SingleStore™

SingleStoreDB Python UDFs

Bringing the AI and ML Capability Closer To Data

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Agenda

- SingleStoreDB
- Python UDFs
- Aura Compute
- Vector UDFs
- Table Valued Functions
- AI Functions
- ML Functions
- JSON and more interesting types
- Performance and Scalability

Along with some Demos…

SingleStoreDB

SingleStore is a **real-time**, **distributed** SQL database that combines *transactional* and *analytical* workloads in **one** system to provide fast performance for intelligent applications.

It achieves high speed through in-memory processing, a **distributed** architecture, and universal storage that handles both row-based and column-based data needs.

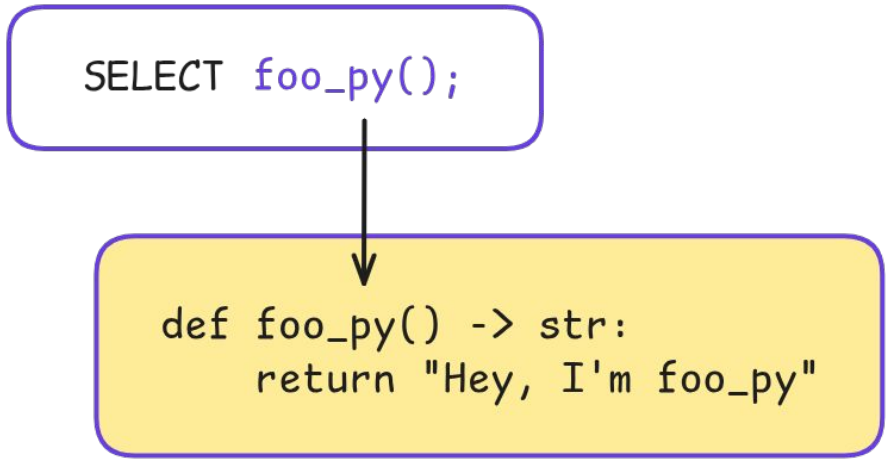
Python UDFs

Call Python functions directly from SQL :)

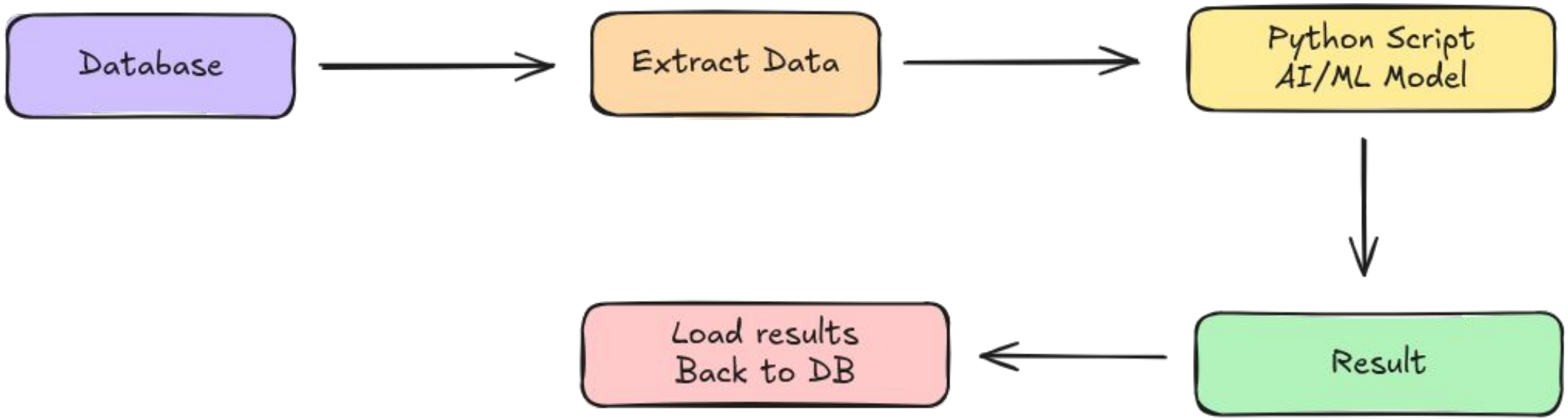
Brings AI/ML Capabilities right into the database.

Custom business logic that's too complex for SQL?
Too easy for Python!

Reduces (almost eliminates) data movement.



Without Python UDFs



That’s too much data movement!

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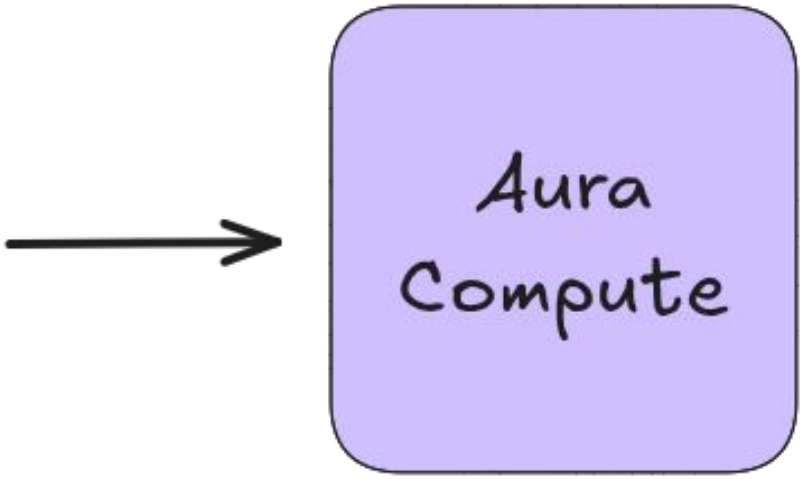
With Python UDFs

```
SELECT
    product_id,
    predict_churn(features)
FROM customers;
```



Simple :)

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Make it more interesting and practical?

```
CREATE PIPELINE video_game_wikipedia_pipeline
AS LOAD DATA STAGE 'data.csv'
BATCH_INTERVAL 2500
DISABLE OFFSETS METADATA GC
SKIP DUPLICATE KEY ERRORS
INTO TABLE video_game_data_v2
FIELDS TERMINATED BY ',' ENCLOSED BY '"' ESCAPED BY '\\'
LINES TERMINATED BY '\n' STARTING BY ''
IGNORE 1 LINES
(id, url, @description)
SET
    description = @description,
    description_embedding = cluster.EMBED_TEXT(@description);
```

How to create one?

1. Define the Python UDFs in a Notebook
2. Try it out interactively :)
3. Publish It!
4. Use the UDF from within the SQL.

Demo Time 1 🎀

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Aura Compute

Our serverless platform

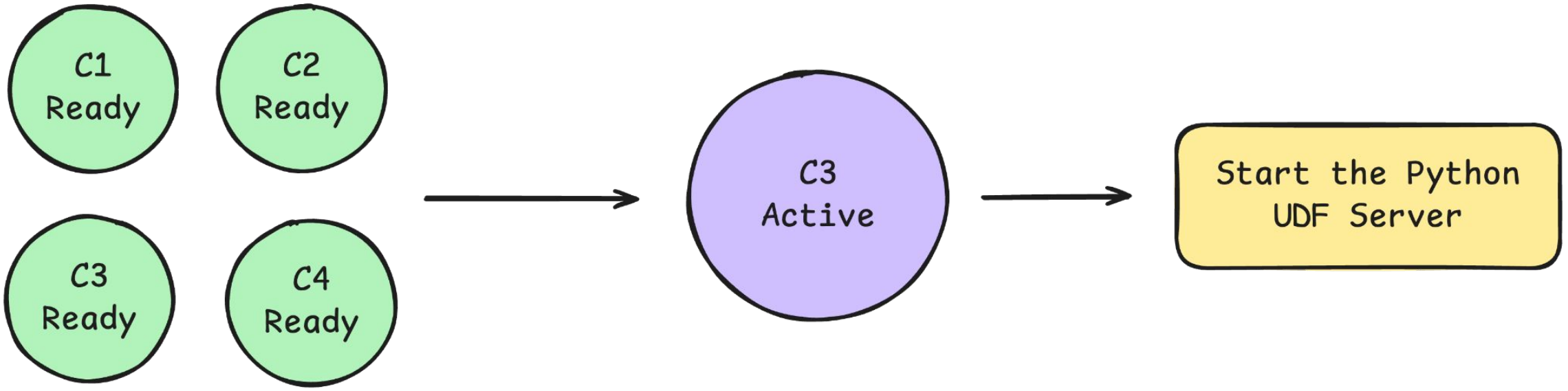
Enables running code securely in a sandboxed environment

Supports scaling!

- Let’s you choose the compute.
  - Even lets you choose a GPU 🔥
- Supports multi-replication.

Powering - Scheduled Jobs, Cloud Functions and more :)

How did that work!?



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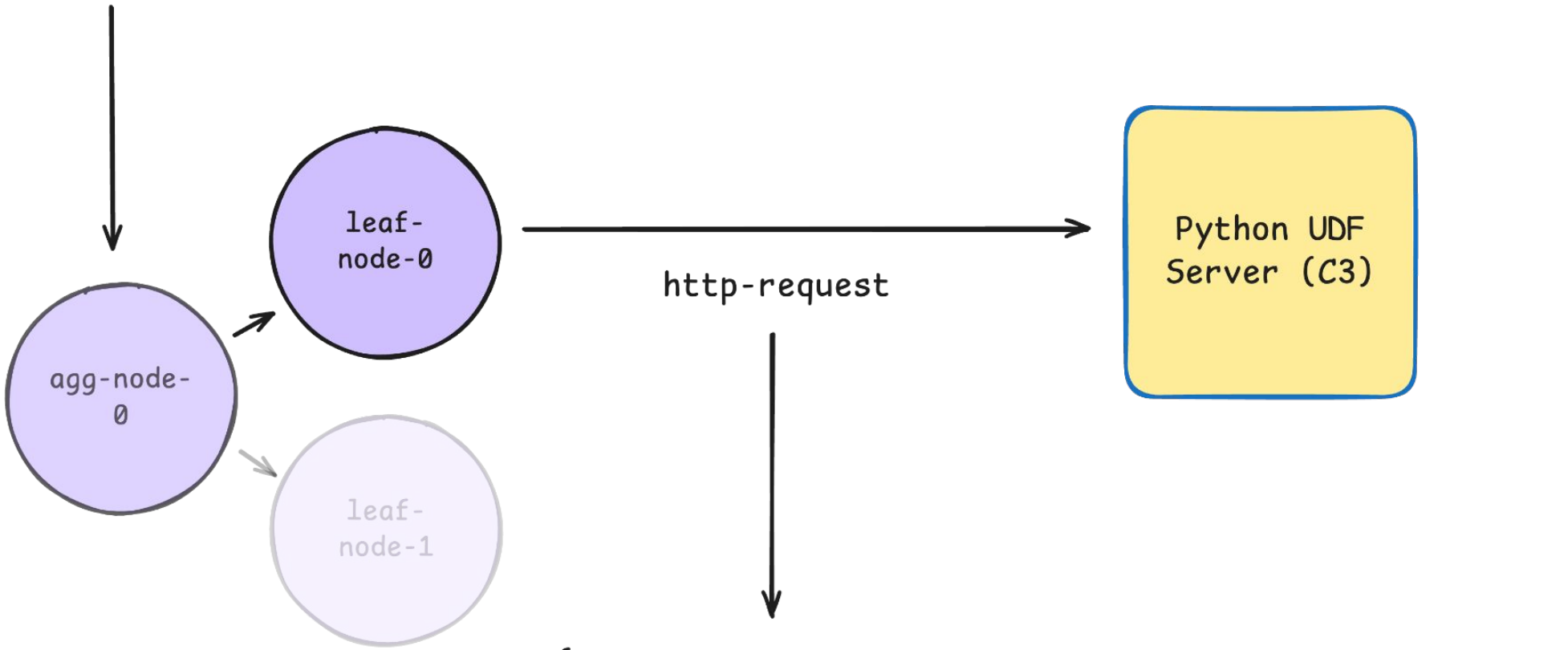
```
@udf
def x_multiply(a: int, b: int) -> int:
    return a * b
```

```
CREATE EXTERNAL FUNCTION db.x_multiply(a INT, b INT)
RETURNS INT ... 'https://singlestore.com/udf-id'
FORMAT ROWDAT_1
...
```

```
SELECT x_multiply(a, b) from table;
```




```
{
    body: [[rowID, columns], ... by default 511 more]
}
```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Vector UDFs

```
@udf
async def foo(arr: npt.NDArray[np.float16]) -> npt.NDArray[np.float16]:
    # This let's you process the whole batch in a single function
    # invocation.
    return arr * 2
```

Table Valued Functions (TVFs)

Returns a Table as a value.

```
@udf
def abc() -> Table[List[str, str, str]]:
    return [“a”, “b”, “c”]


SQL> SELECT a, b from abc();
```


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AI Functions

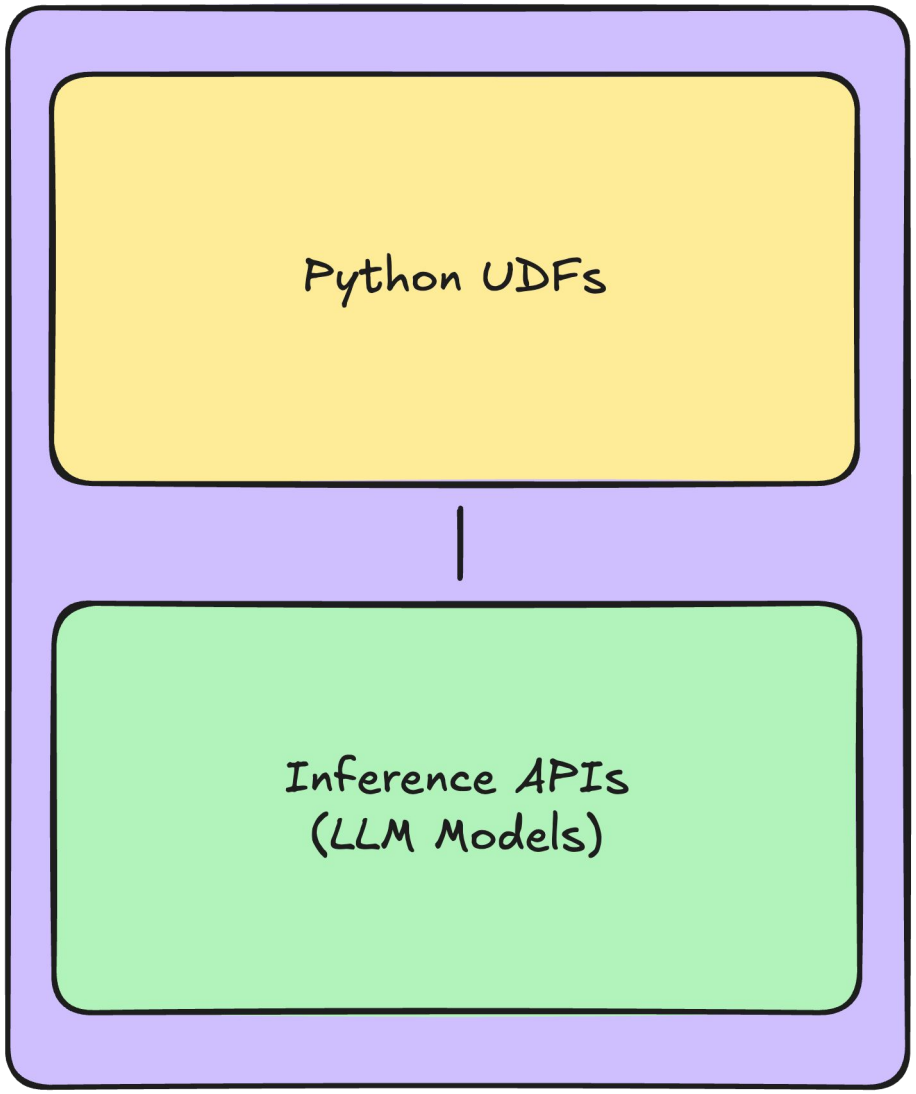
Pseudo builtins, that provide AI capabilities to the engine right out of the box.

EMBED_TEXT

AI_TRANSLATE

AI_SUMMARIZE

and more…



Demo Time 2 

ML Functions

Pseudo builtins, that provide ML capabilities to the engine right out of the box.

ML_CLASSIFY

ML_ANOMALY_DETECT

Demo Time 3 

JSON Type Support For Function Parameters

```
from singlestoredb.functions.typing import JSON

@udf

def transform_json_add_field(json_data: JSON, new_field: str, new_value: str) -> JSON:

    if isinstance(json_data, dict):

        result = json_data.copy()

        result[new_field] = new_value

        return result

    return json_data
```

Performance and Scalability

1. Choose the compute!
2. Multi-replicas :)
    a. Let’s you choose minimum and maximum replicas and supports auto-scaling 🔥
    b. GPU instances for heavy computation!

Thank You