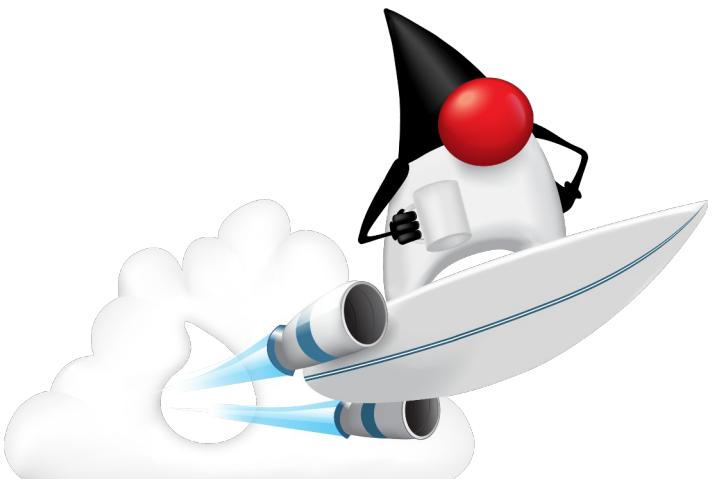
Polyglot Pipelines with



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THE ASF CONFERENCE
CODE

Bob Paulin

Datavolo – Software Engineer
ASF Member
Java Champion
CJUG Board Chair

Podcasts

Java Off Heap - https://www.javaoffheap.com/

Java Pub House - https://www.javapubhouse.com/

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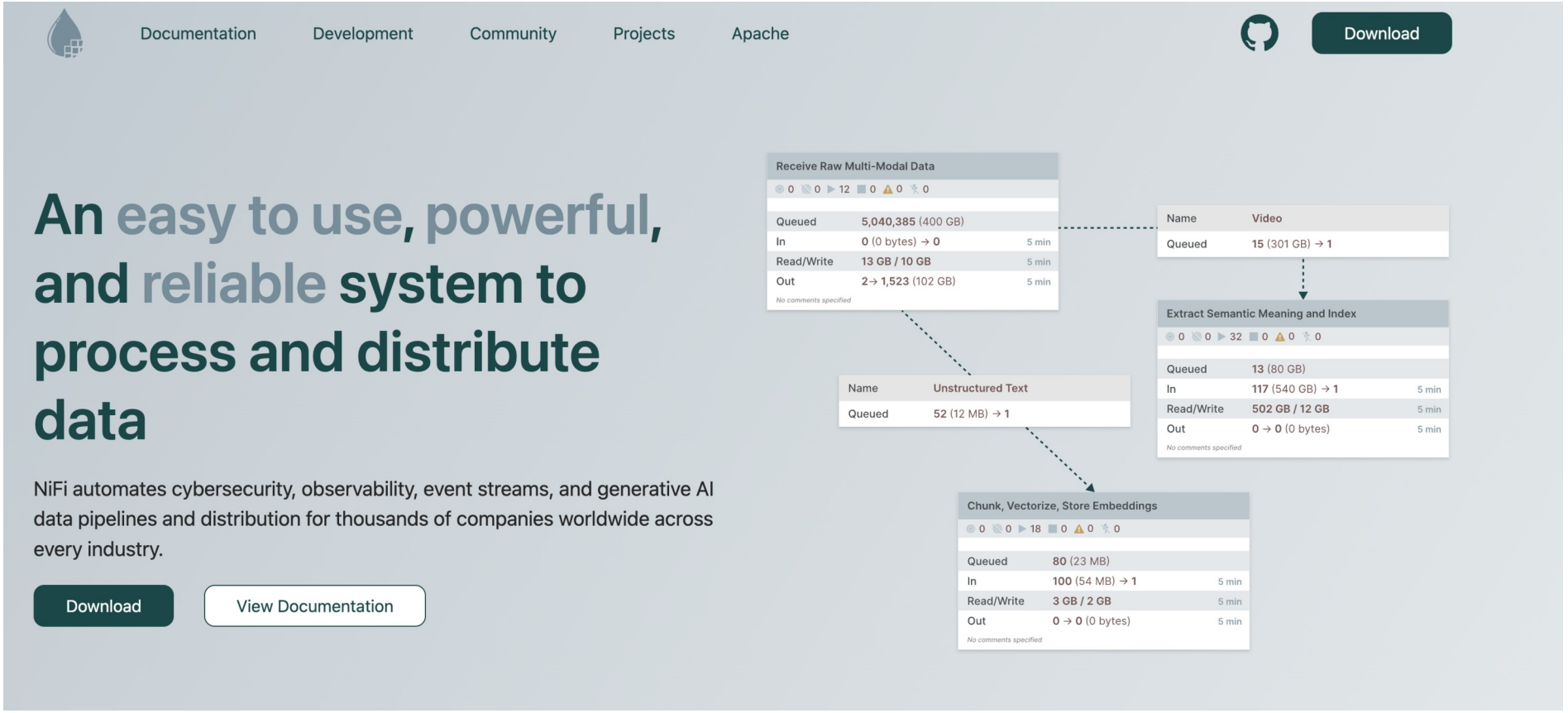
Apache NiFi


Documentation
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Community
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An easy to use, powerful, and reliable system to process and distribute data
NiFi automates cybersecurity, observability, event streams, and generative AI data pipelines and distribution for thousands of companies worldwide across every industry.
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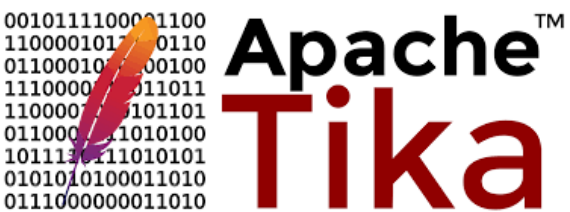
Queued 5,040,385 (400 GB)
In 0 (0 bytes) → 0 5 min
Read/Write 13 GB / 10 GB 5 min
Out 2→ 1,523 (102 GB) 5 min
No comments specified
Name Video
Queued 15 (301 GB) → 1
Extract Semantic Meaning and Index
Queued 13 (80 GB)
In 117 (540 GB) → 1 5 min
Read/Write 502 GB / 12 GB 5 min
Out 0 → 0 (0 bytes) 5 min
No comments specified
Name Unstructured Text
Queued 52 (12 MB) → 1
Chunk, Vectorize, Store Embeddings
Queued 80 (23 MB)
In 100 (54 MB) → 1 5 min
Read/Write 3 GB / 2 GB 5 min
Out 0 → 0 (0 bytes) 5 min
No comments specified

Apache NiFi

Building a Simple OpenSearch Index

https://data.cityofchicago.org/resource/xzkq-xp2w.csv

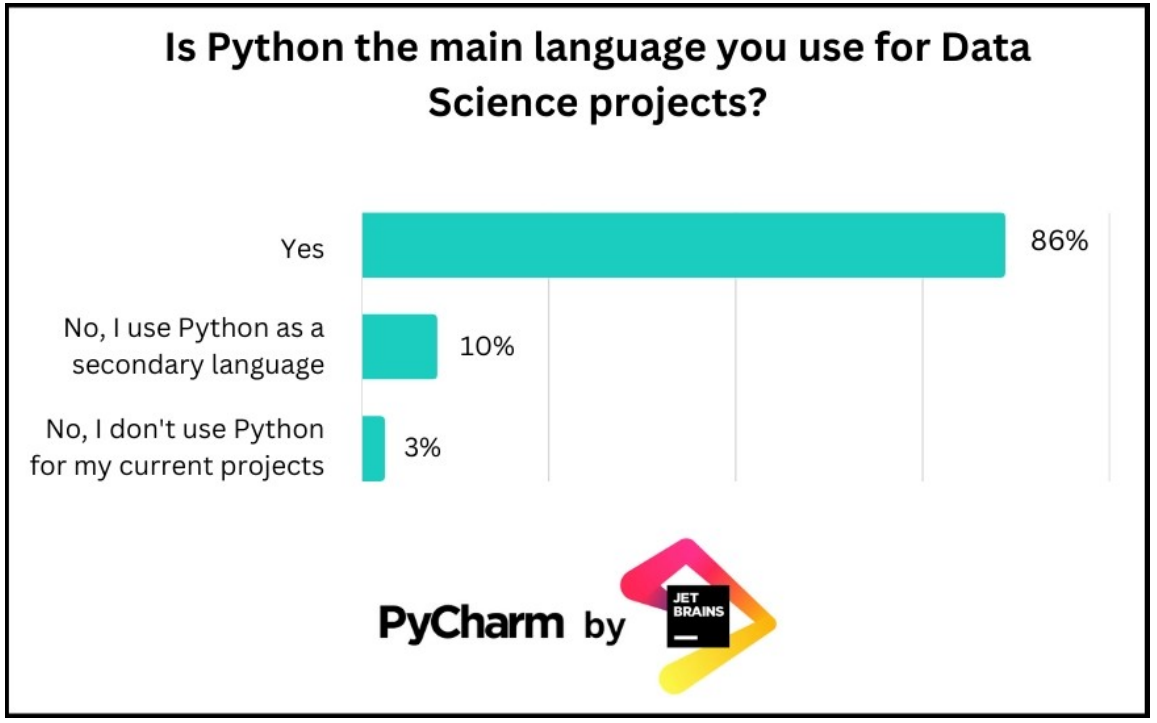
Apache NiFi Loves Java



Is there anything that I might not prefer to write in Java?

AI

ML and Data Science Community extensively use Python



https://blog.jetbrains.com/pycharm/2023/10/future-of-data-science/

Python ML Libraries

Languages and Libraries evolve based on usage

”The next best thing to having good ideas is recognizing good ideas from your users. Sometimes the latter is better.” - Eric Raymond

See also

Growing a Language, by Guy Steele

How do I enable my developers to use the best tool for the job?

Apache NiFi 2.x Py4J Plugin

How Does Py4J Work in NiFi?

- Separate Python Process with Socket Connection

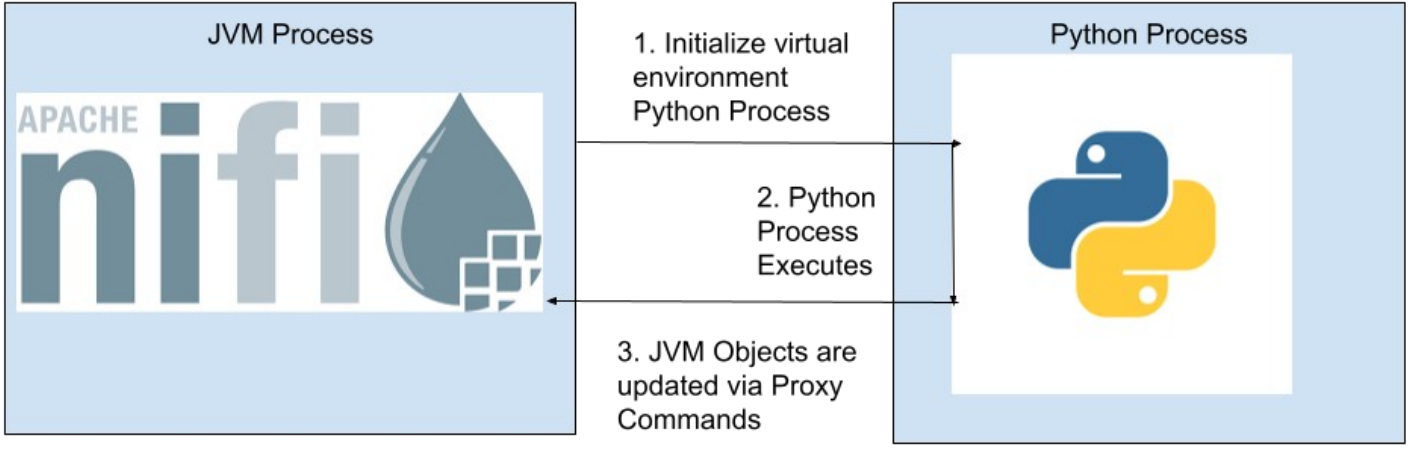
How Does Py4J Work in NiFi?

- Separate Python Process with Socket Connection
- Python Virtual Environment for dependency isolation

How Does Py4J Work in NiFi?

- Separate Python Process with Socket Connection
- Python Virtual Environment for dependency isolation
- Object proxies
  - Updates on the Python side mutates the objects on on the JVM

How Does Py4J Work in NiFi?



Integrating Python Libraries

- Processor Member Field
- requirements.txt
- Bundled in NAR file

What can I do in NiFi with Python?

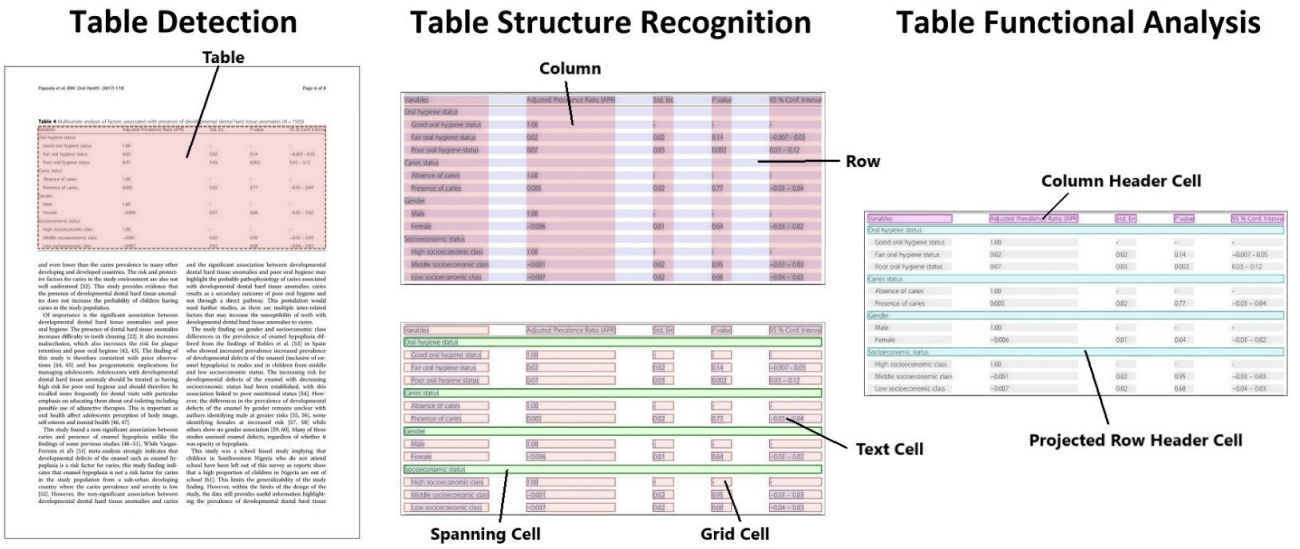
- Transform Flow Files
- Create Flow Files
- Transform Records

Lets Build a NiFi Python Plugin

Table Transformer (TATR)

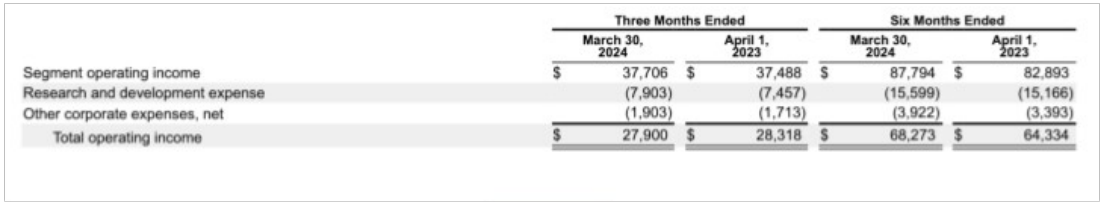
A deep learning model based on object detection for extracting tables from PDFs and images.

First proposed in "PubTables-1M: Towards comprehensive table extraction from unstructured documents".



https://github.com/microsoft/table-transformer

Lets Build a NiFi Python Plugin



	Three Months Ended		Six Months Ended	
	March 30, 2024	April 1, 2023	March 30, 2024	April 1, 2023
Segment operating income	$ 37,706	$ 37,488	$ 87,794	$ 82,893
Research and development expense	(7,903)	(7,457)	(15,599)	(15,166)
Other corporate expenses, net	(1,903)	(1,713)	(3,922)	(3,393)
Total operating income	$ 27,900	$ 28,318	$ 68,273	$ 64,334

Encode

{'pixel_values': tensor([[[[2.2489, 2.2489, 2.2489, ..., 2.2489, 2.2489, 2.2489]]]]), 'pixel_mask': tensor([[[1, 1, 1, ..., 1, 1, 1],])}

Model Inference

TableTransformerObjectDetectionOutput(loss=None, loss_dict=None, logits=tensor([[[-13.3932, -7.7760, -7.5944, -10.9697, -11.2009, -7.4343, 4.2611],...]]], grad_fn=<ViewBackward0>), pred_boxes=tensor([[[0.5433, 0.6224, 0.3335, 0.0981], [0.4947, 0.2442, 0.9166, 0.0779],]]], grad_fn=<SigmoidBackward0>), ……)

Post Process

{'scores': tensor([1.0000, 0.9999, 0.9995, 0.9997, 0.9999, 0.9996, 0.9999, 0.9994, 0.9997, 0.9995, 0.9999, 0.9998, 0.9999, 0.9999, 0.9997], grad_fn=<IndexBackward0>), 'labels': tensor([1, 1, 3, 5, 1, 2, 1, 2, 2, 5, 0, 2, 1, 2, 2]), 'boxes': tensor([[1740.9777, 126.5295, 2830.4287, 659.9639], ...]]grad_fn=<IndexBackward0>)}

Building a Nifi Python Plugin

Type of Processor

	Three Months Ended		Six Months Ended	
	March 30, 2024	April 1, 2023	March 30, 2024	April 1, 2023
Segment operating income	$ 37,706	$ 37,488	$ 87,794	$ 82,893
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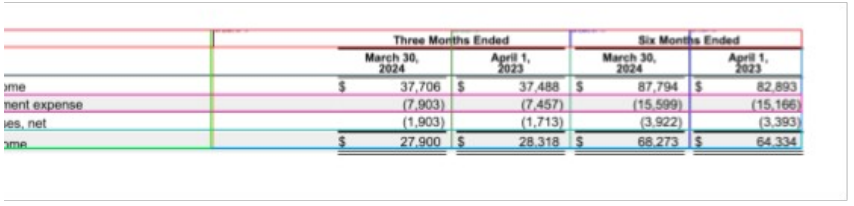
annotated

coco



	Three Months Ended		Six Months Ended	
	March 30, 2024	April 1, 2023	March 30, 2024	April 1, 2023
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es, net	(1,903)	(1,713)	(3,922)	(3,393)
ome	$ 27,900	$ 28,318	$ 68,273	$ 64,334


```
{
  "info": {
    "year": "2024",
    "version": "1.0",
    "description": "A coco file"
  },
  "images": [
    {
      "id": 0,
      "file_name": "apple-chart-100px-whitespace.png"
    }
  ],
  "licenses": [
    {
      "id": 0,
      "name": "Apache"
    }
  ],
```

Building a Nifi Python Plugin

Dependencies

Hatch Datavolo Nar Plugin

- Allows Python dependencies to be packaged with processor source code.
- Formats project for simple deployment as a NAR in nifi/extensions directory
- Open Source

Building a NiFi Python Plugin

Processor Properties

Processor Details TableDetectionProcessor 0.0.1-SNAPSHOT

Settings | Scheduling | Properties | Relationships | Comments

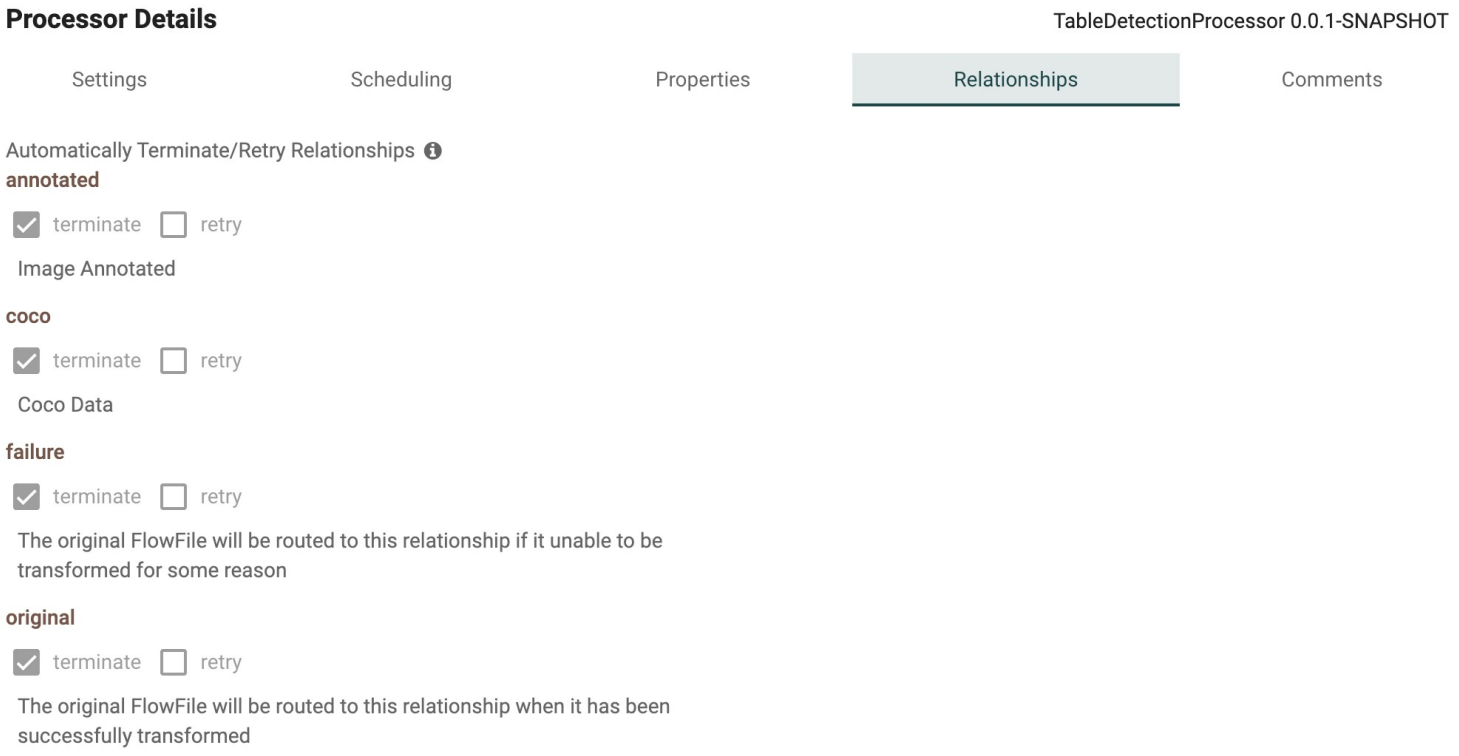
Required field

Verification

Property	Value
Table Model Name	microsoft/table-transformer-structure-reco...
Output Type	annotations

Building a Nifi Python Plugin

Relationships



Building a Nifi Python Plugin

NiFi Lifecycle Behavior

def onScheduled(self, context)

def onStopped(self, context)

Building a Nifi Python Plugin

Triggering Behavior

```
def transform(self, context, flowFile)
```

Building a NiFi Python Plugin

Ship IT! ✅

Challenges with Apache NiFi Python in Production

- Security Vulnerabilities

Challenges with Apache NiFi Python in Production

- Security Vulnerabilities
- GPU Acceleration

Challenges with Apache NiFi Python in Production

- Security Vulnerabilities
- GPU Acceleration
- Scaling

Looking to do this in Production?

Thank You!

Code

Me

Bob Paulin
@bobpaulin

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https://datavolo.io