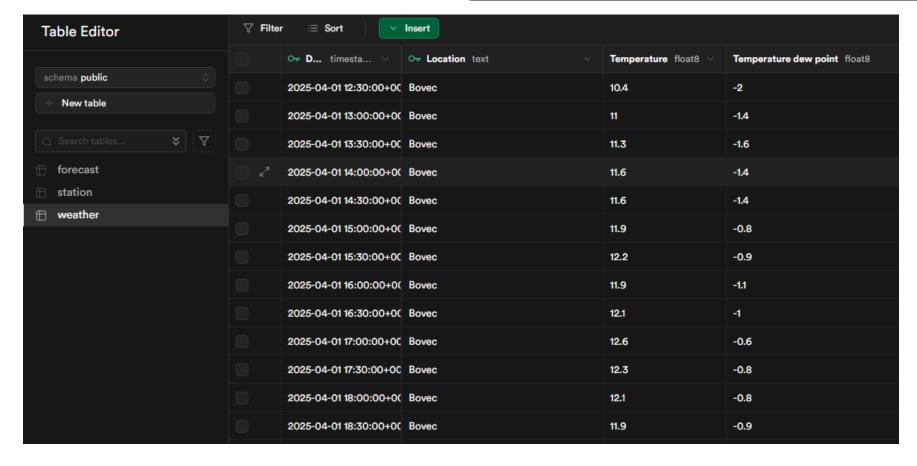
- omejitev pri natančnosti naučenih modelov
- omejitev realnočasovnih podatkov zaradi frekvence izvedbe poteka dela
- prenapihnjena Docker slika ob namestitvi v produkcijo
- DagsHub, Supabase in Railway izpadi strežnikov

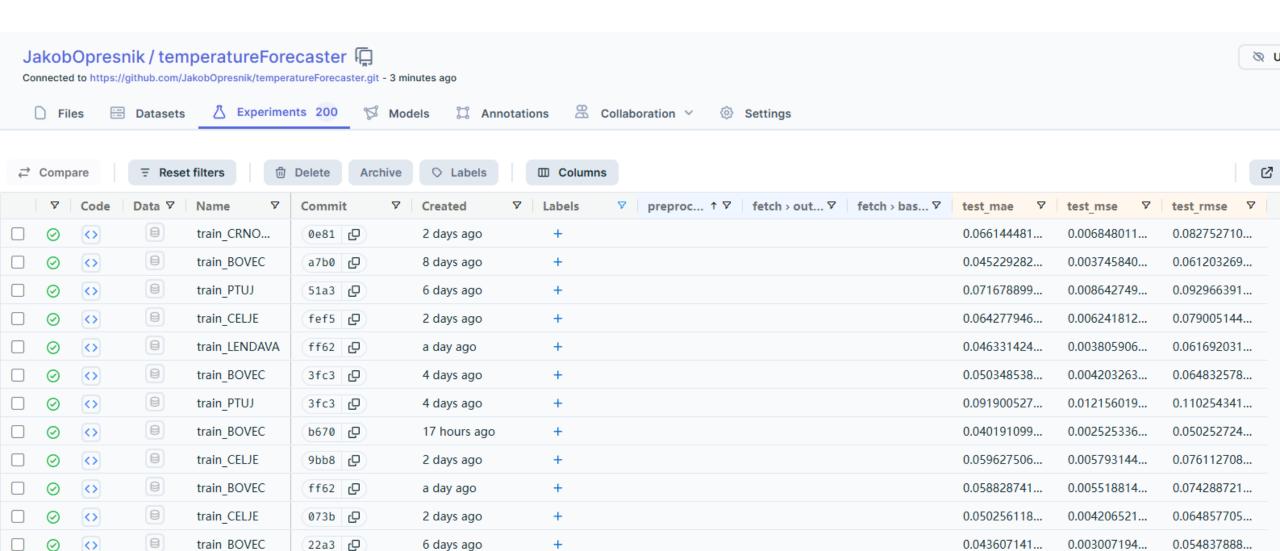
DELOVANJE INTELIGENTNEGA SISTEMA

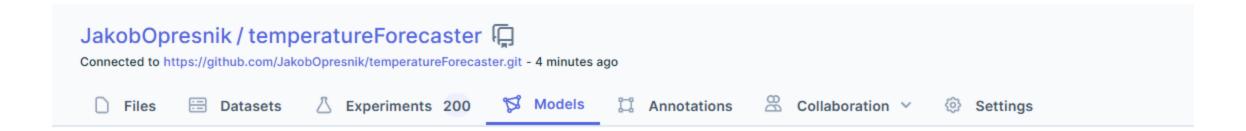


```
github > workflows > % fetch and train.yml
 1 name: Fetch data on schedule
         name: Fetch, preprocess and save temperature data to Supabase
         runs-on: ubuntu-latest
          timeout-minutes: 90
           MLFLOW_TRACKING_URI: https://dagshub.com/JakobOpresnik/temperatureForecaster.mlflow/
            MLFLOW_TRACKING_USERNAME: JakobOpresnik
           MLFLOW_TRACKING_PASSWORD: ${{ secrets.DAGSHUB_TOKEN }}
            SUPABASE_URL: ${{ secrets.SUPABASE_URL }}
            SUPABASE_KEY: ${{ secrets.SUPABASE_KEY }}
            SUPABASE TABLE NAME: 'weather'
           - name: Checkout repository
             uses: actions/checkout@v4
               token: ${{ secrets.PAT TOKEN }}
               fetch-depth: 0
            - name: Setup Git
               git config --local user.email "actions@github.com"
               git config --local user.name "GitHub Actions"
            - name: Install Poetry
               pipx install poetry
            - name: Setup Python
             uses: actions/setup-python@v4
               python-version: '3.11.8'
               cache: poetry
```

| ∀ Filter | r ∷≣ Sort | ∨ Insert | | | |
|-----------------|------------|------------------------------|-------------|--------------------|----------------|
| | Ow id int8 | created_at timestamptz ∨ | name text ~ | latitude numeric ∨ | longitu nume ∨ |
| | 26 | 2025-06-10 09:34:31.730736+0 | LENDAVA | 46.562634 | 16.452506 |
| | 27 | 2025-06-10 09:34:31.730736+0 | PTUJ | 46.418545 | 15.869091 |
| | 28 | 2025-06-10 09:34:31.730736+0 | CELJE | 46.238006 | 15.269033 |
| | 29 | 2025-06-10 09:34:31.730736+0 | BOVEC | 46.338401 | 13.552329 |
| | 30 | 2025-06-10 09:34:31.730736+0 | CRNOMELJ | 45.572651 | 15.190234 |



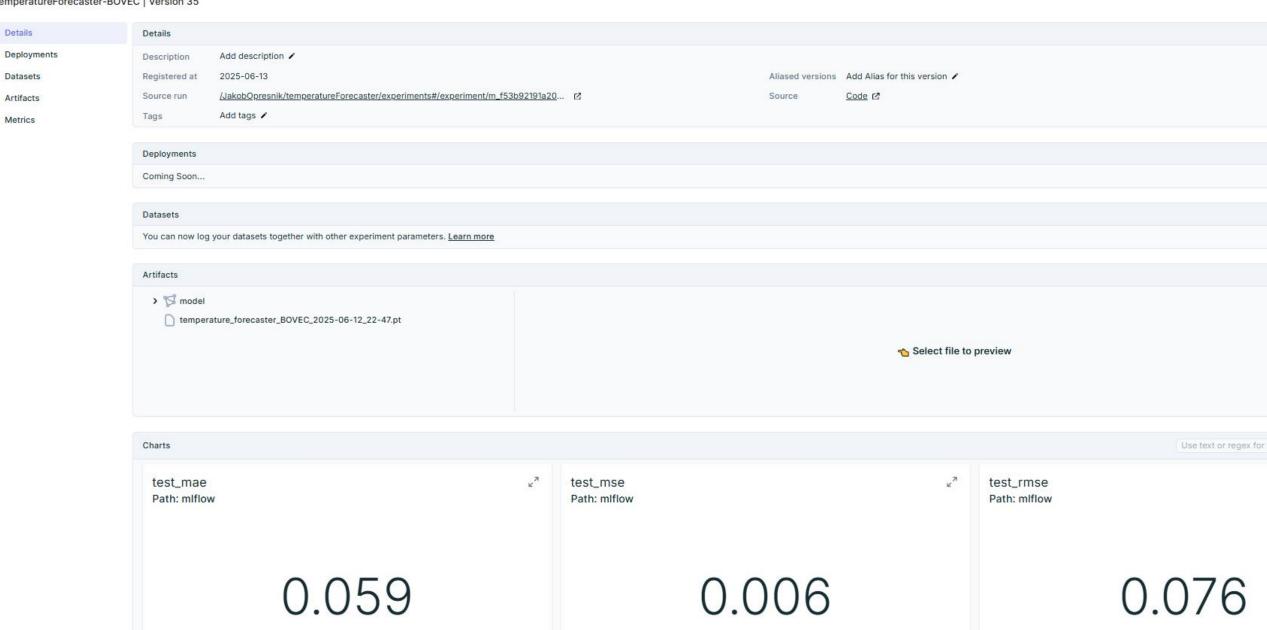


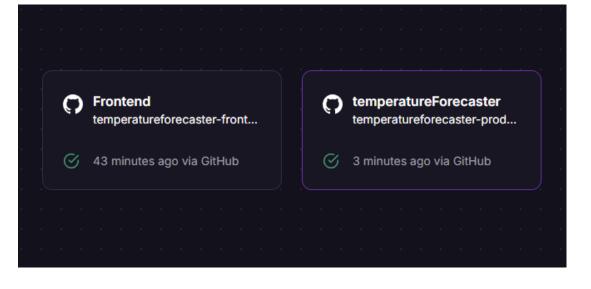


Registered Models

| Model name | Description | Latest Version |
|--------------------------------|-------------|----------------|
| TemperatureForecaster-BOVEC | | Version 35 |
| TemperatureForecaster-CELJE | | Version 34 |
| TemperatureForecaster-CRNOMELJ | | Version 34 |
| TemperatureForecaster-LENDAVA | | Version 37 |
| TemperatureForecaster-PTUJ | | Version 35 |

TemperatureForecaster-BOVEC | Version 35





† temperatureForecaster

Deployments

Variables

Metrics

Settings

temperatureforecaster-production.up.railway.app

DEPLOYING

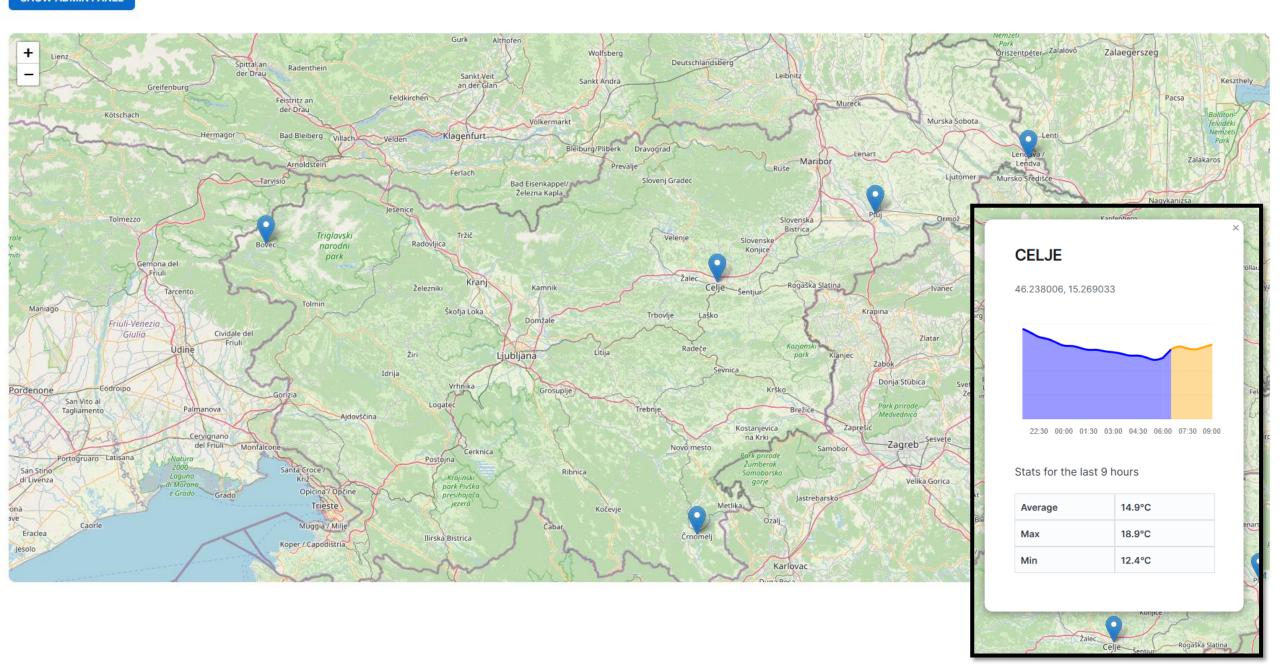


Fix Dockerfile

2 minutes ago via GitHub

Deployment in progress:

- ✓ Initialization
- Build
- Deploy
- Post-deploy > Tidying up previous deployments...



III Model Evaluation Metrics

| station | MAE | MSE | RMSE |
|----------|-------|-------|-------|
| LENDAVA | 0.045 | 0.003 | 0.059 |
| PTUJ | 0.076 | 0.009 | 0.096 |
| BOVEC | 0.088 | 0.011 | 0.104 |
| CRNOMELJ | 0.061 | 0.006 | 0.077 |
| CELJE | 0.049 | 0.004 | 0.064 |

✓ Data Validation Reports

- LENDAVA
- PTUJ
- BOVEC
- CRNOMELJ
- CELJE

Data Test Reports

- LENDAVA
- PTUJ
- BOVEC
- CRNOMELJ
- CELJE

