NEURAL INFORMATION PROCESSING SYSTEMS
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haphazard: A Unified Library and Benchmark for Online Learning under Varying Feature Availability

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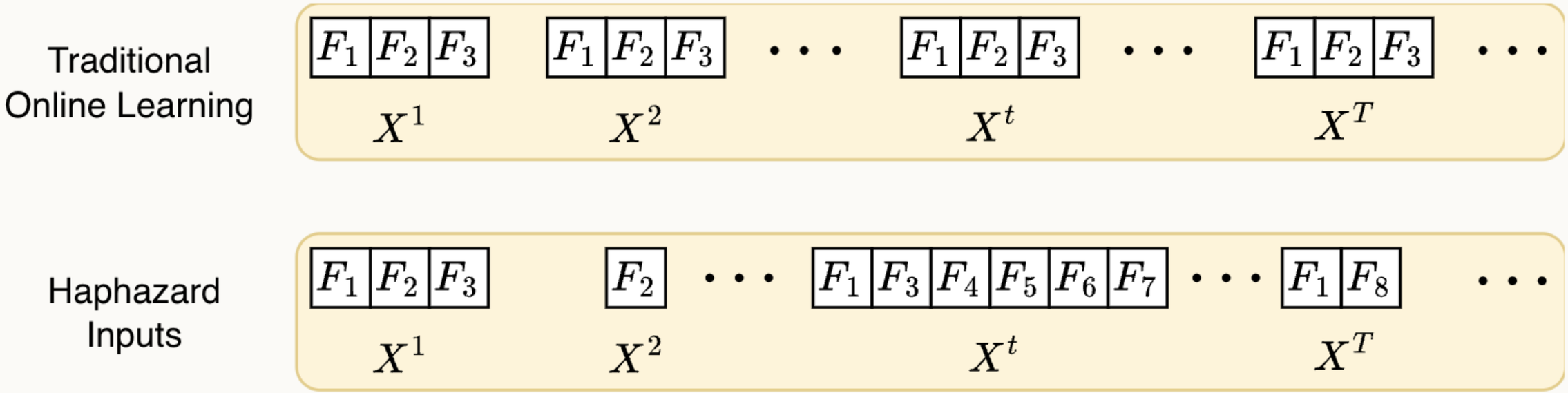
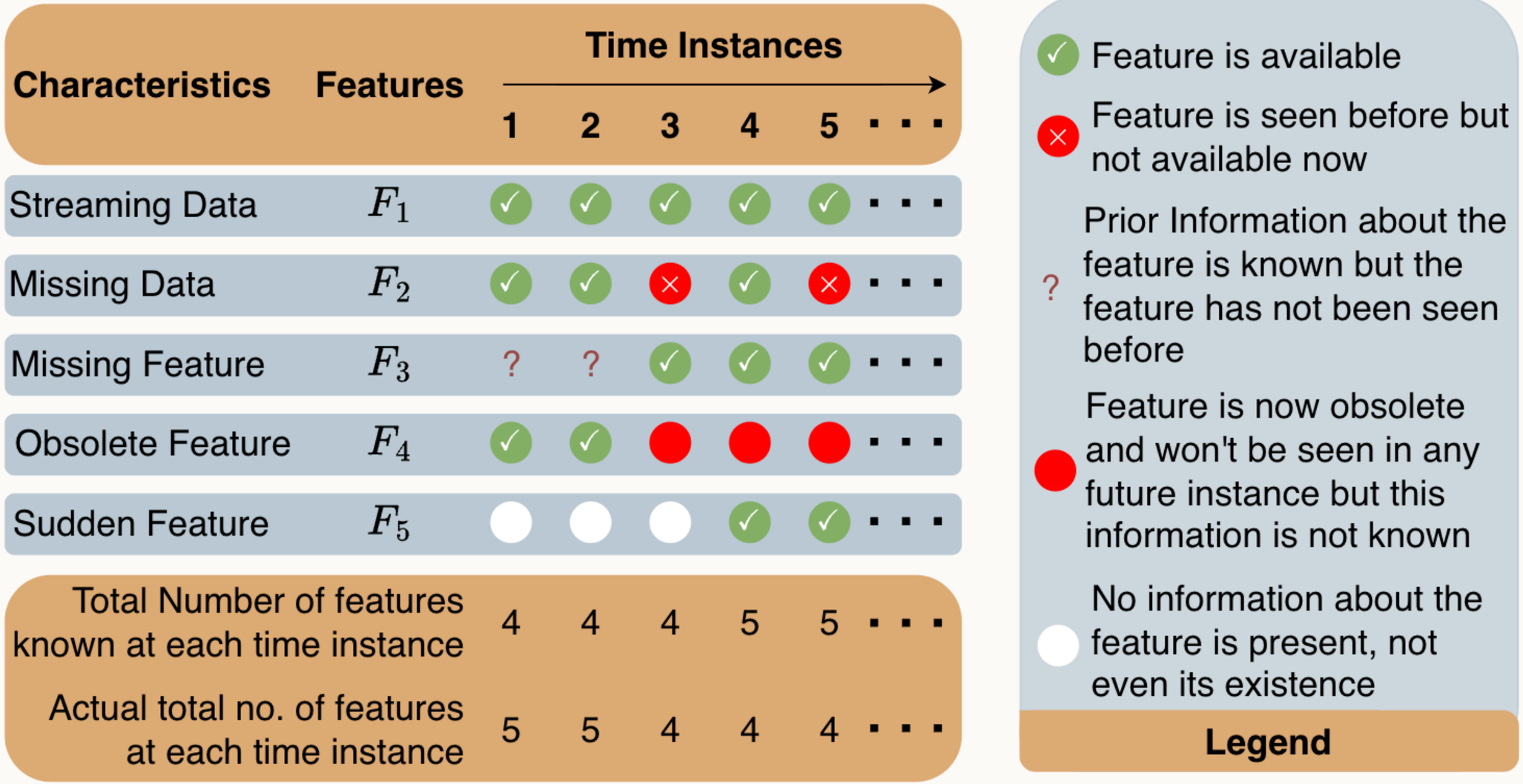
22 datasets	11 models	4 regimes
5+1 normalizers	7 metrics	3 lines of code

Real streams don’t keep inputs fixed



What are haphazard inputs?



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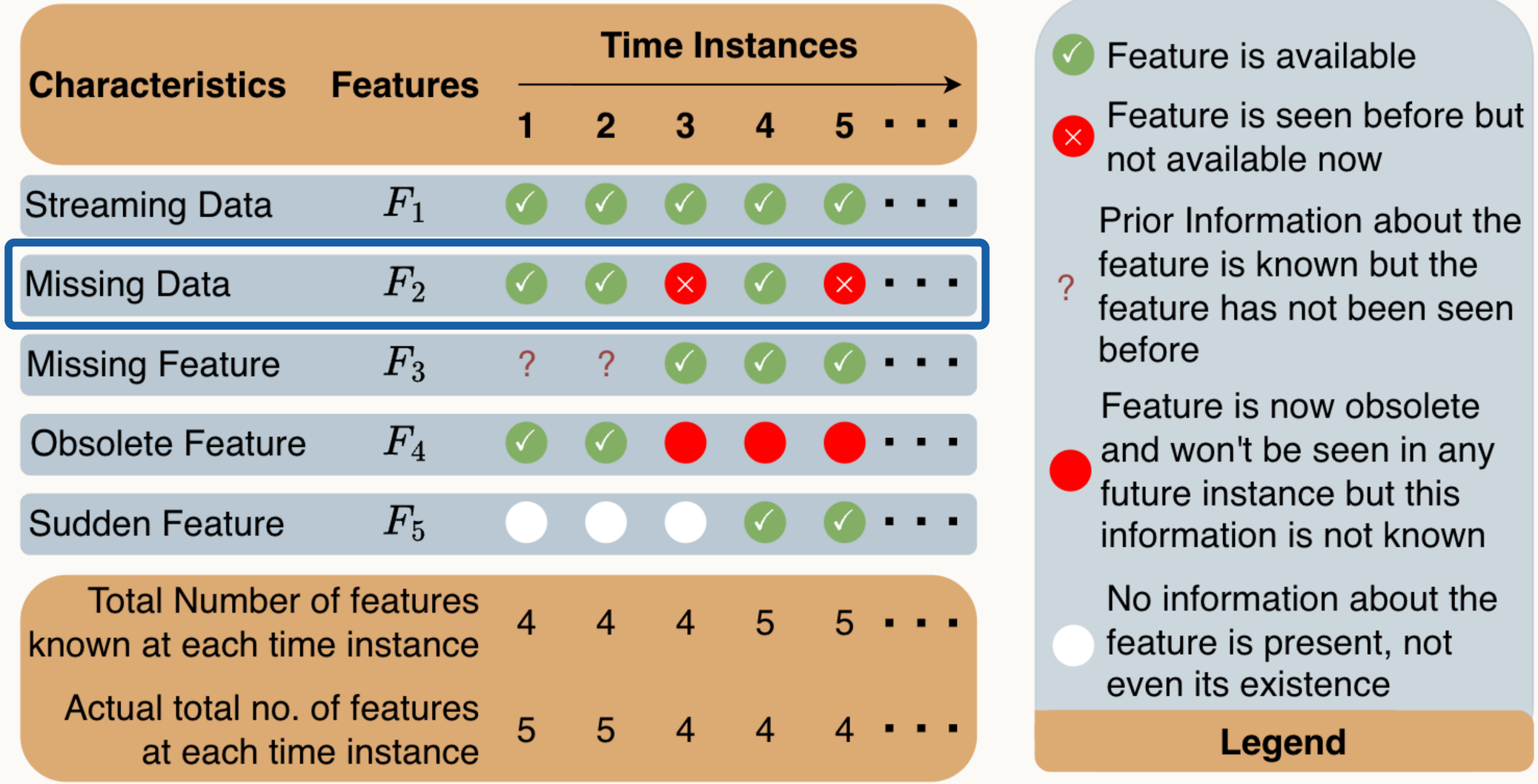

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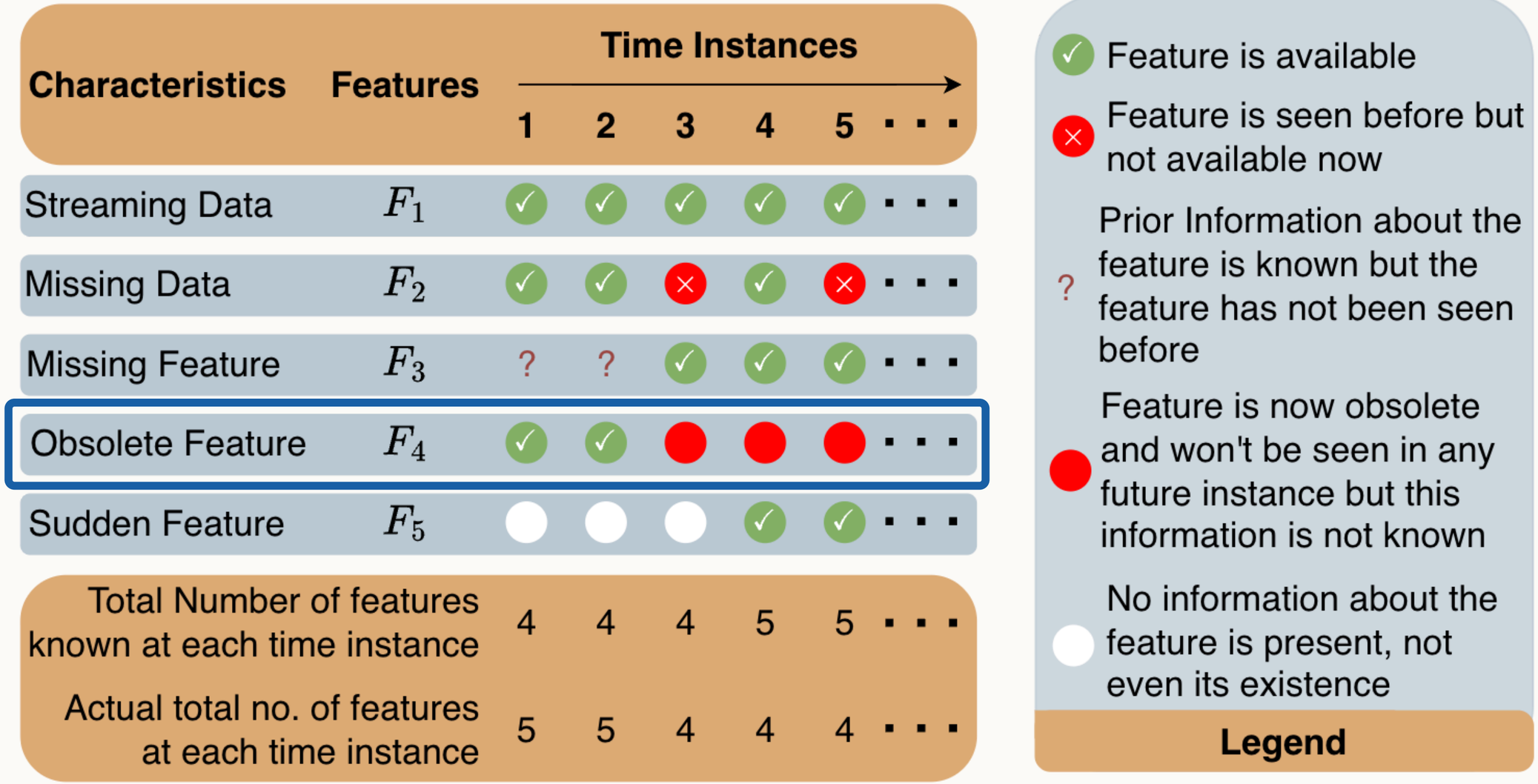


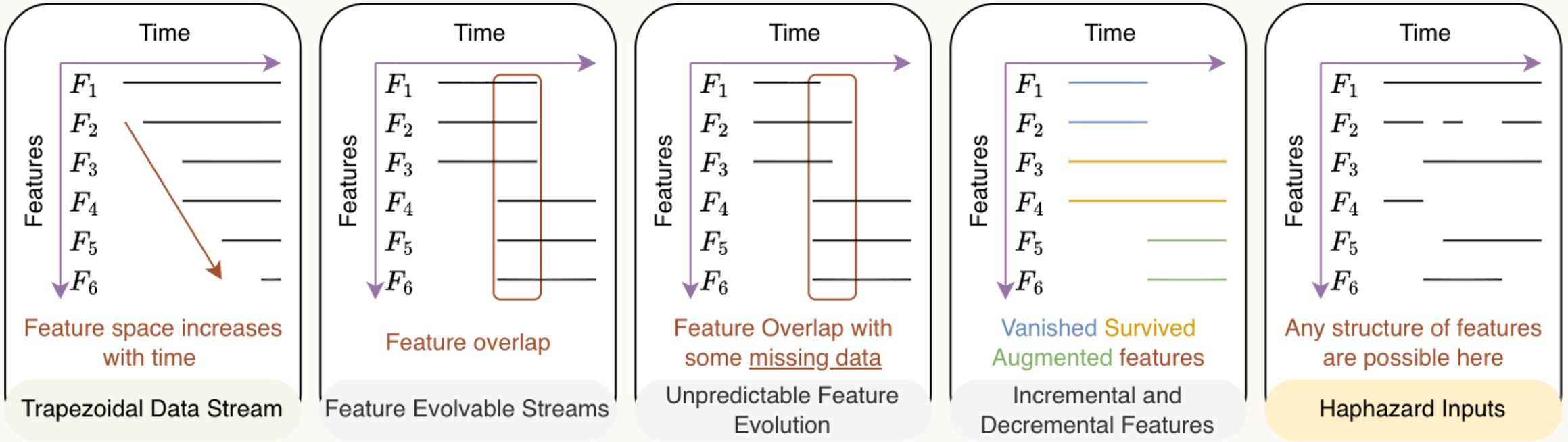
What are haphazard inputs?

Characteristics	Features	Time Instances 1	2	3	4	5	...
Streaming Data	F_1	✓	✓	✓	✓	✓	...
Missing Data	F_2	✓	✓	×	✓	×	...
Missing Feature	F_3	?	?	✓	✓	✓	...
Obsolete Feature	F_4	✓	✓	●	●	●	...
Sudden Feature	F_5	○	○	○	✓	✓	...
Total Number of features known at each time instance		4	4	4	5	5	...
Actual total no. of features at each time instance		5	5	4	4	4	...

Legend

- ✓ Feature is available
- × Feature is seen before but not available now
- ? Prior Information about the feature is known but the feature has not been seen before
- ● Feature is now obsolete and won't be seen in any future instance but this information is not known
- ○ No information about the feature is present, not even its existence

Most general: anything can change

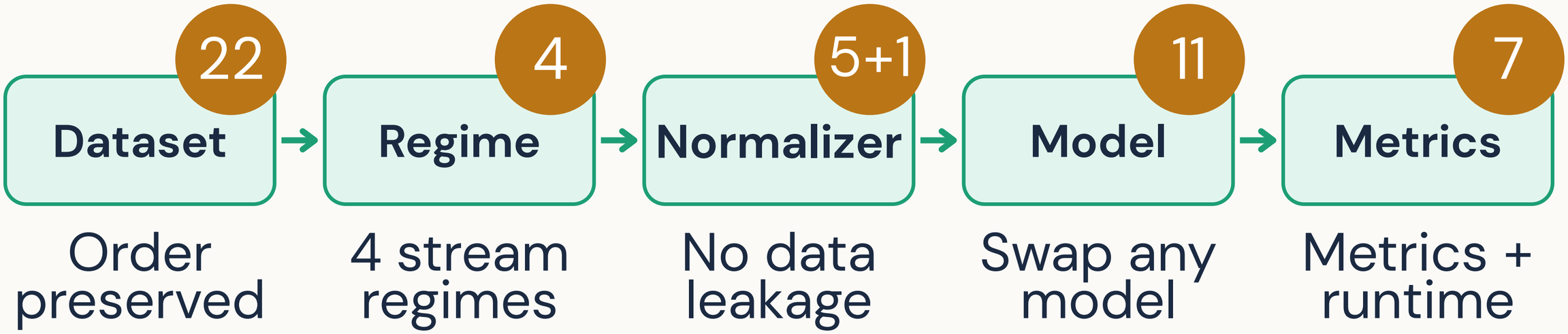


Every paper tested differently

Data / leakage	Shuffled / per model	Misleading / accuracy	Limited regimes

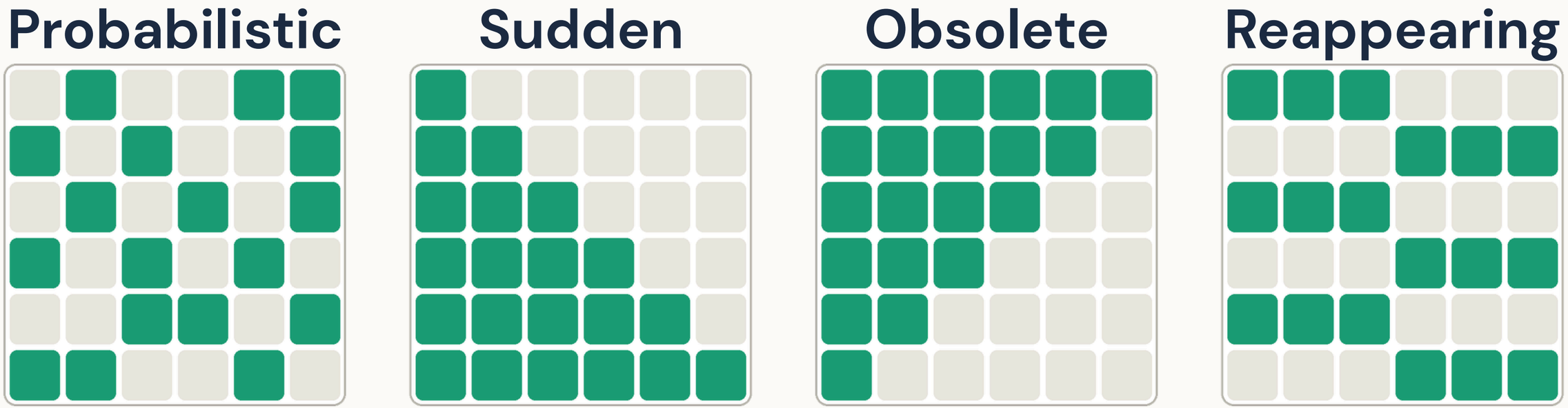
So results can’t be compared

One pipeline, any model



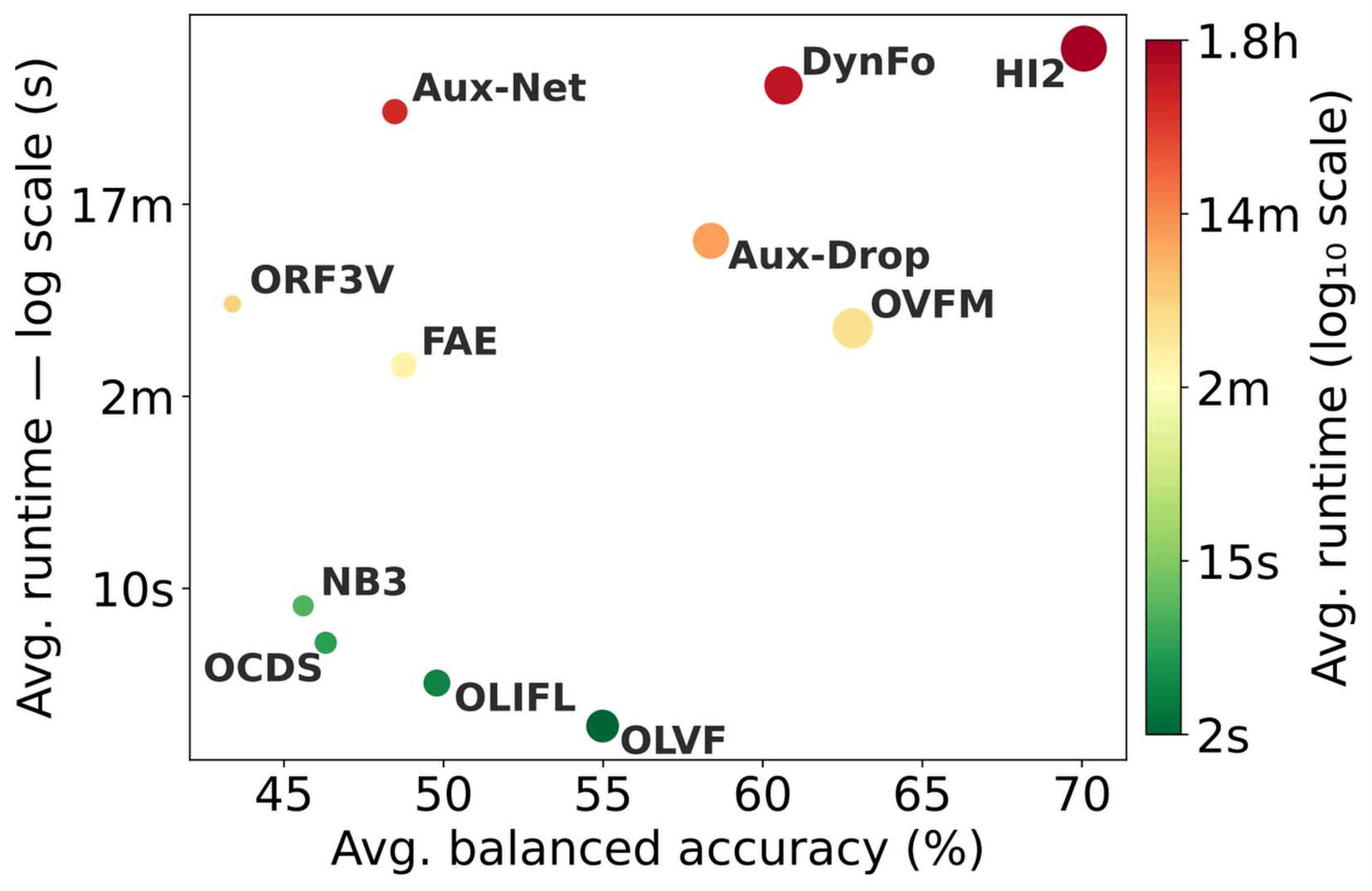

```
data = load_dataset("magic04", scheme="sudden", norm="zscore")
model = load_model("nb3")
out = model(data)
```

Four ways features can change



Rows = time · columns = features · green = observed

Higher accuracy costs runtime



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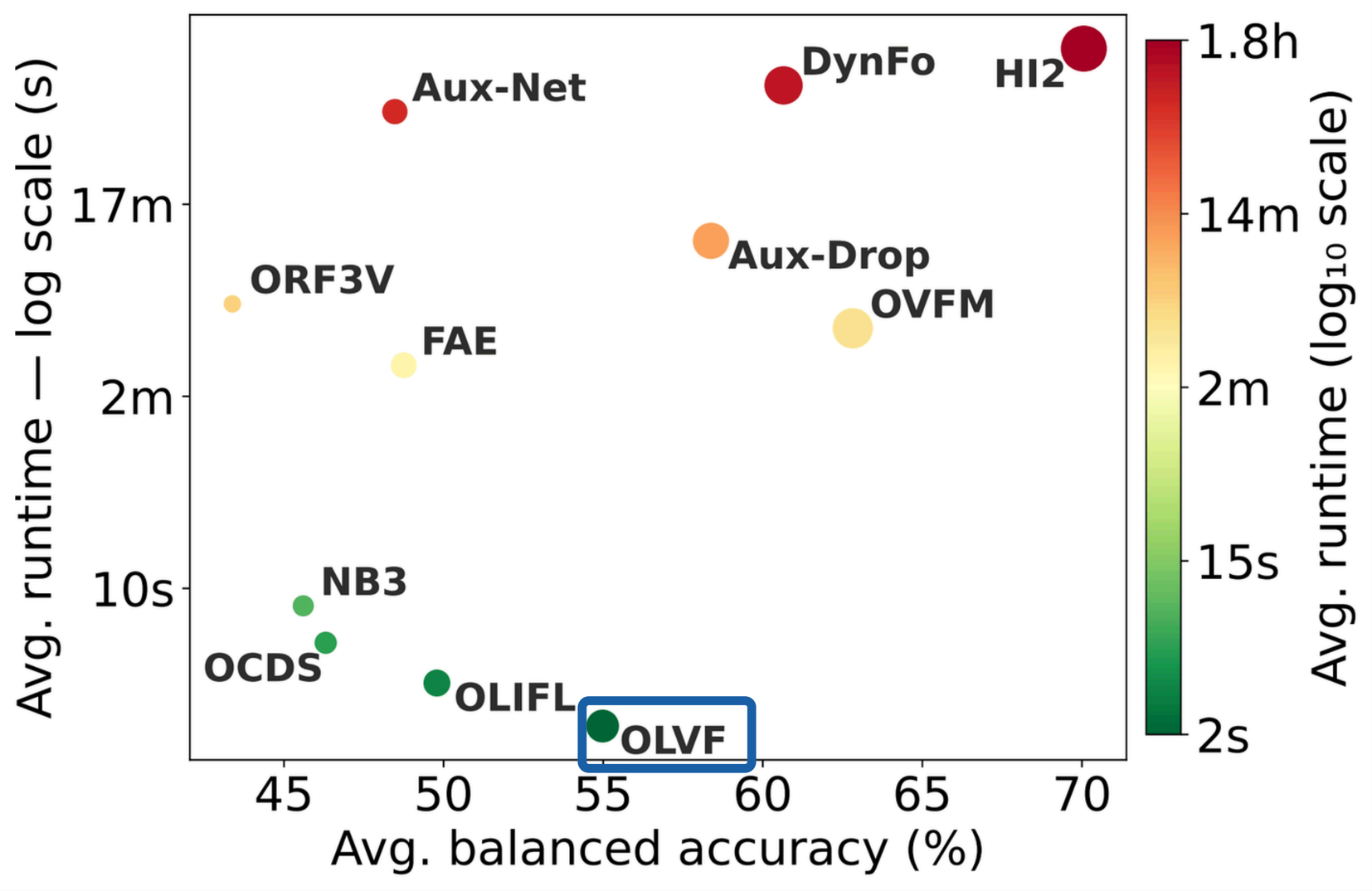

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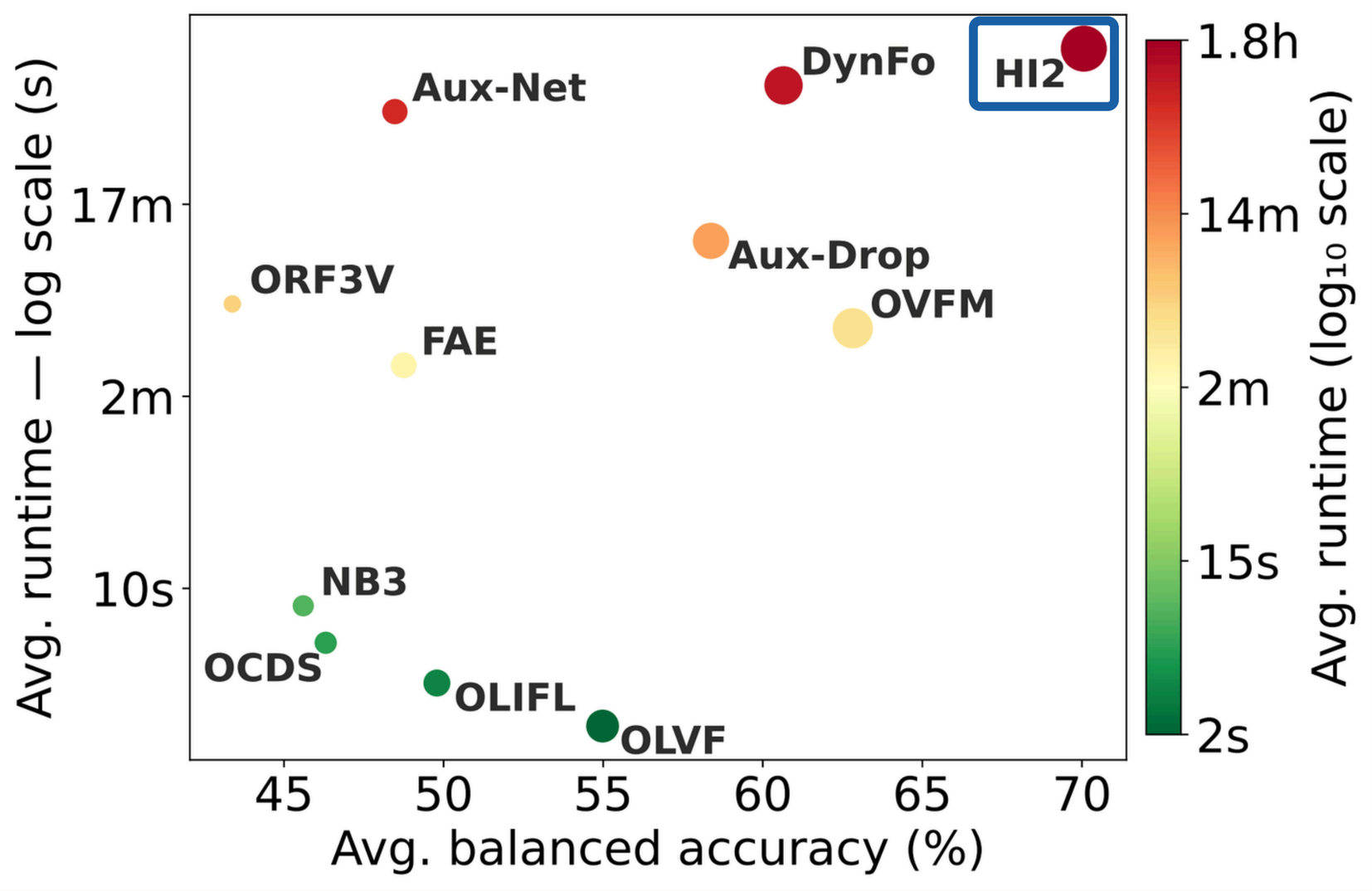

What we learned

Accuracy hides imbalance
Use balanced accuracy

Speed vs. accuracy tradeoff
Pick by latency budget

Simple models compete
when speed matters

Nothing else does all of this

Feature	haphazard	Survey	Repos	River/MOA
Haphazard inputs	✓	✓	✓	✗
Stream regimes	**4**	1	1–3	0
Beyond binary	✓	✗	✗	✓
Plug-in design	✓	✗	✗	○

Try it. Extend it.

```
pip install haphazard
```

Subclass BaseModel

@register_model()

drop in folder

THANK YOU!

Library resources

GitHub

PyPI

Docker

Connect on linkedin

Arijit Das

Rohit Agarwal