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SeaDataNet AISBL · Havforskningsinstituttet · Ifremer · MARIS · MEDIN · National Oceanography Centre · INGV · iMagine · IODE · eosc Blue-Cloud2026

A new online app for ocean temperature quality control - An artificial intelligence approach

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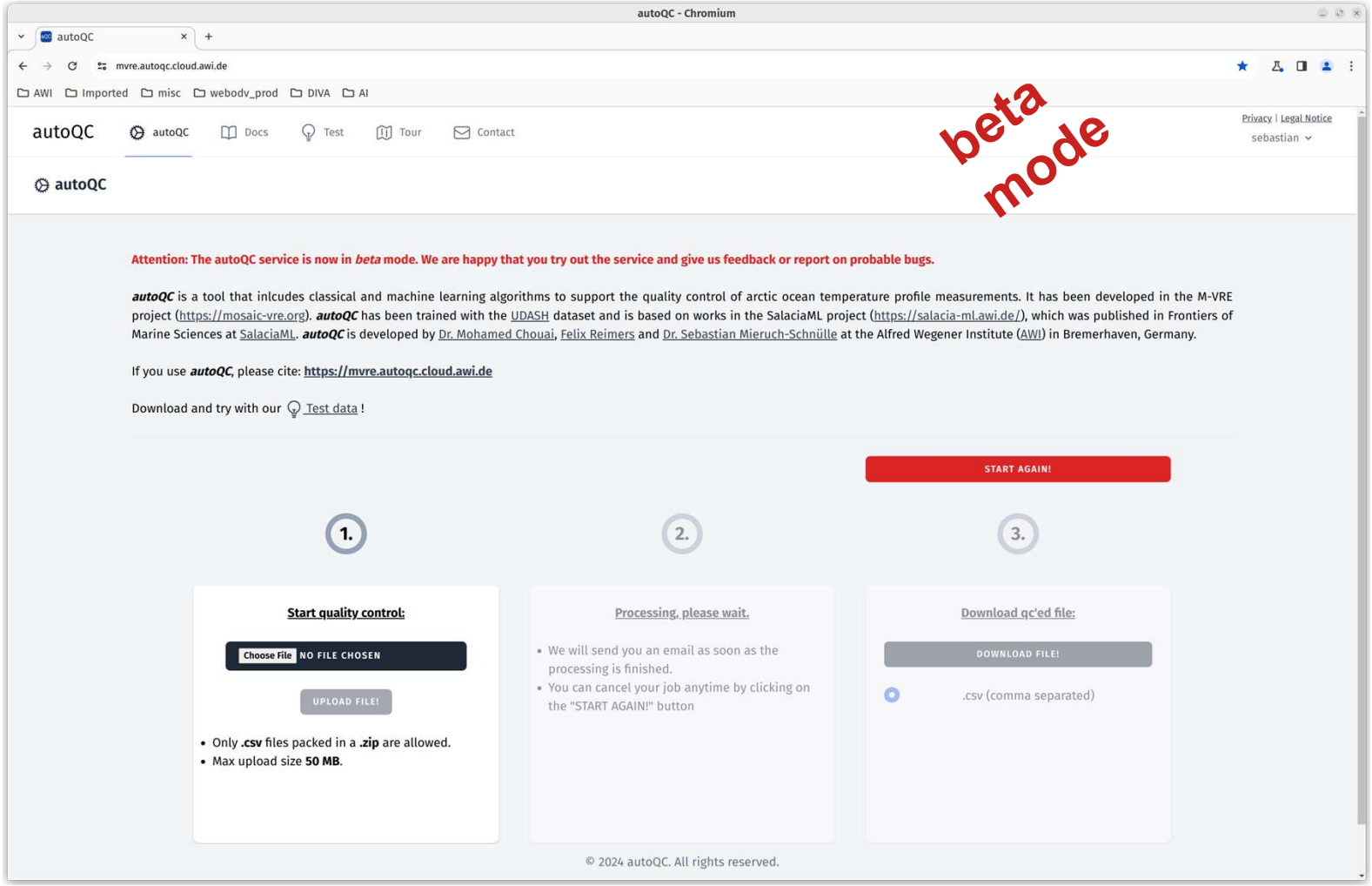
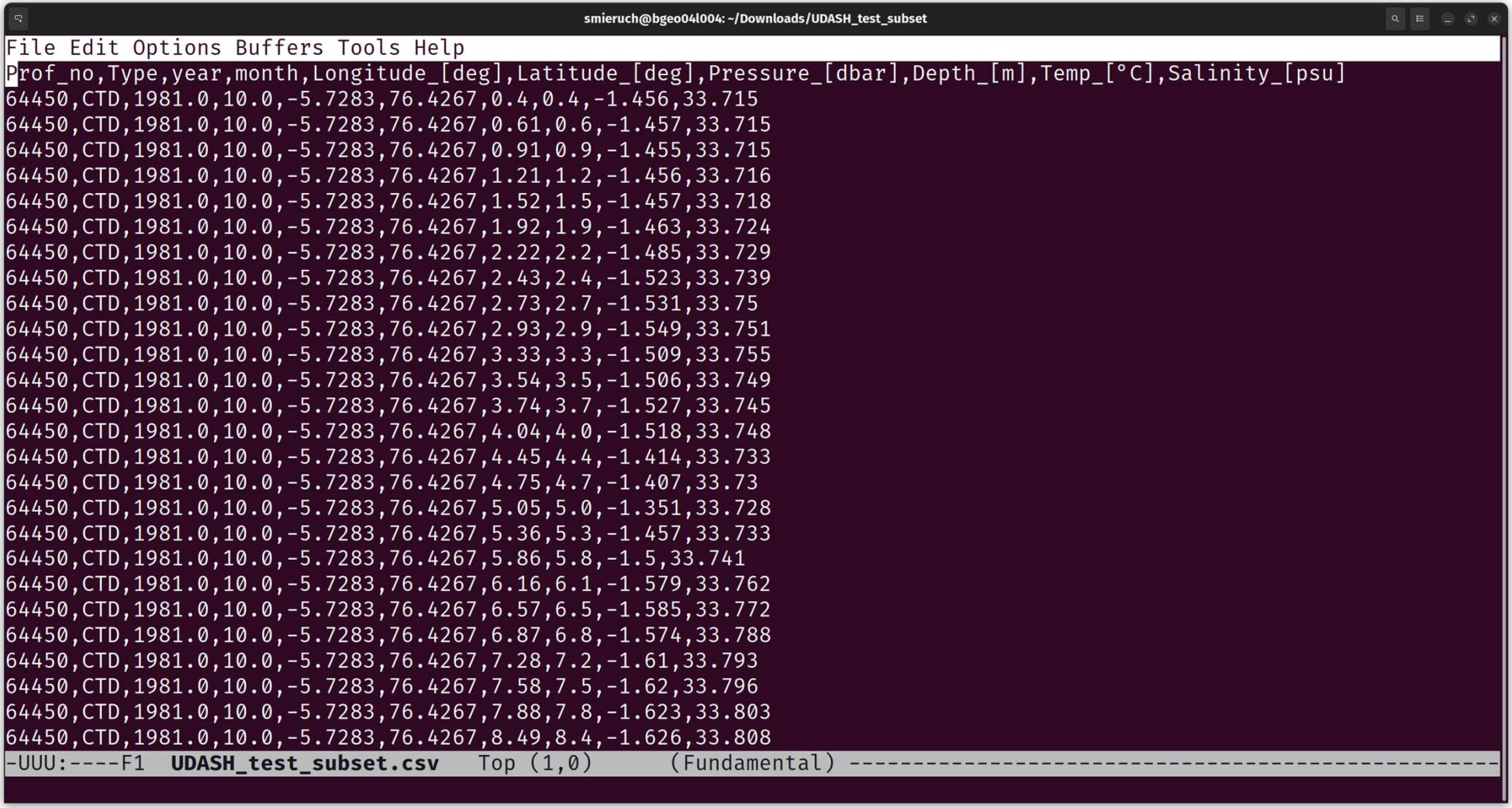
Bundesministerium
für Bildung
und Forschung

ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR-
UND MEERESFORSCHUNG

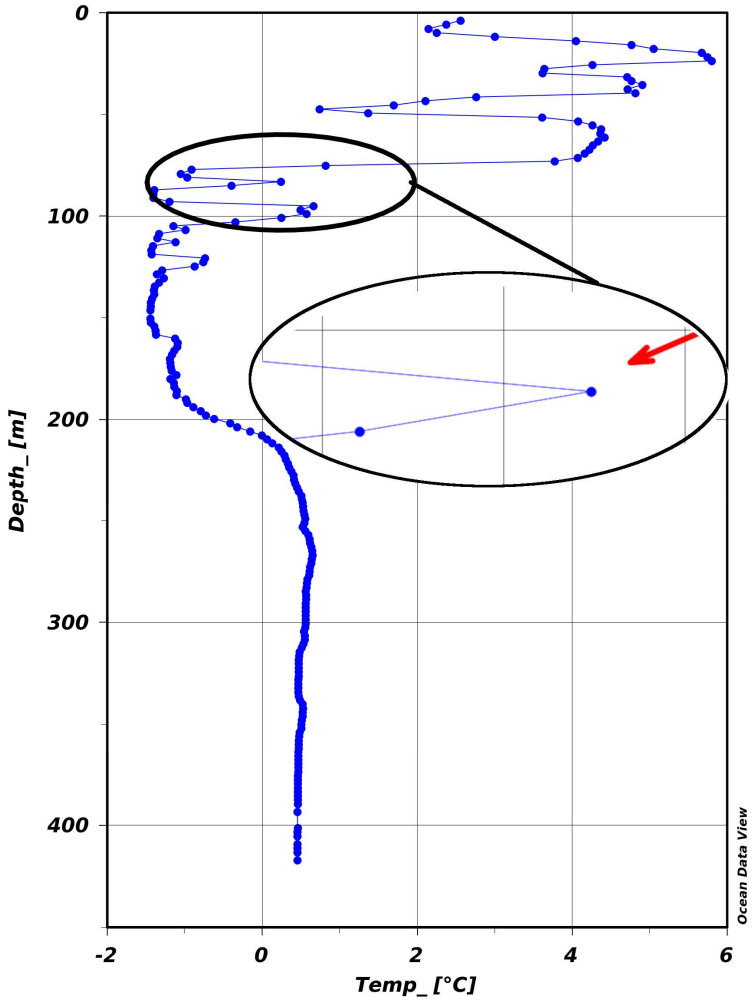
The app: https://mvre.autoqc.cloud.awi.de/

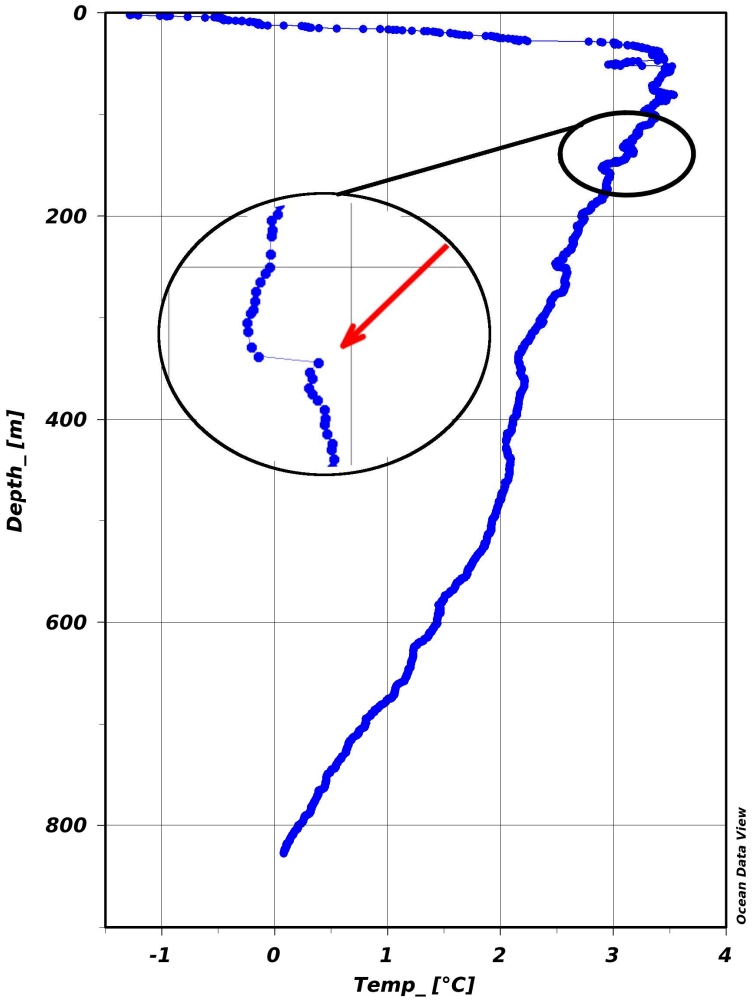


The input data

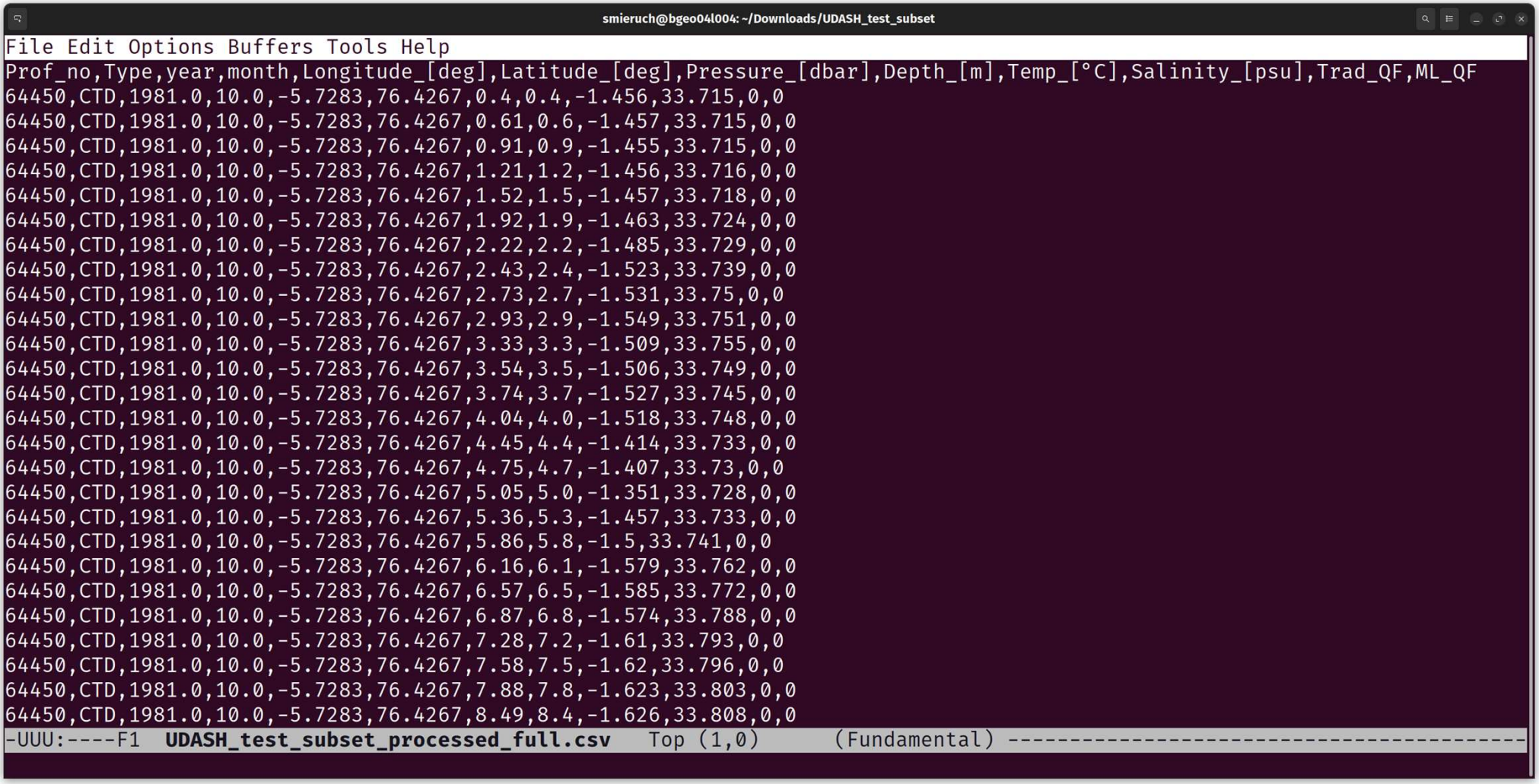


The flags: spike & suspect gradient

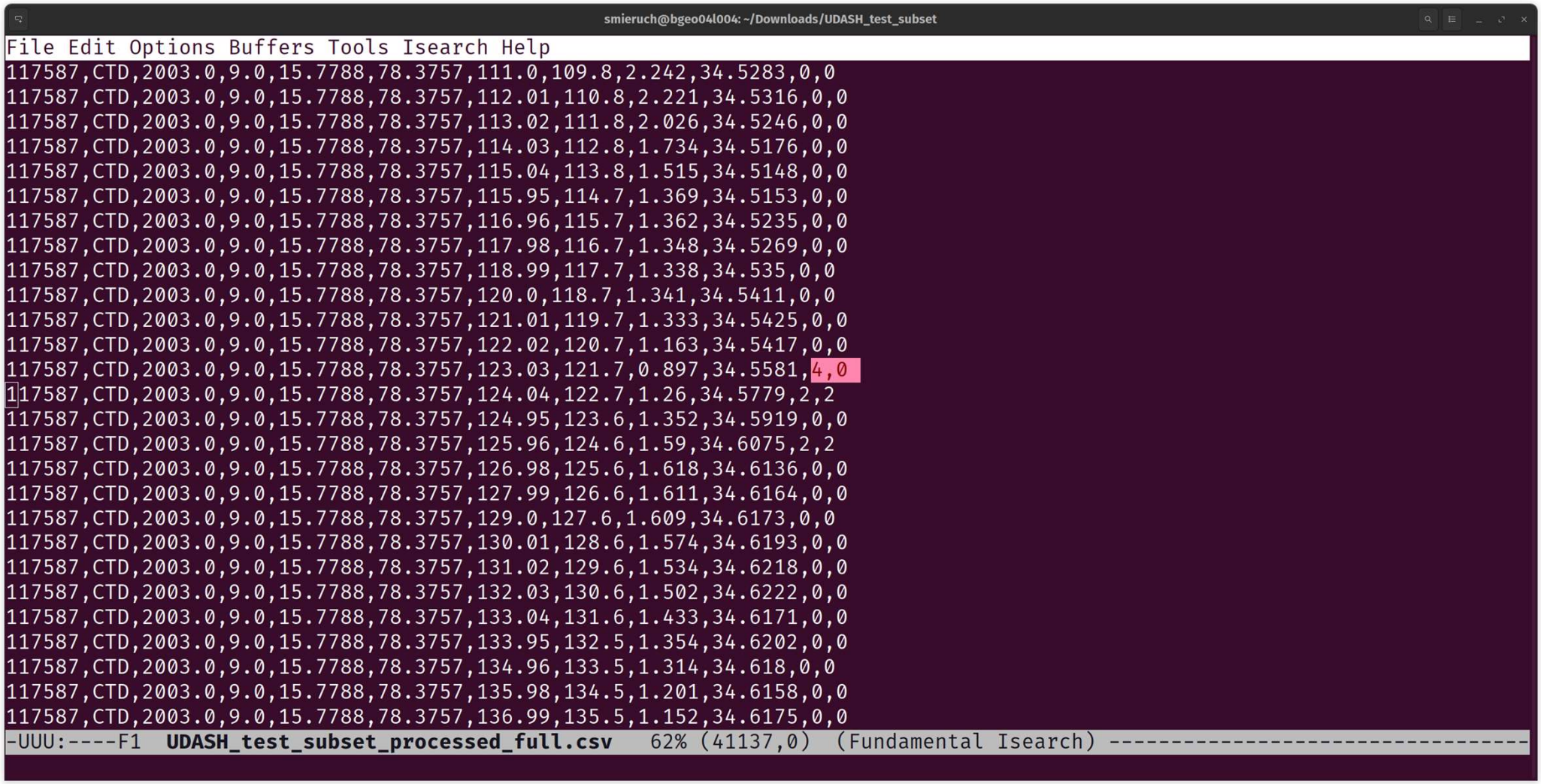




The output data



The AI


smieruch@bgeo04l004: ~/Downloads/UDASH_test_subset
File Edit Options Buffers Tools Isearch Help
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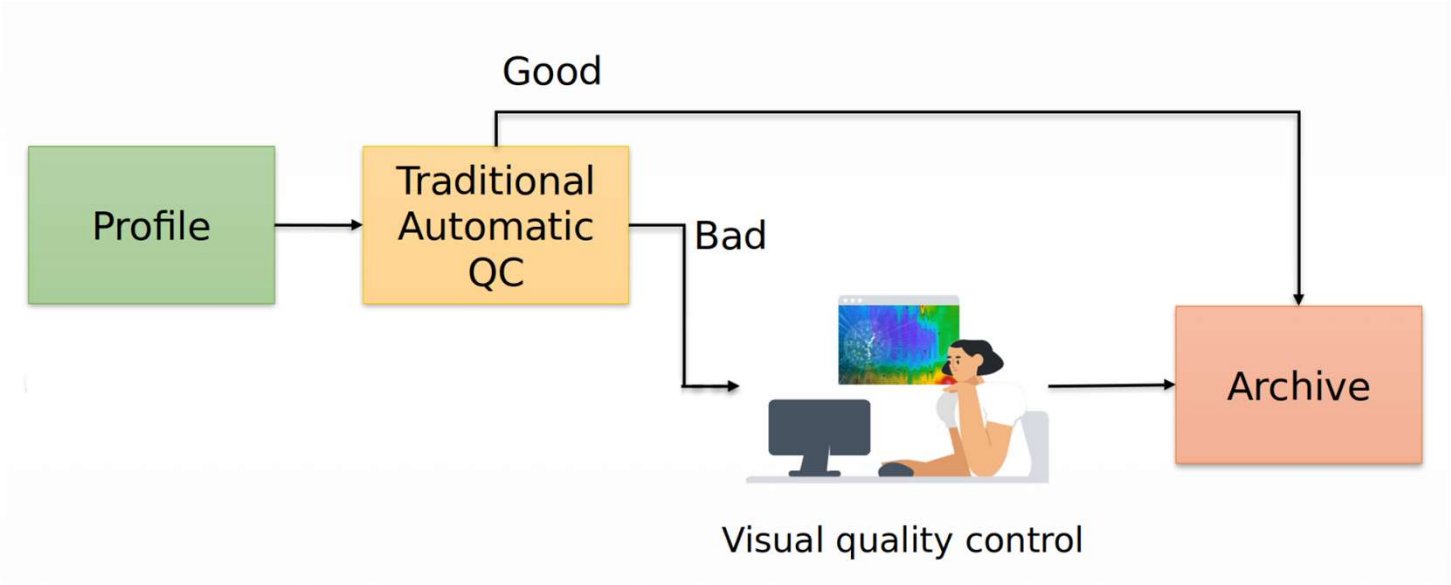
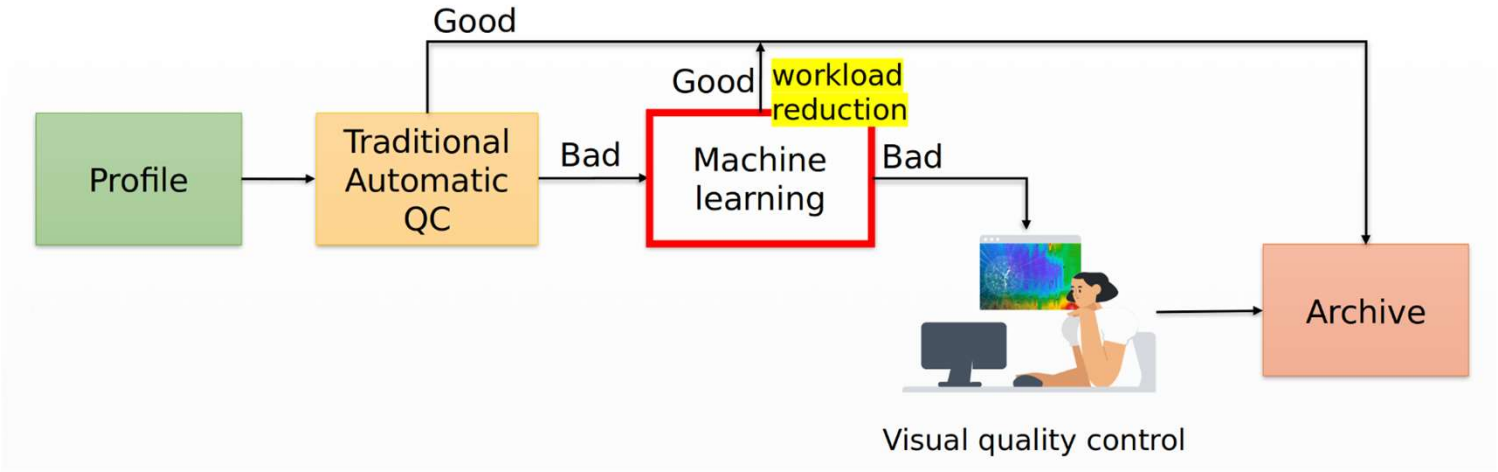
-UUU:----F1 UDASH_test_subset_processed_full.csv 62% (41137,0) (Fundamental Isearch)

The classical approach



The classical + AI approach



The evaluation

Classic checks:

TP=1,229,357	FP=335
FN=2,443	TN=2,595

Classic + AI checks:

TP=1,231,439	FP=339
FN=361	TN=2,591

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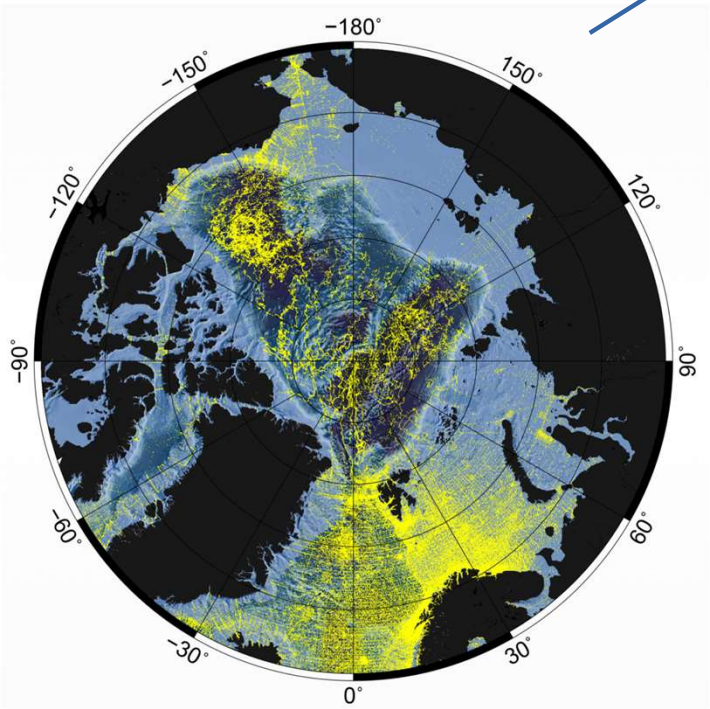
v

How we did it

UDASH (Unified Database for Arctic and Subarctic Hydrography)
https://doi.pangaea.de/10.1594/PANGAEA.872931

280,000 temperature and salinity profiles

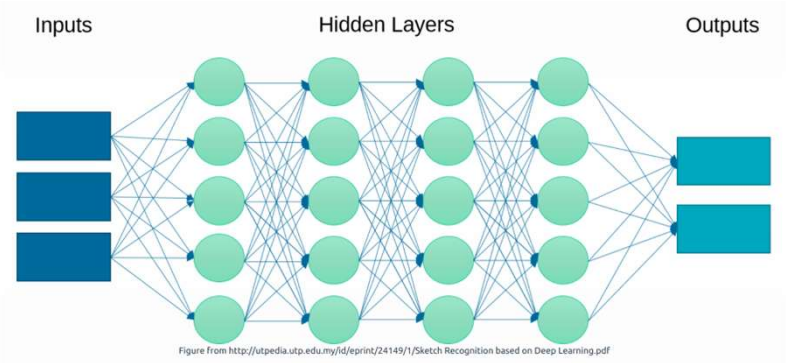
Visually controlled by human expert



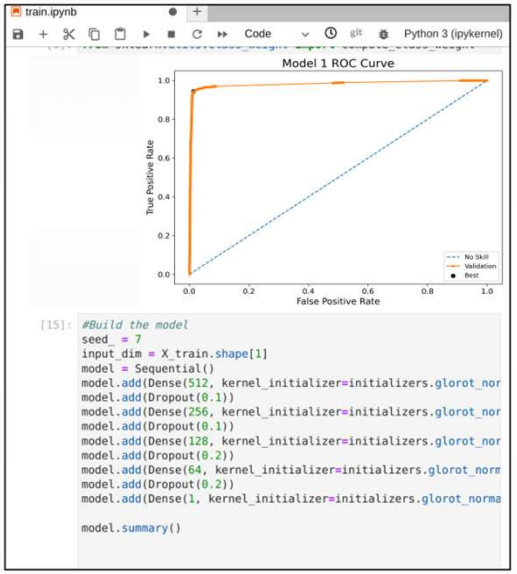
Classical QC checks

```
all_in_one.ipynb
Code
#                   Outliers in mixed layer
#
# ================================================================
def Traditional_outlier_detection(Data):
    gradient = T_Suspect_gradient_T_D(Data)
    Data['gradient2']=np.array(gradient)
    data1=Data.loc[(Data['gradient2']>=0.5) & (Data['Depth_[m]']<=100)]
    data1.loc[:,'QF_trad'] = 4
    return data1
def T_Suspect_gradient_T_D(Data):
    unique_profil=Data['Prof_no'].unique()
    d_grad=[]
    data2=[]
    for j in range(len(unique_profil)):
        profil=Data[Data["Prof_no"].isin([unique_profil[j]])].reset_index(drop=True)
        #data2=pd.concat([data2,profil])
        data2.append(profil.values)
        t=profil['Temp_[°C]'].values
        d=profil['Depth_[m]'].values
        i=0
        grad=[-999]
        while i < d.size - 1:
            #case of -999 in temperature
            if -999 in (t[i], t[i+1],d[i + 1], d[i]):
                grad = np.append(grad, -999) #give this value 1000
            else:
                if (d[i + 1] - d[i])!=0:
                    grad = np.append(grad, (t[i + 1] - t[i]) / (d[i + 1] - d[i]))
                else:
                    grad = np.append(grad, -999) #give this value 1000
            i+=1
        #grad = np.append(grad,grad[-1])
        d_grad.append(grad)
    d_grad_flat=[item for sublist in d_grad for item in sublist]
    return np.array(d_grad_flat)
# ================================================================
#
```

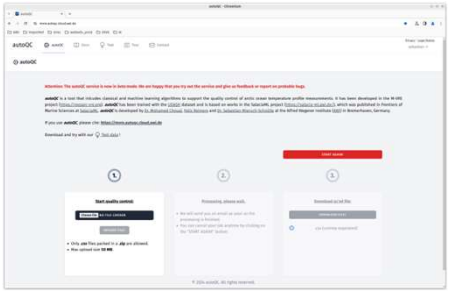
MLP (Multi-Layer-Perceptron)



AI – training, validation, evaluation



App



Future

- Mature and finalize
- GitHub: https://github.com/mchouai27/SalaciaML-Arctic
- Apply on salinity
- Improve algorithms
- Approach communities, e.g. SeaDataNet, IQuOD, ...
- Develop model for other error: statistical screening
- Use other datasets (from other qc-operators)
- ...

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