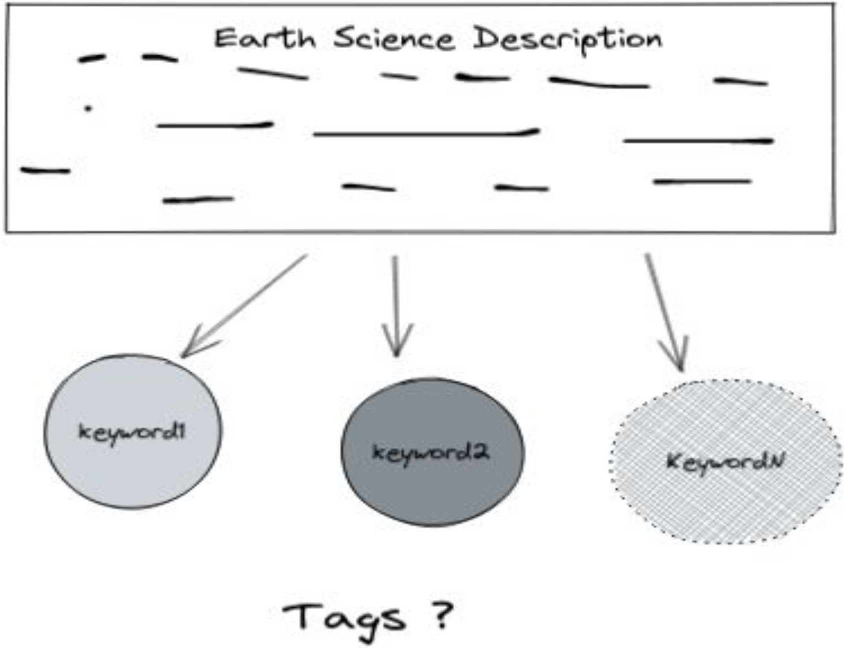
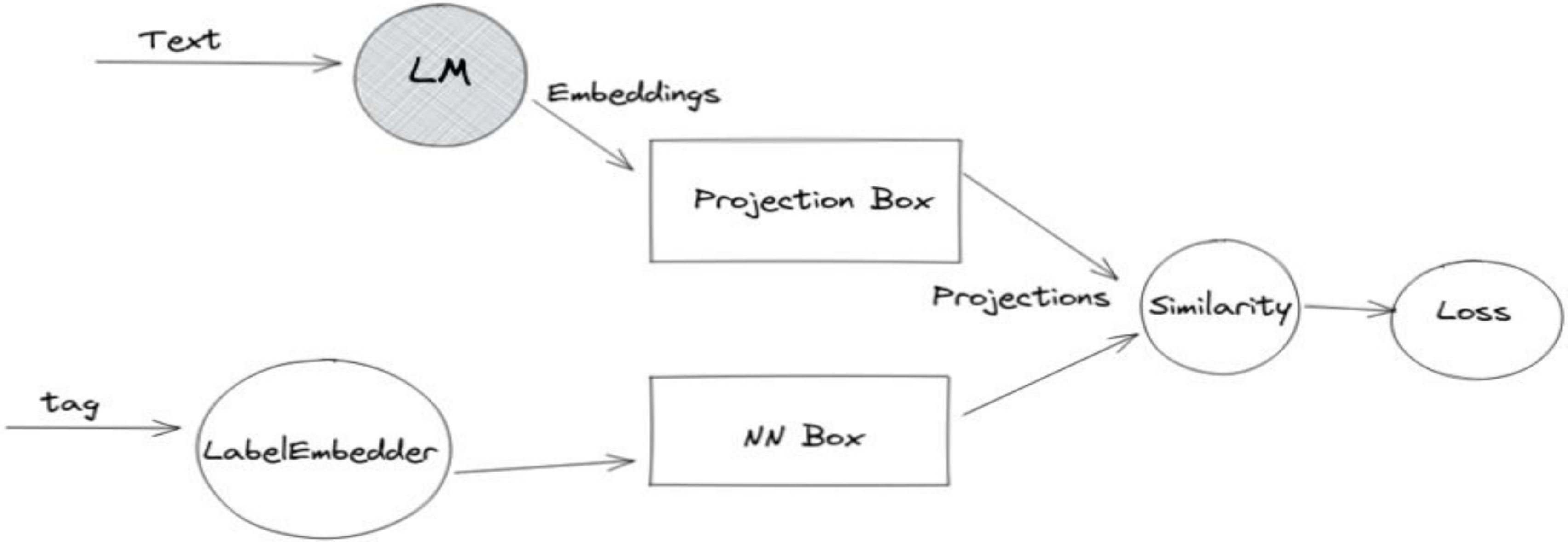
Earth Science

Where Nish meets
NLP meets UAH

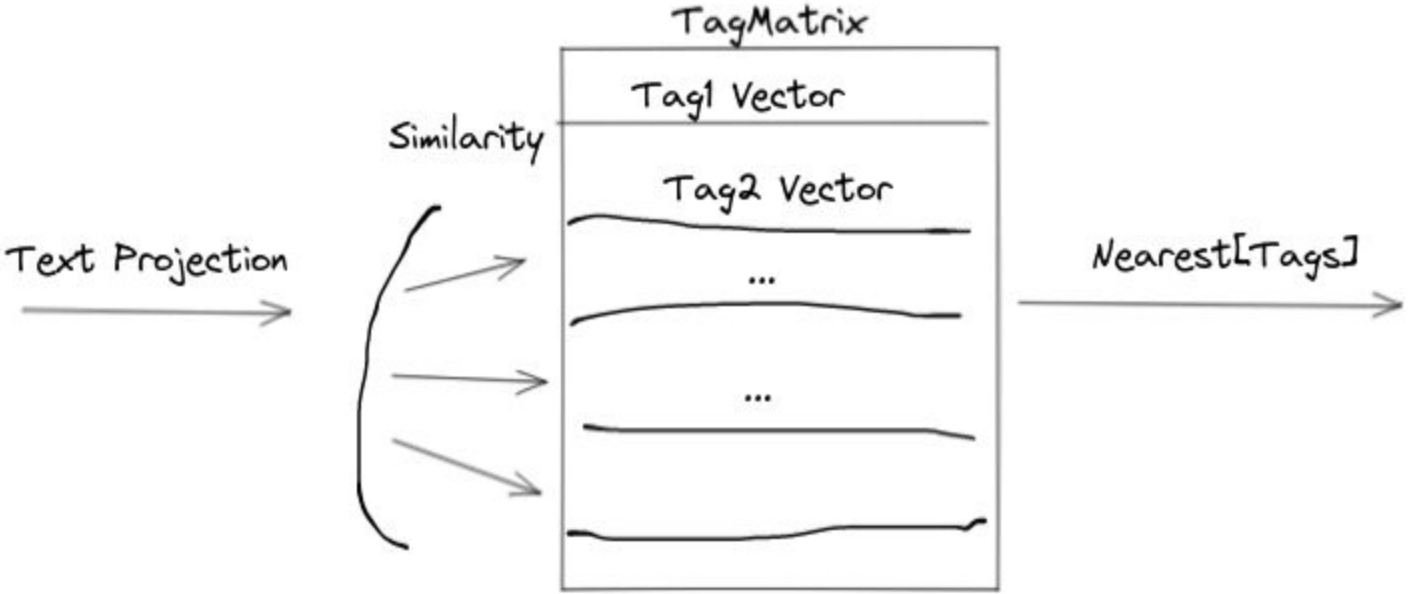
Problem Statement



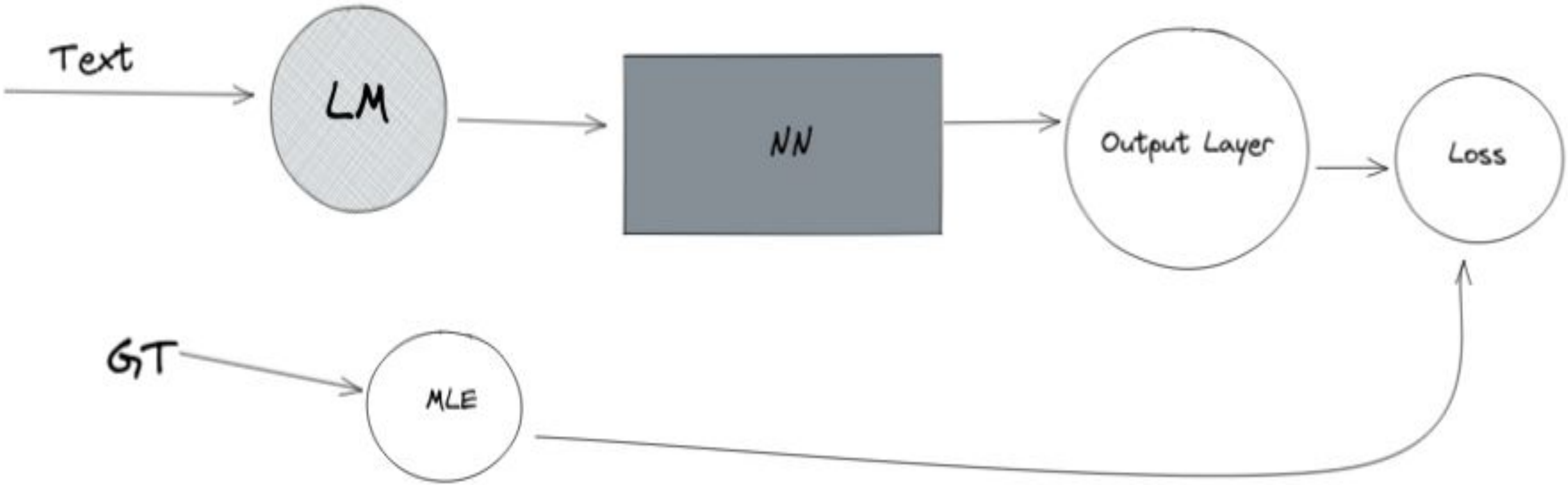
Approach 1


Text
LM
Embeddings
Projection Box
Projections
Similarity
Loss
tag
LabelEmbedder
NN Box

Approach 1 (Inference)

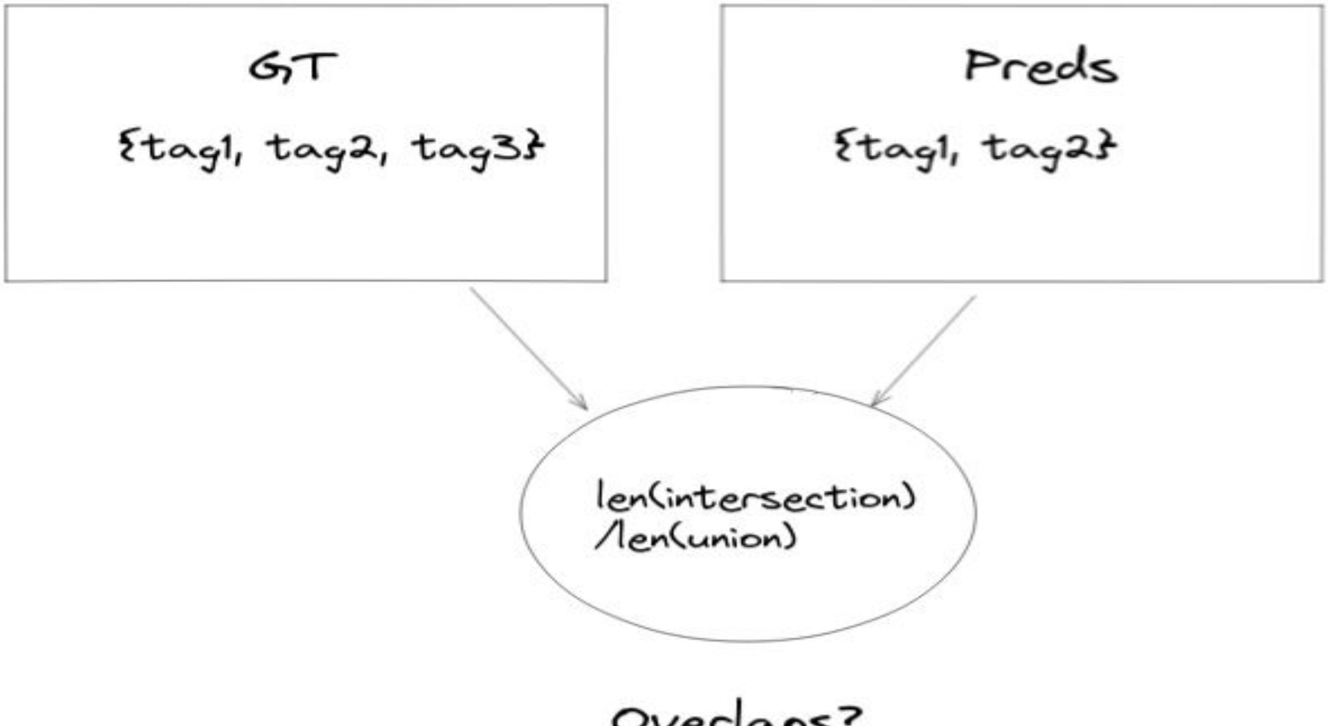


Approach 2

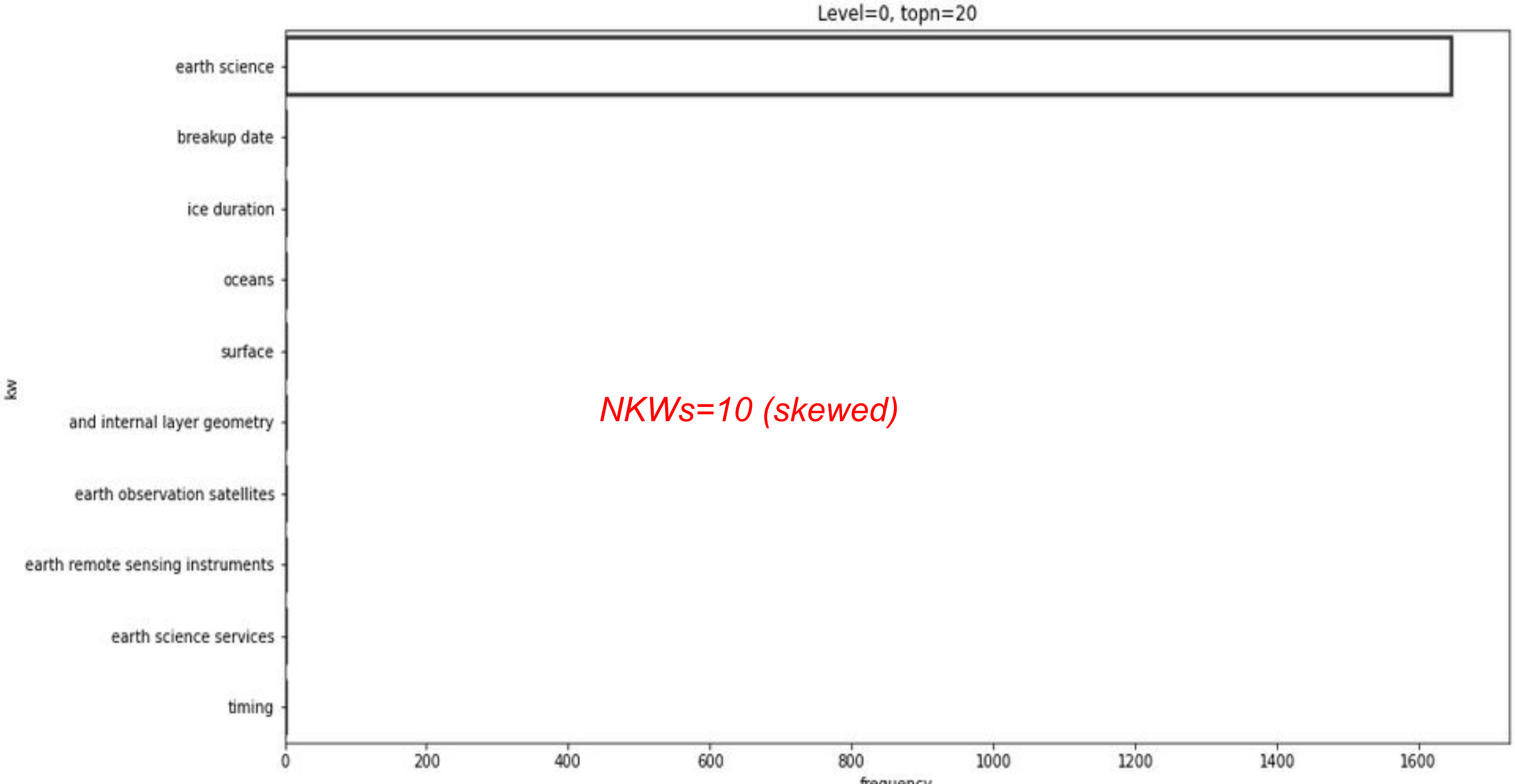


Approach 2 (Inference Metric)

Jaccard Similarity

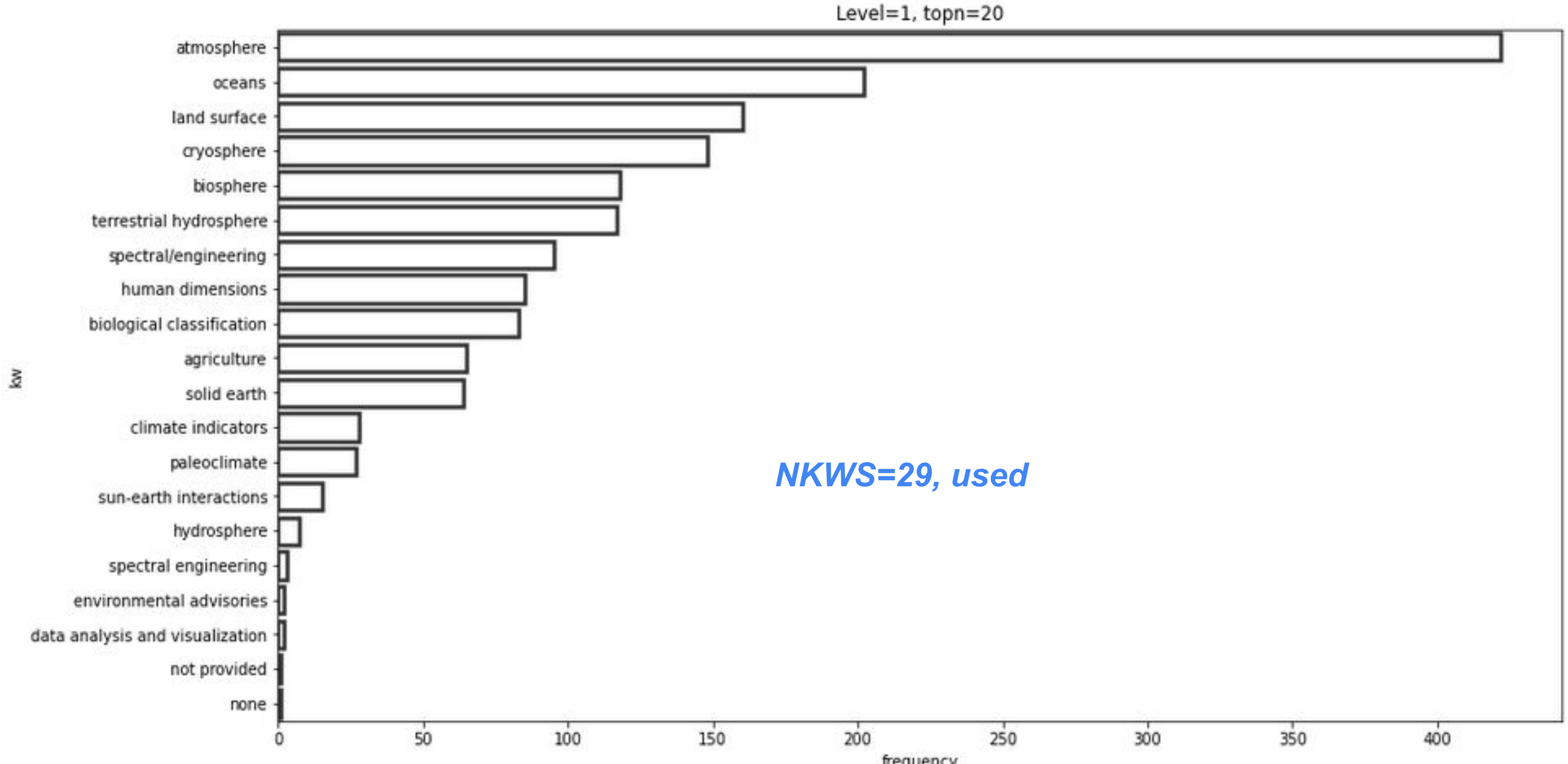


Tag Analysis (level=0, root)



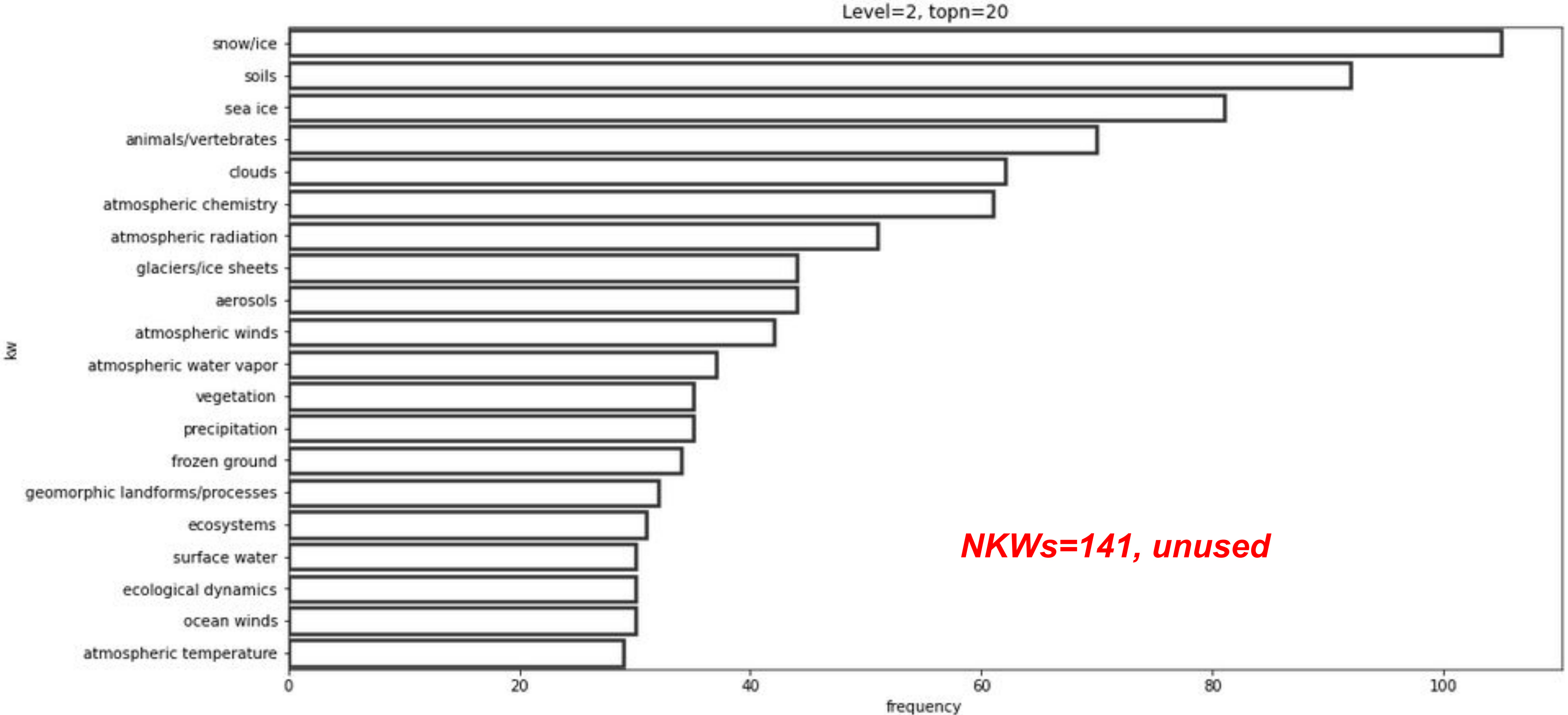
NKWs=10 (skewed)

Tag Analysis (level=1)



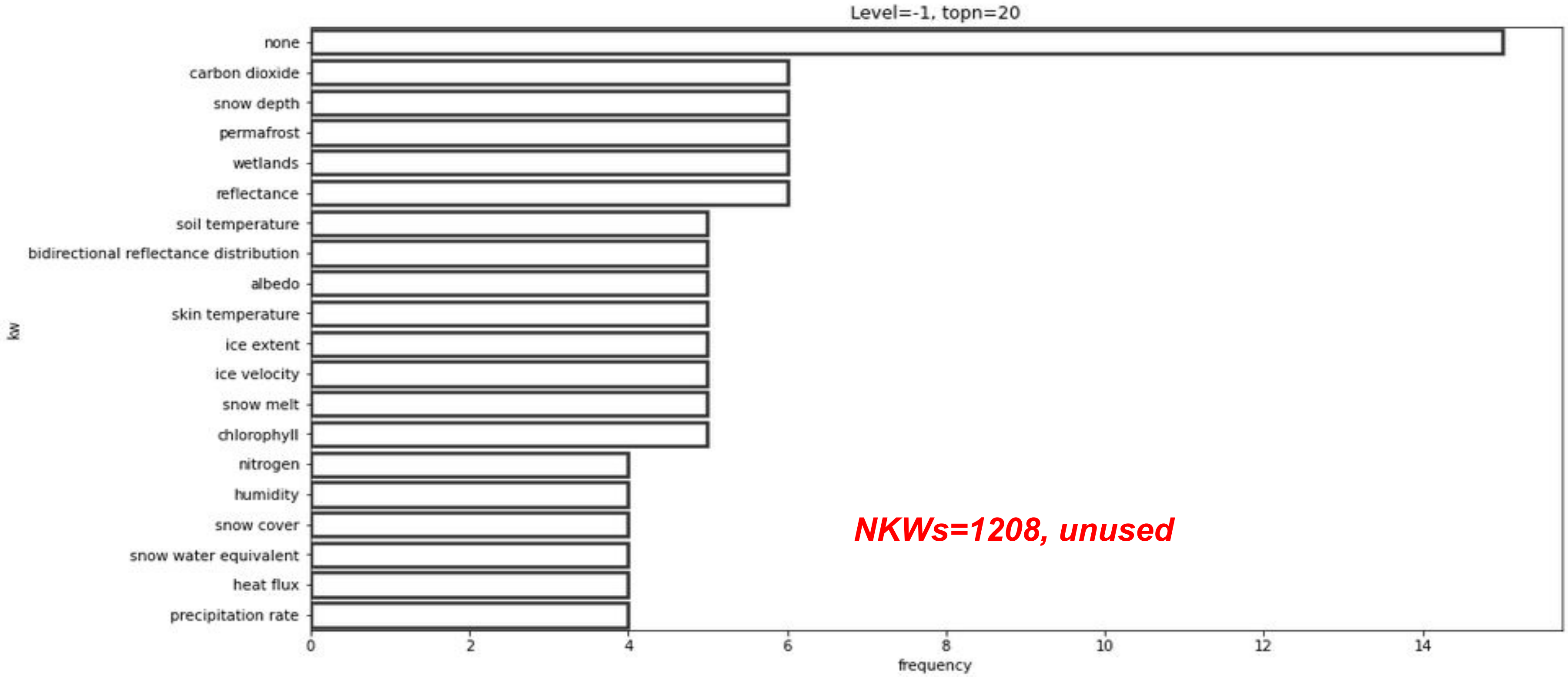
NKWS=29, used

Tag Analysis (Level=2)



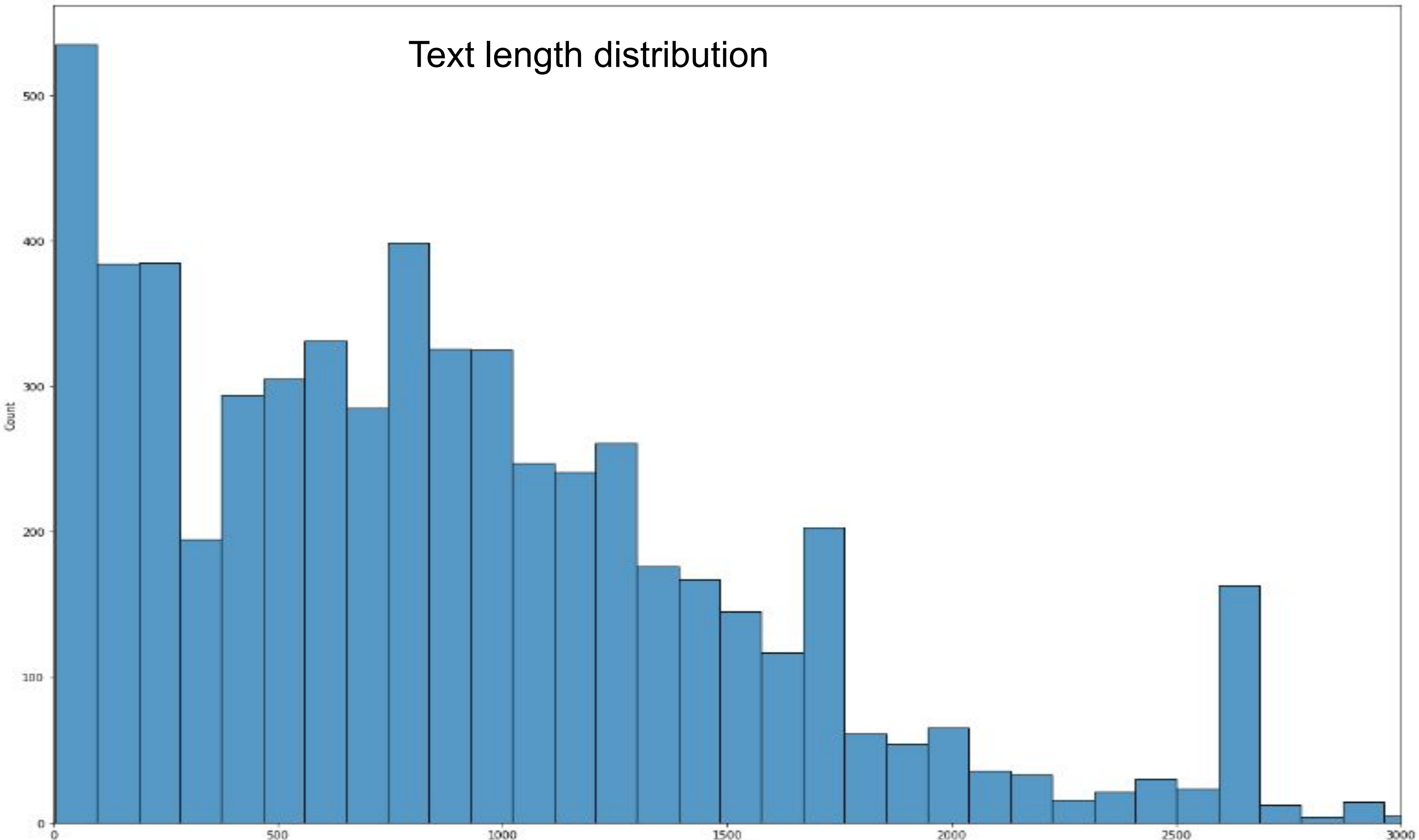
NKWs=141, unused

Tag Analysis (Level=-1, leaves)



NKWs=1208, unused

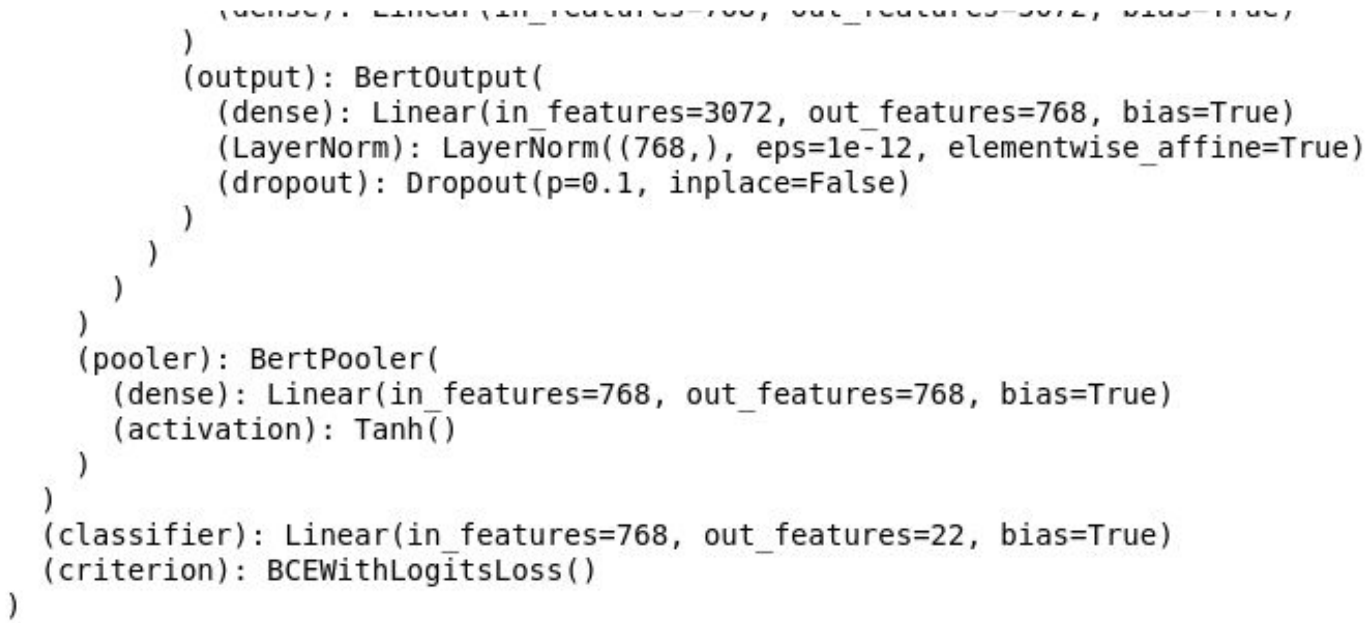
Data Analysis



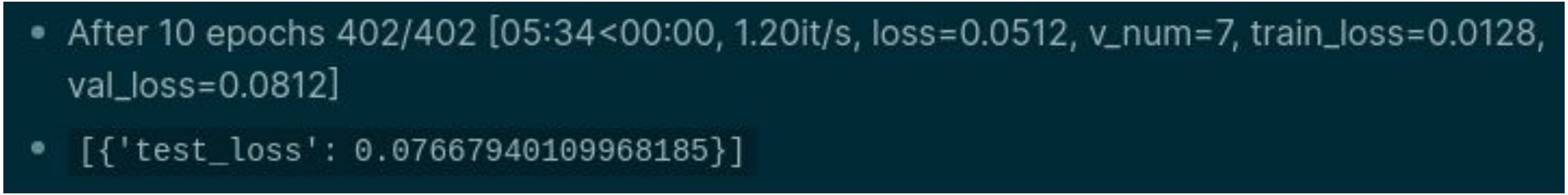
Text length distribution

Model Architecture

BERT + Linear Layer



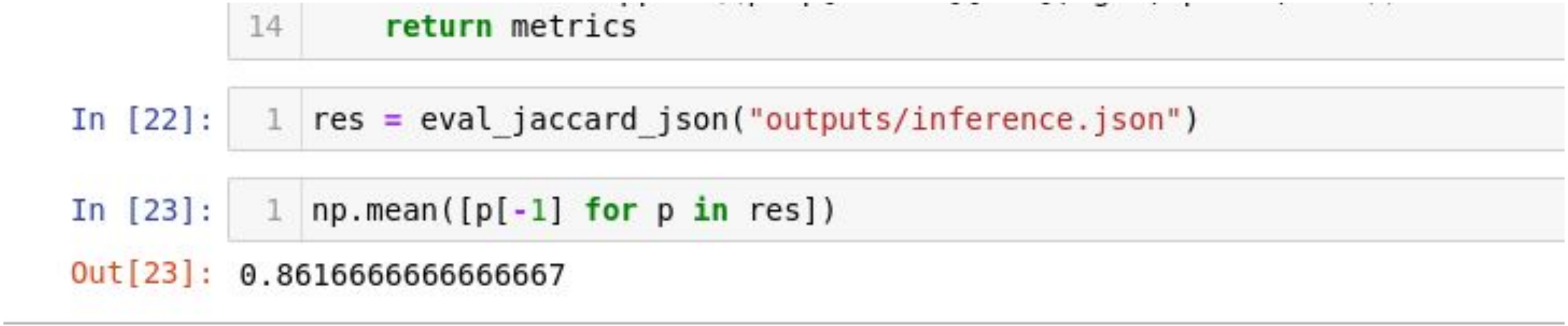
```
            (dense): Linear(in_features=768, out_features=3072, bias=True)
          )
          (output): BertOutput(
            (dense): Linear(in_features=3072, out_features=768, bias=True)
            (LayerNorm): LayerNorm((768,), eps=1e-12, elementwise_affine=True)
            (dropout): Dropout(p=0.1, inplace=False)
          )
        )
      )
    )
    (pooler): BertPooler(
      (dense): Linear(in_features=768, out_features=768, bias=True)
      (activation): Tanh()
    )
  )
  (classifier): Linear(in_features=768, out_features=22, bias=True)
  (criterion): BCEWithLogitsLoss()
)
```



- After 10 epochs 402/402 [05:34<00:00, 1.20it/s, loss=0.0512, v_num=7, train_loss=0.0128, val_loss=0.0812]
- `[{'test_loss': 0.07667940109968185}]`

Sorry, couldn’t get the proper log graph for training. :(

Jaccard Metrics

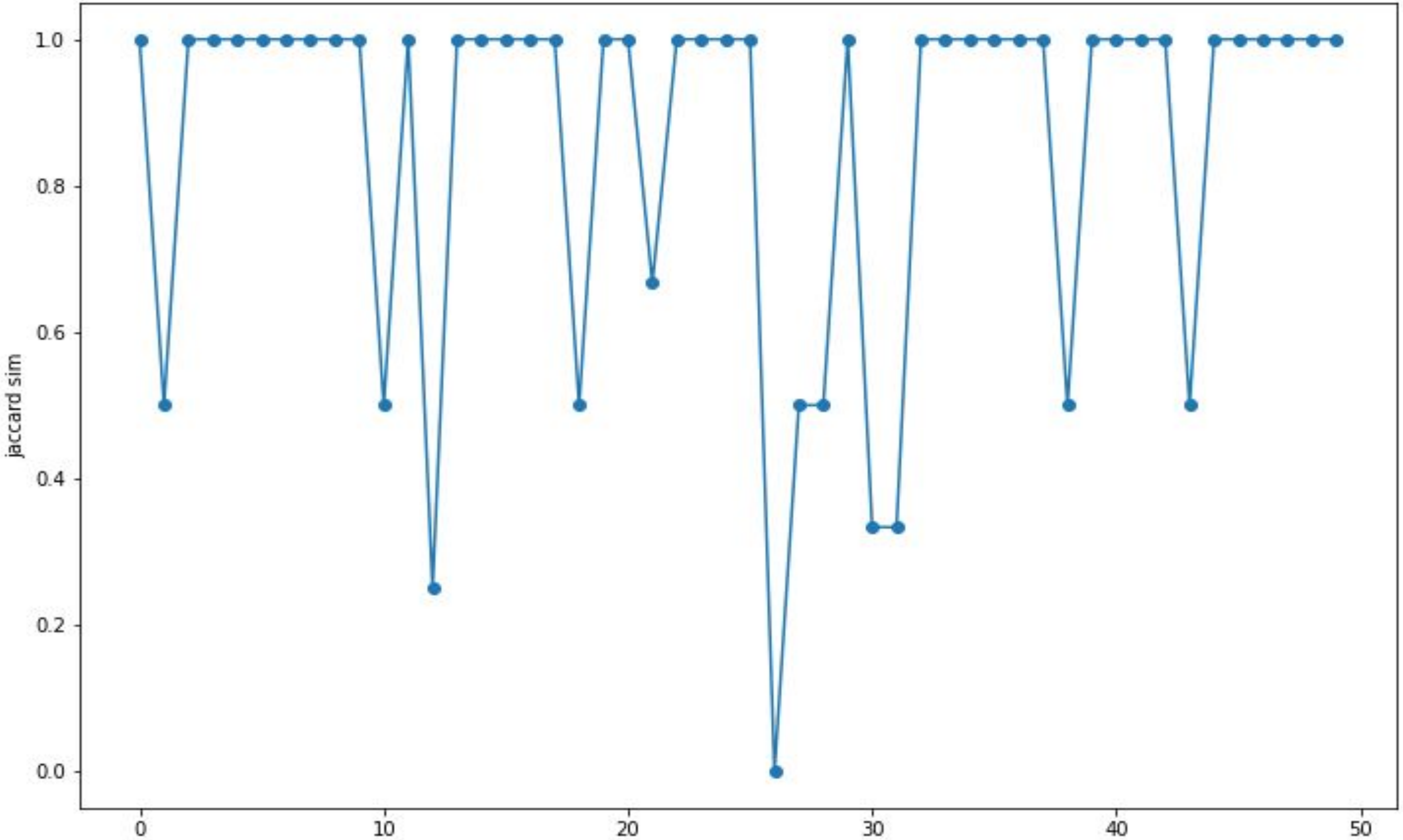


```
    return metrics
```

```
In [22]: res = eval_jaccard_json("outputs/inference.json")
```

```
In [23]: np.mean([p[-1] for p in res])
Out[23]: 0.8616666666666667
```

Jaccard Metrics



Improvements

- Representation Learning?
- Longformer?
- ...

Reference

- loss function for multi-label classification
- multi-label classification using BERT
- Longformer
- Google's paper on representation learning for 2d documents

Final Thoughts

- This was tedious (yet fun)
- It was difficult (challenging) because of **“hierarchies”.** Interesting problem nevertheless.