W A L D

A Modern & Sustainable Analytics Stack

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inovex

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- Mathematical Modelling
- Modern Data Warehousing & Analytics
- Personalisation & RecSys
- Uncertainty Quantification & Causality
- Python Data Stack
- OSS Contributor & Creator of PyScaffold

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is an innovation and quality-driven IT project house with a focus on digital transformation.

- Application Development (Web Platforms, Mobile Apps, Smart Devices and Robotics, UI/UX design,Backend Services)
- Data Management and Analytics (Business Intelligence, Big Data, Searches, Data Science and Deep Learning, Machine Perception and Artificial Intelligence)
- Scalable IT-Infrastructures (IT Engineering, Cloud Services, DevOps, Replatforming, Security)
- Training and Coaching (inovex Academy)

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Data Warehouse

vs

Data Lake

&

ETL

vs

ELT

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COMPARISON

Data Lake vs Data Warehouse

	Data Lake	Data Warehouse
Data Structure	Raw	Processed
Purpose of Data	Not yet determined	Currently in use
Users	Data scientists / engineers	Business professionals
Accessibility	Highly accessible and quick to update	More complicated and costly to make changes

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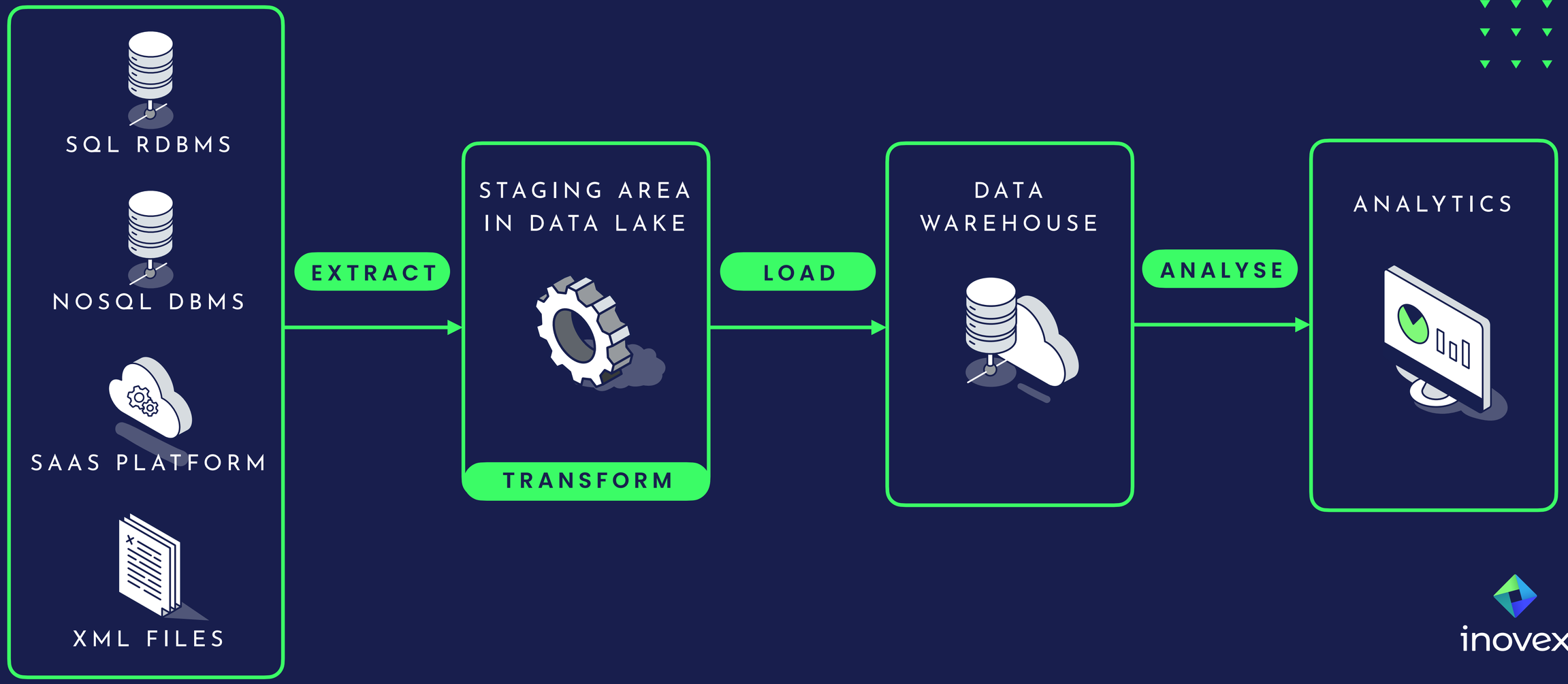
COMPARISON

ETL — Extract, Transform, Load



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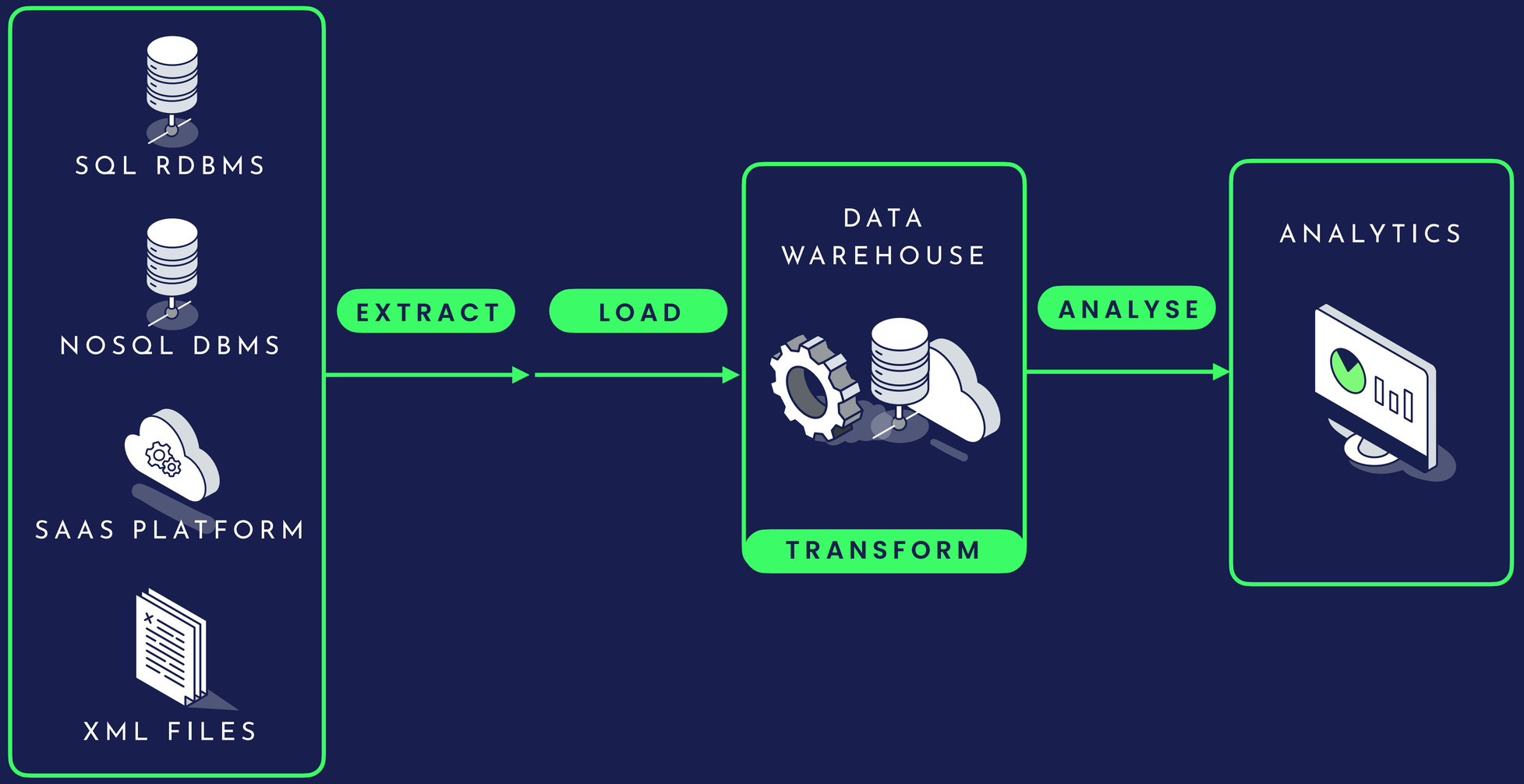
COMPARISON

ELT — Extract, Load, Transform



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PROGRESS

The Evolution of Databricks & Snowflake

databricks

DATA LAKE

& ETL

snowflake

DATA WAREHOUSE

& ELT

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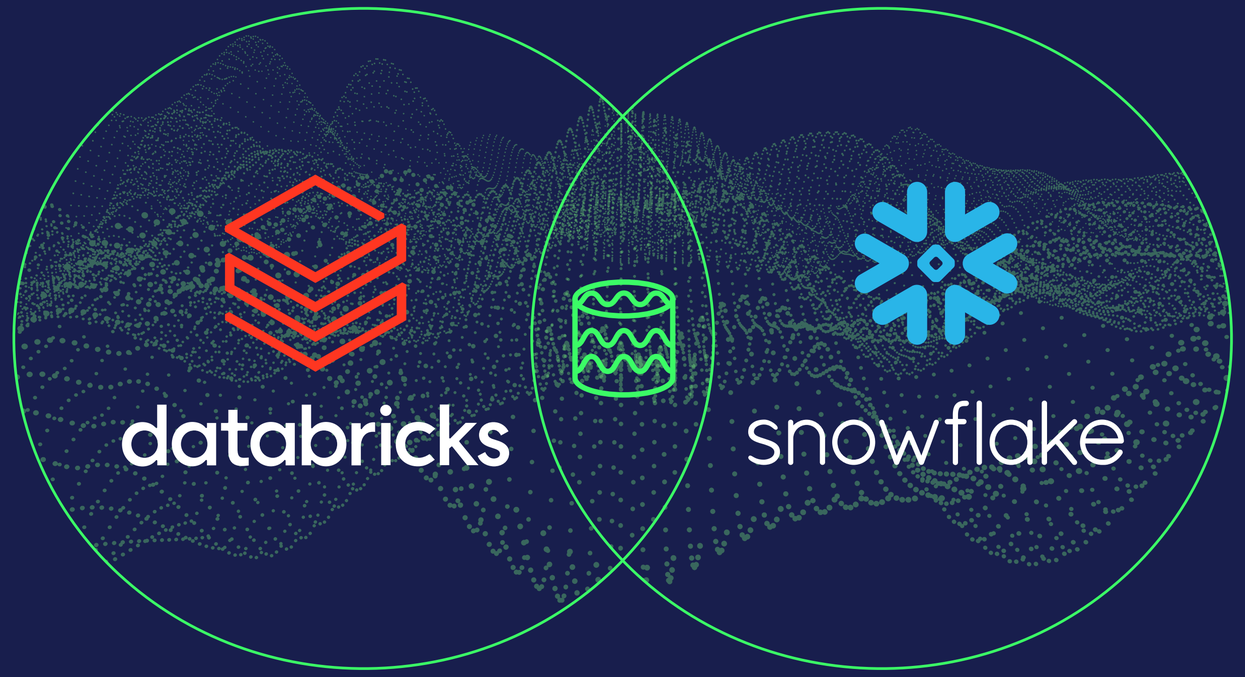
PROGRESS

The Evolution of Databricks & Snowflake

DATABRICKS
LAKEHOUSE



SNOWFLAKE
DATA CLOUD

UNIFICATION
OF DATA WAREHOUSE & LAKE

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WALD

STACK

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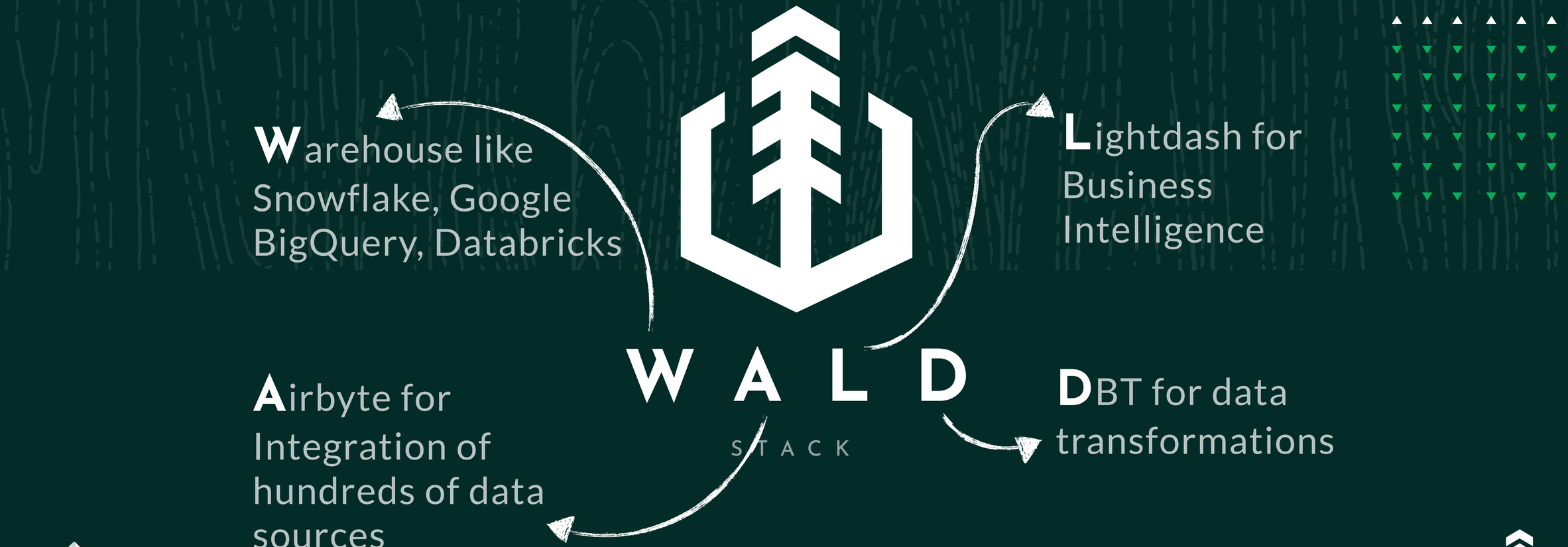
WALD STACK

A Modern & Sustainable Analytics Stack



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WALD STACK

WALD based on Google Big Query

- fully managed enterprise data warehouse
- only available on Google Cloud Platform
- uses dbt-bigquery to run Python UDFs with Dataproc using PySpark

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WALD STACK

WALD based on Databricks

- uses Databrick’s SQL warehouse
- available on all major cloud providers
- uses dbt-databricks to run Python UDFs with PySpark

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WALD STACK

WALD based on Snowflake

- comes with all the benefits of Snowflake, e.g. governance, easy collaboration, security, near zero maintenance
- runs on all major cloud providers
- tons of great documentation
- the easiest to use and full-featured option to get started with WALD

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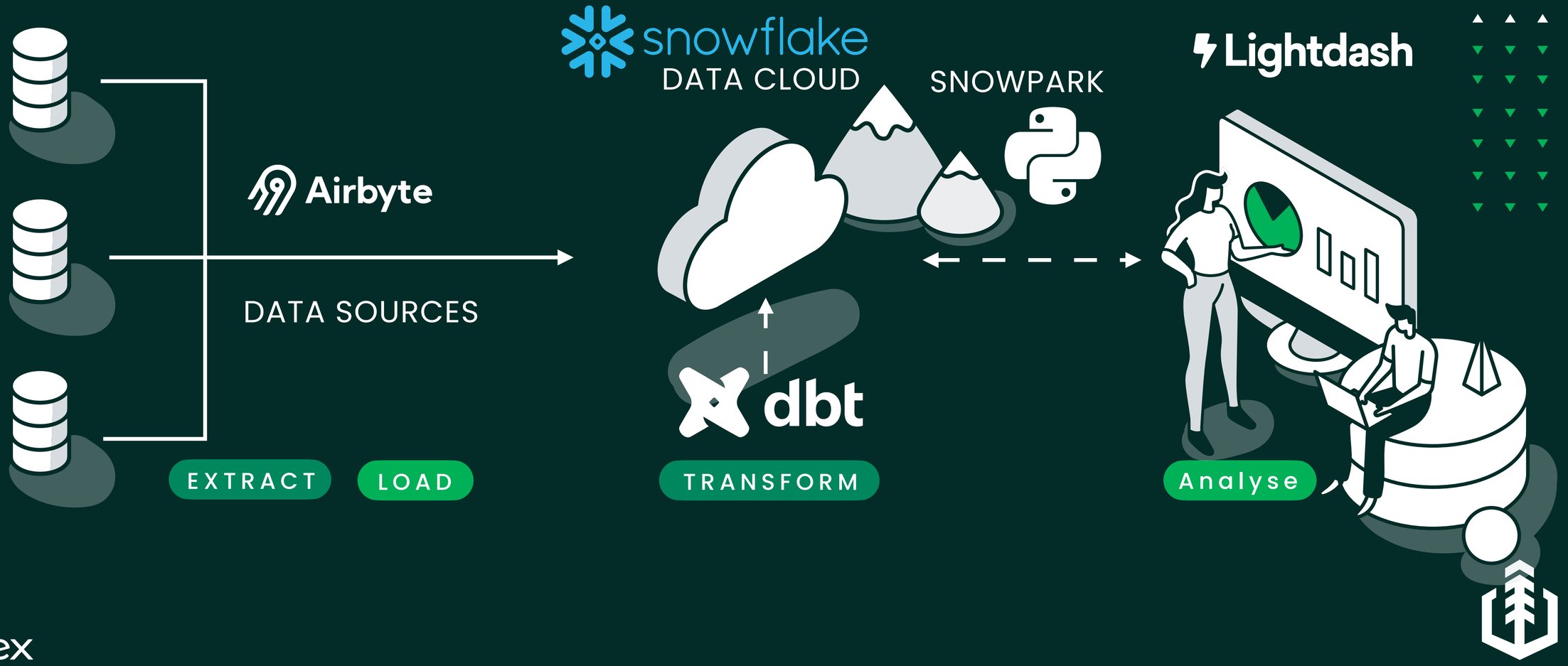
WALD STACK

Modern Analytics Stack



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WALD STACK

Example Use-Case

find all code & details under

https://waldstack.org

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FORMULA 1

Analysis and Position Prediction

1. Upload data using Airbyte to Snowflake
2. Use dbt for some basic analysis
3. Use dbt with Snowpark for some ML to predict future position
4. Visualise our results with Lightdash

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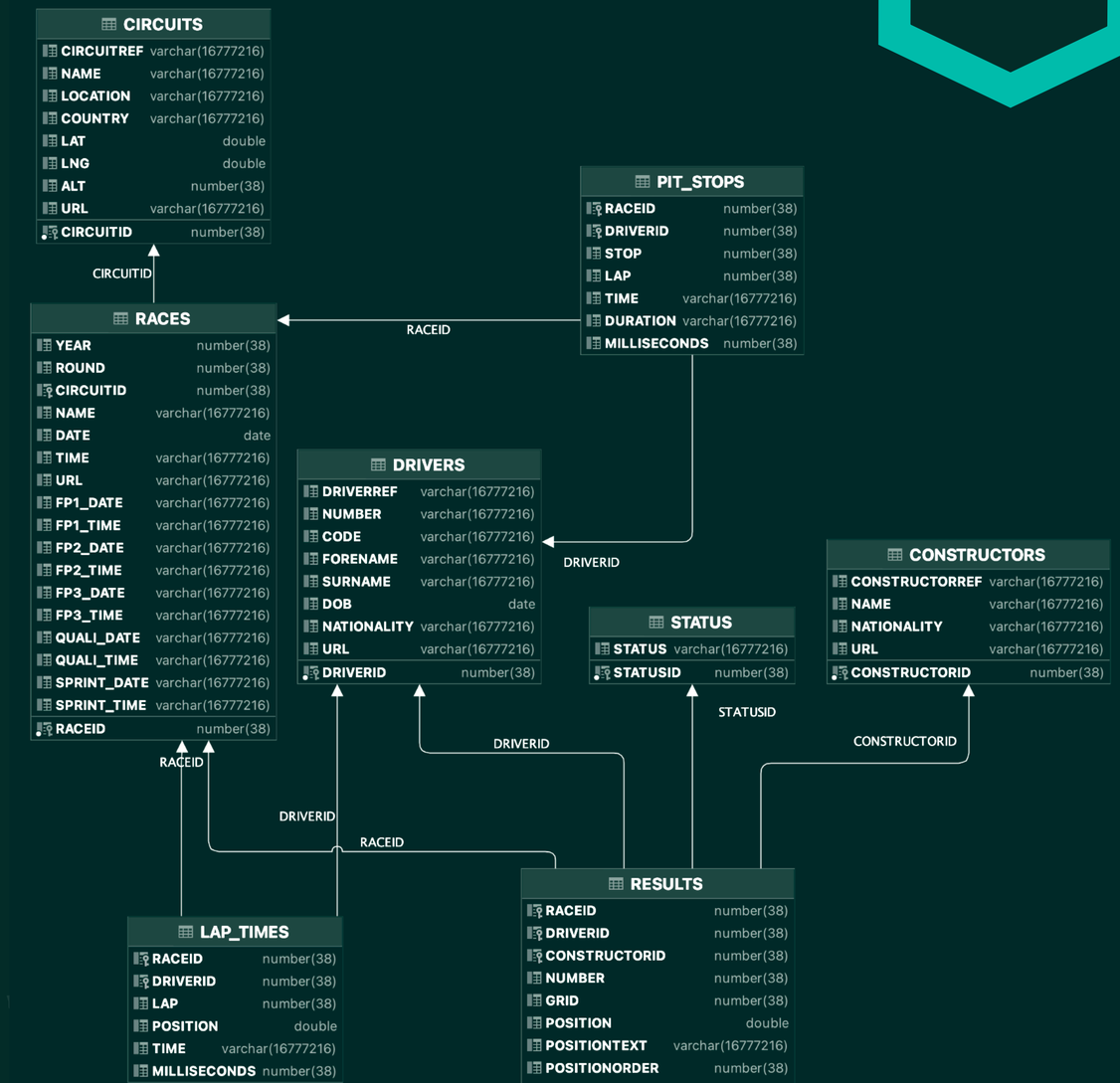
FORMULA 1

Rough Overview of the Data

- **dimensions:** drivers, circuits, constructors, races
- **facts:** lap_times, pit_tops, results



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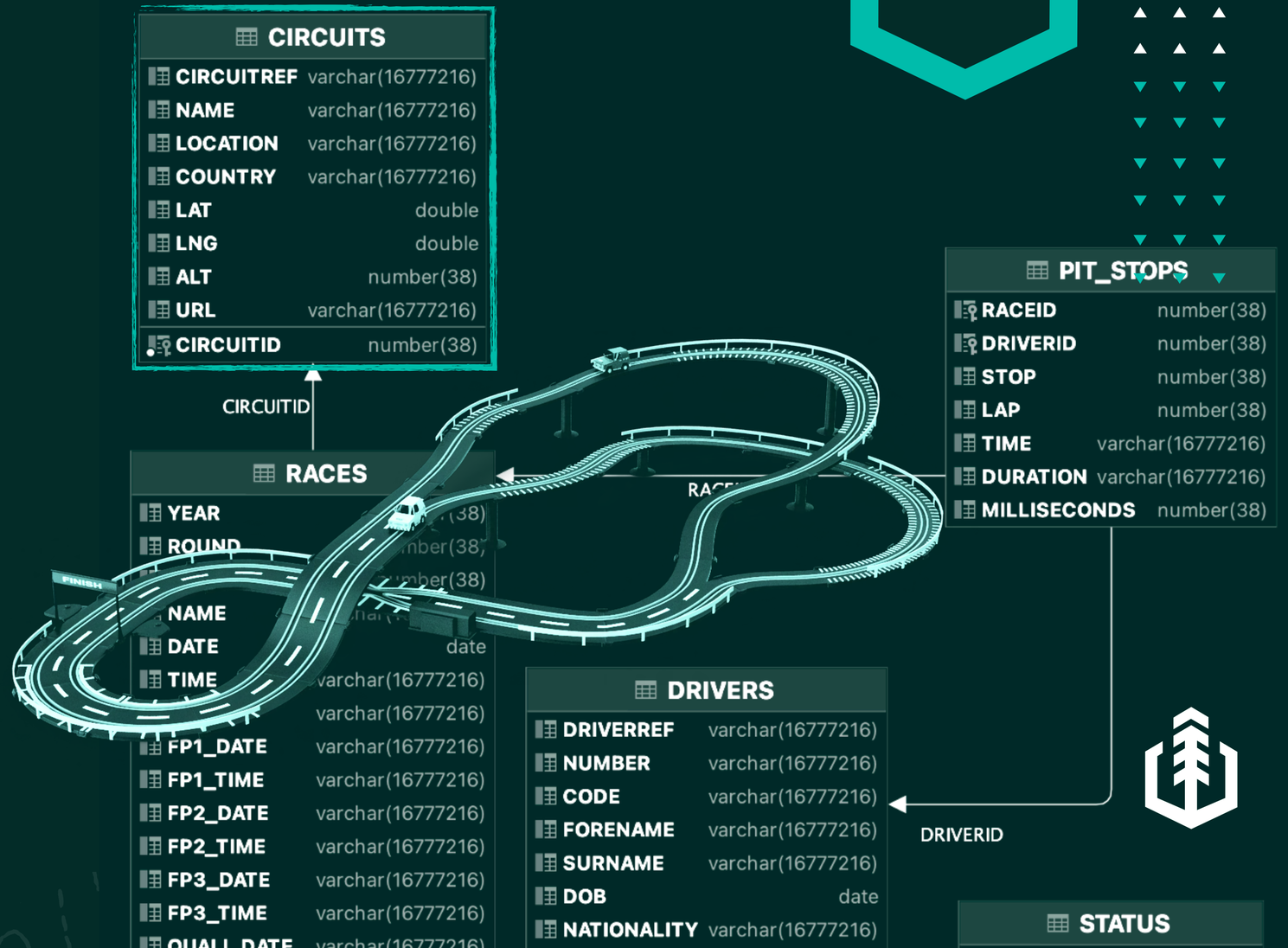

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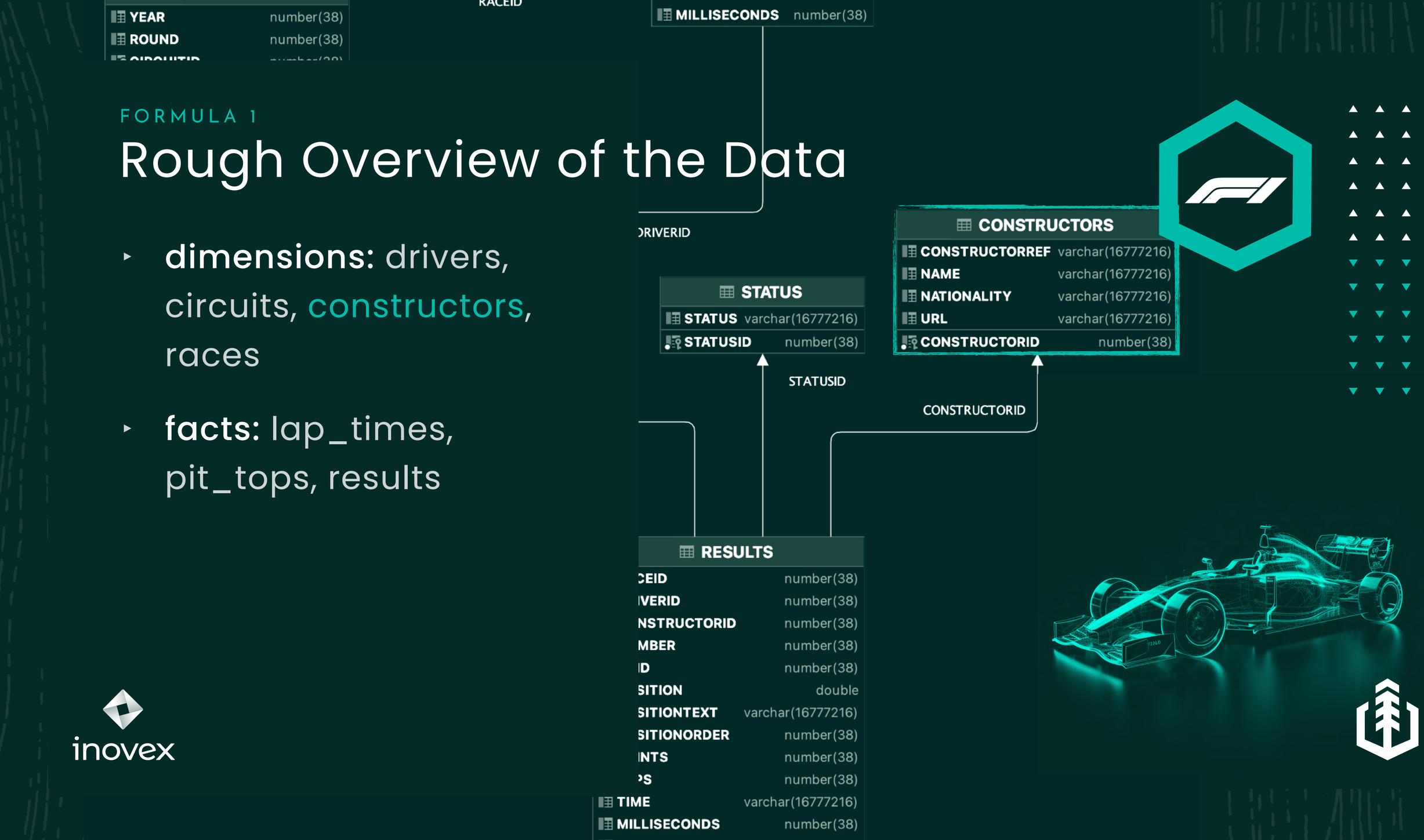

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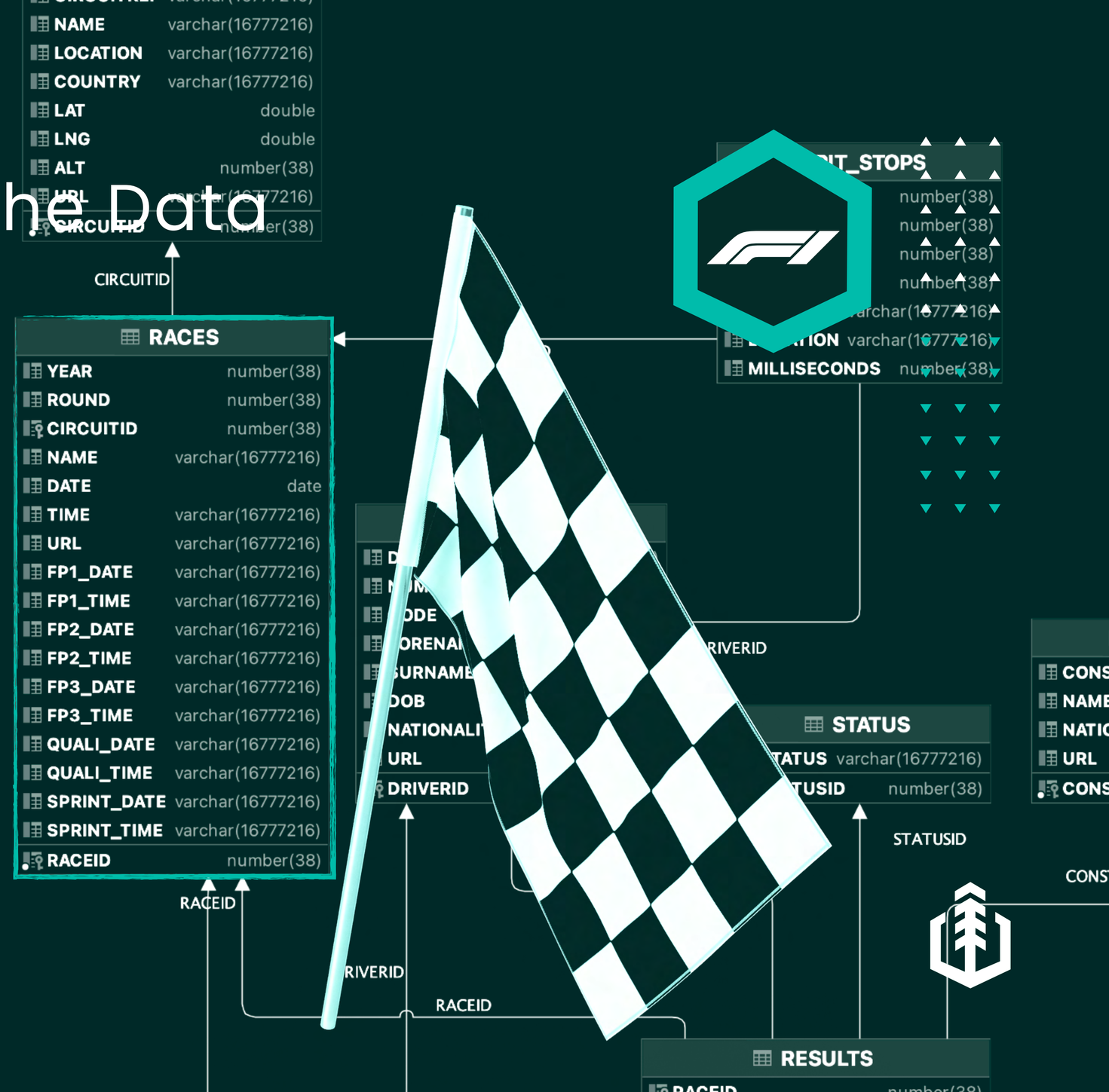

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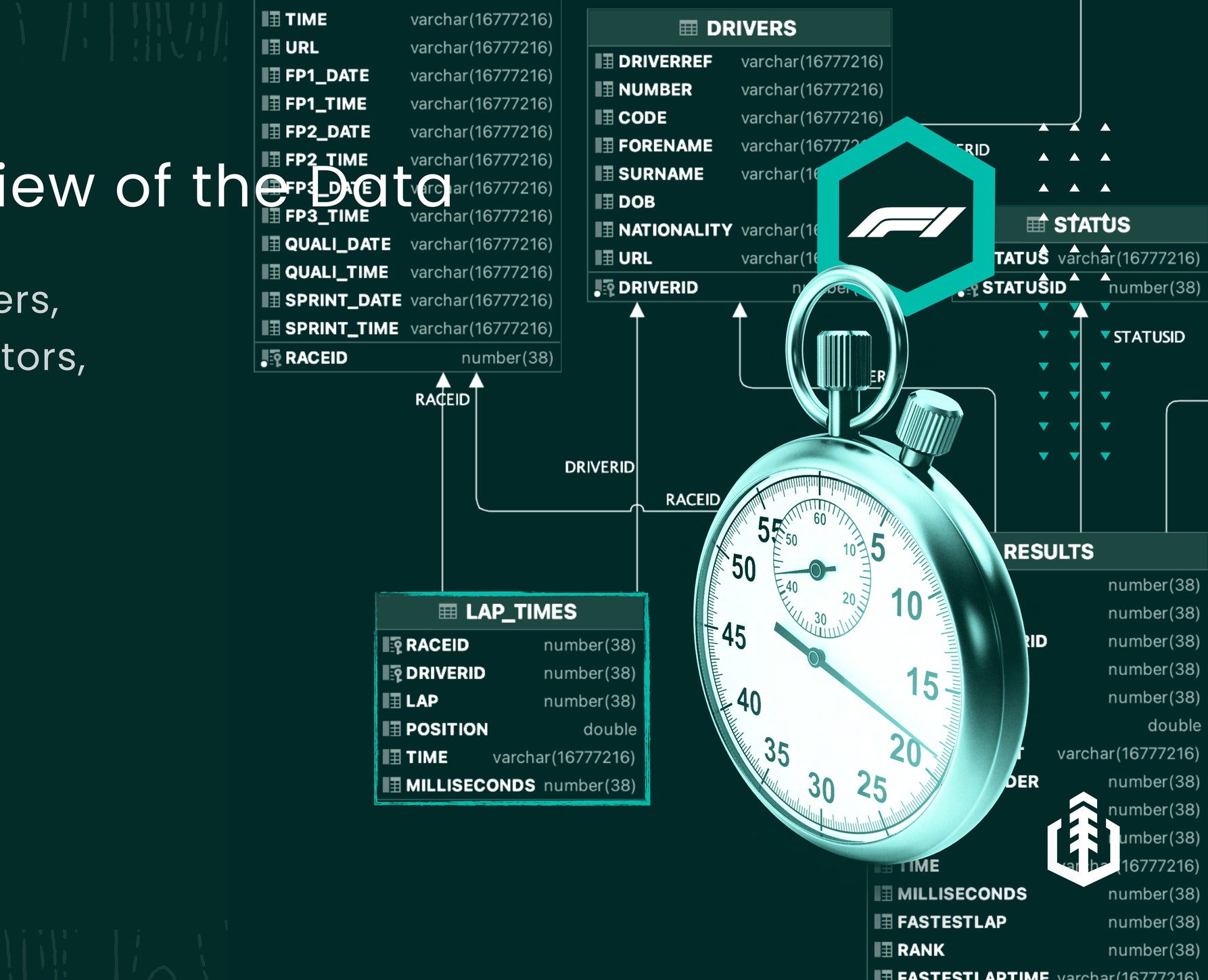

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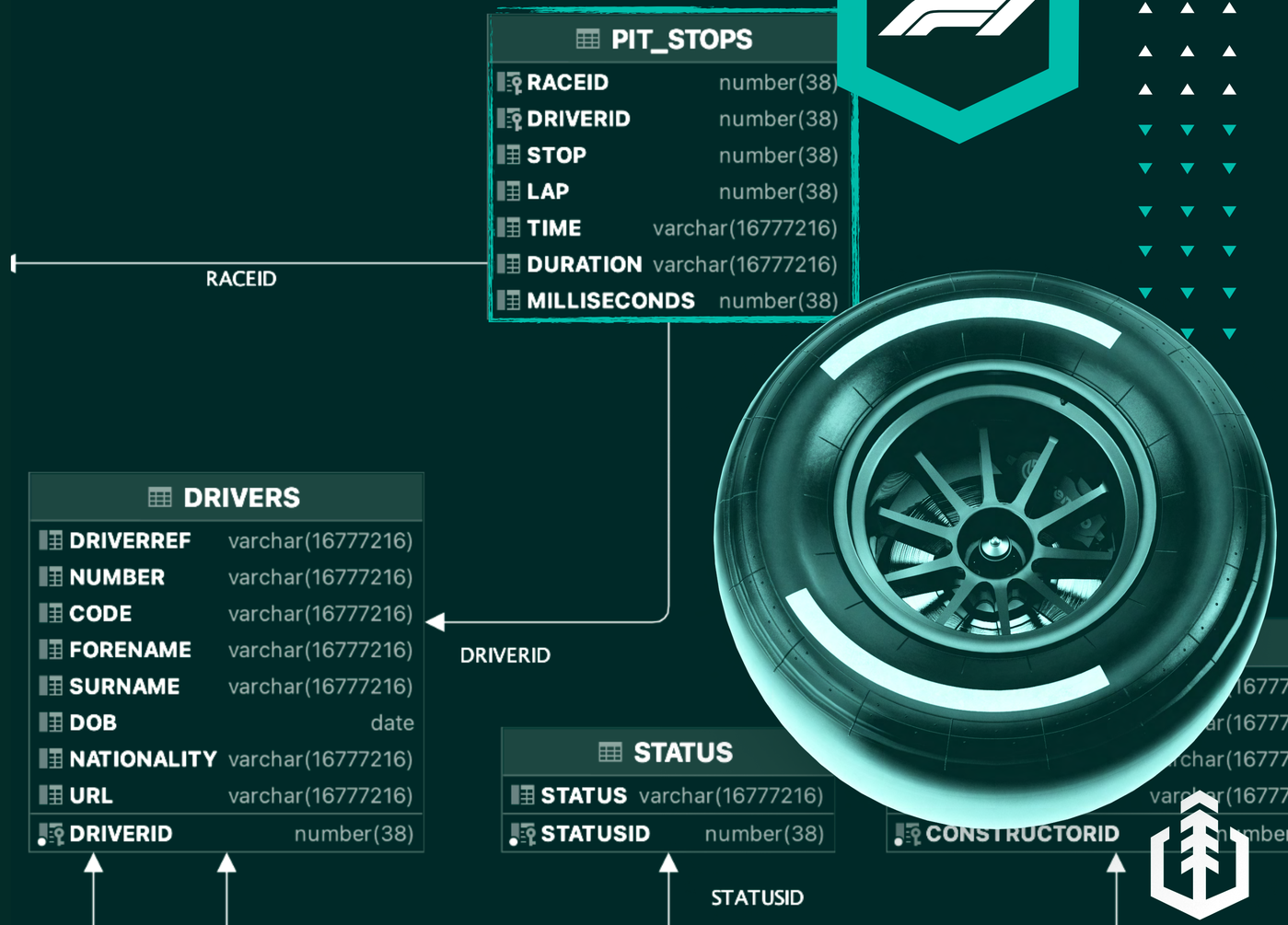

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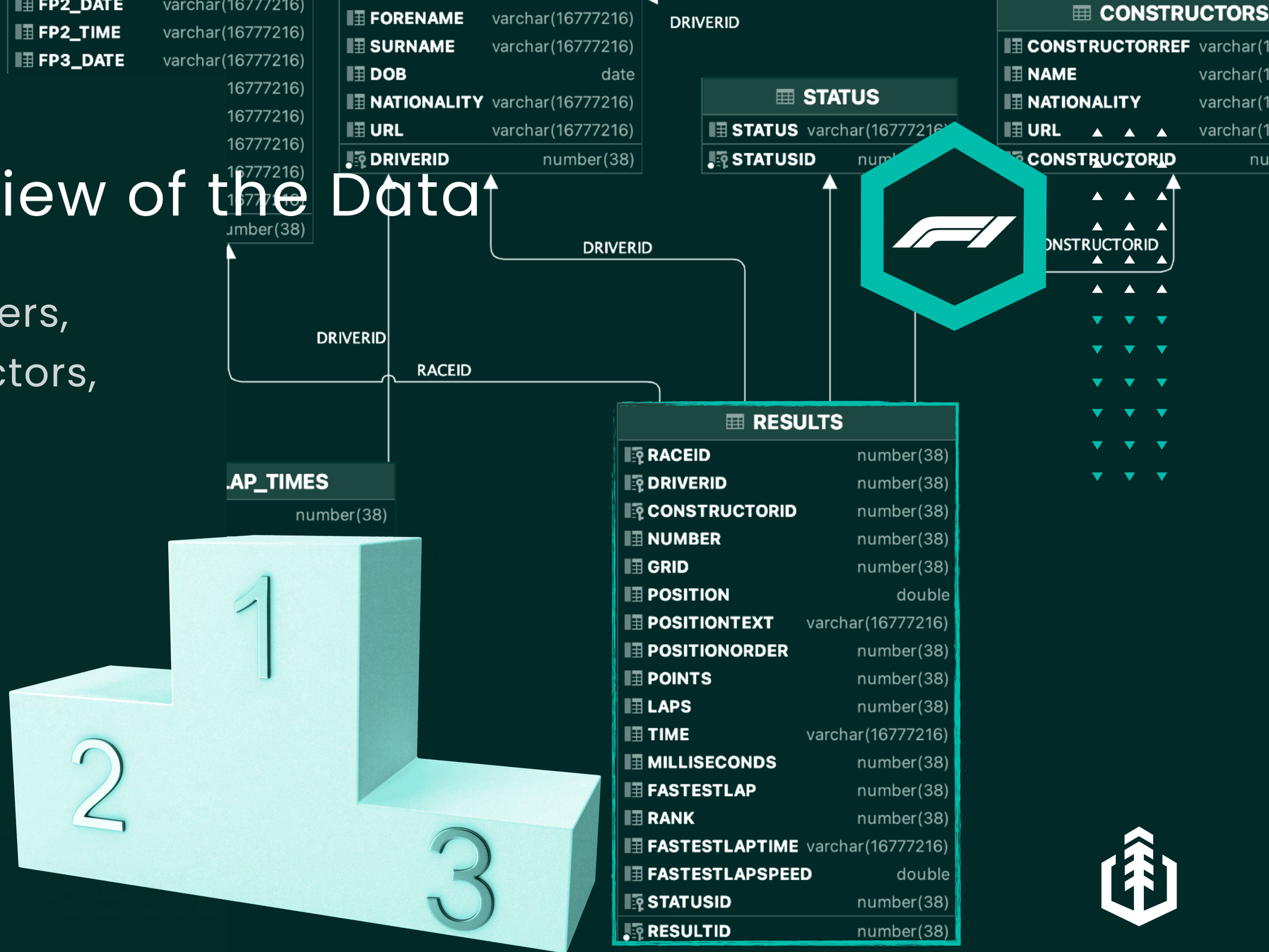

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SNOWFLAKE

Snowflake Setup

- activate the Anaconda Packages (Preview Feature)
- create a warehouse to be used for dbt
- that’s it already!

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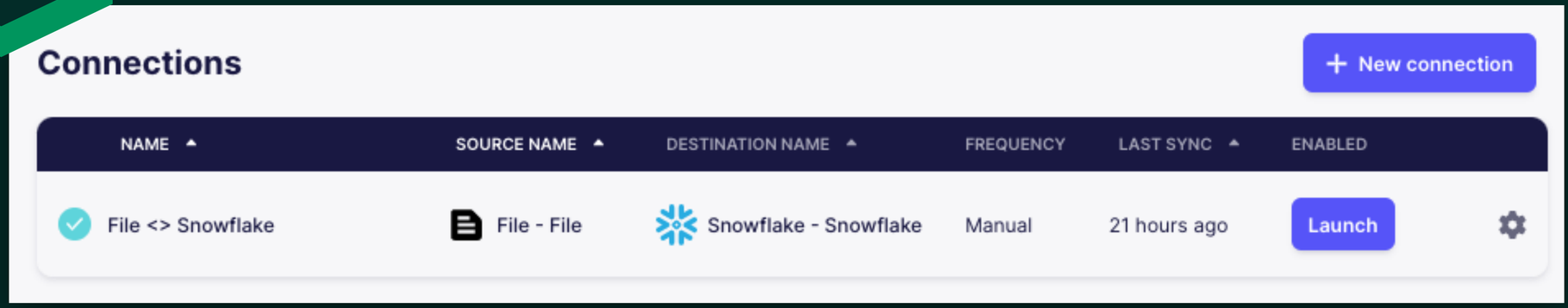
AIRBYTE

Ingesting the Data with Airbyte

Simply select

- file as source
- Snowflake as destination

and hit Launch



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PYTHON + SNOWPARK

Setup Python/Snowpark for dbt

- just install along dbt also
  - **`dbt-snowflake`**
  - **`snowflake-snowpark-python`**
  - **`snowflake-connector-python`**
- and configure Snowflake in your profiles.yml

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PYTHON + SNOWPARK

Training a Python Model in dbt/Snowpark

```python
def model(dbt, session):
    dbt.config(
        packages=["numpy", "scikit-learn", "pandas"],
        materialized="table",
        tags="train",
    )
    session.sql("create or replace stage MODELSTAGE").collect()
    test_train_df = dbt.ref("train_test_dataset")
    test_train_pd_df = test_train_df.to_pandas()
    X_train, X_test, y_train, y_test = train_test_split(
        test_train_pd_df.drop(["target"], axis=1), test_train_pd_df[target_col],
        train_size=0.7, random_state=42
    )
    model = LogisticRegression()
    model.fit(X_train, y_train)
    save_file(session, model, "@MODELSTAGE/", "model_v1.joblib")
```

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DBT/SNOWPARK

Predicting with a trained Model in dbt/Snowpark

```python
def model(dbt, session):
    dbt.config(
        packages=["snowflake-snowpark-python", "scikit-learn", "pandas"],
        materialized="table",
        tags="predict",
    )
    model = load_model_from_stage(session)

    @udf
    def predict(p_df: T.PandasDataFrame[int, int]) -> T.PandasSeries[int]:
        pred_array = model.predict(p_df)
        return pd.Series(pred_array)

    snow_df = dbt.ref("hold_out_dataset_for_prediction").select(*FEATURE_COLS)

    return snow_df.withColumn("predicted", predict(*FEATURE_COLS))
```

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LIGHTDASH

Visualisation with Lightdash

Lightdash pulls dimensions and metrics from dbt.

What are the avg lap times split by year and grand prix?

METRIC DIMENSIONS

Lightdash

- runs ad-hoc queries
- creates charts from queries
- creates dashboards from charts
- organises everything in spaces

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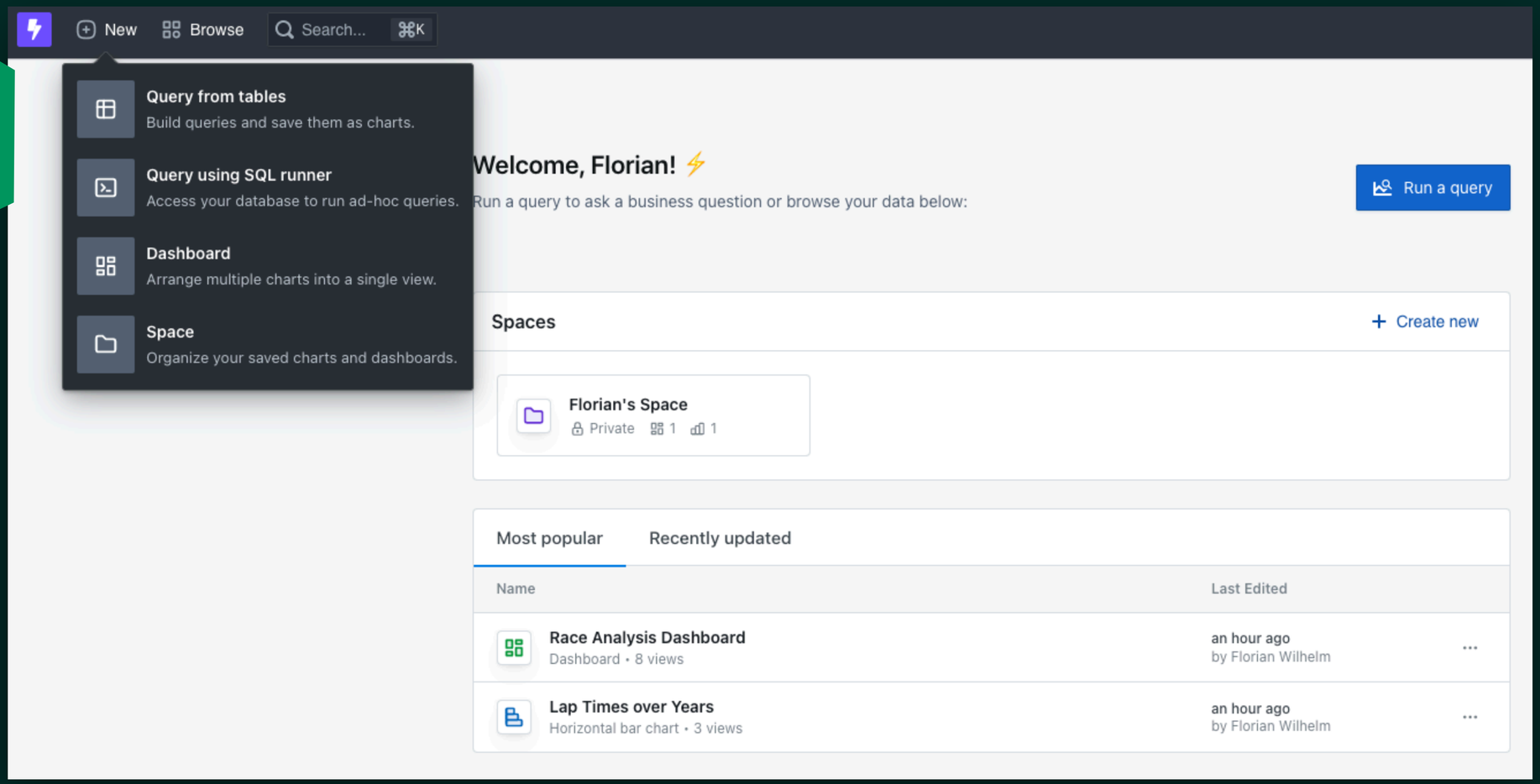
LIGHTDASH

Main View of Lightdash



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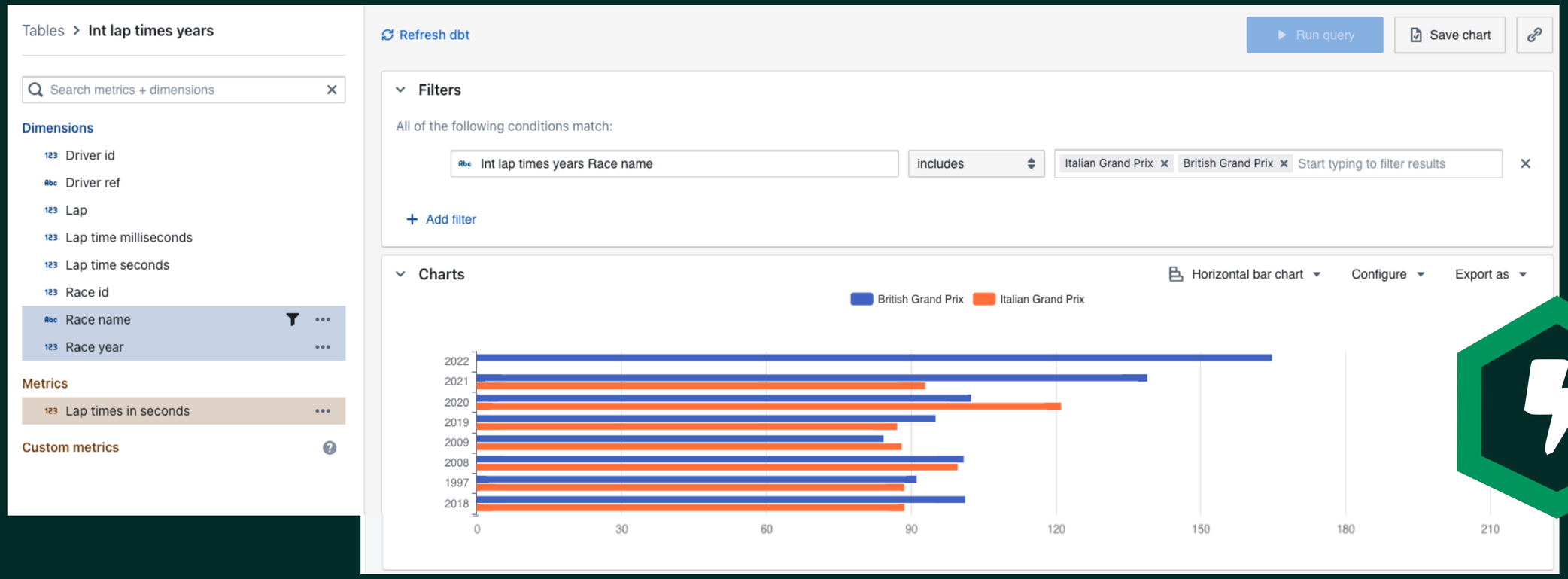
LIGHTDASH

Analysing the Average Lap Times



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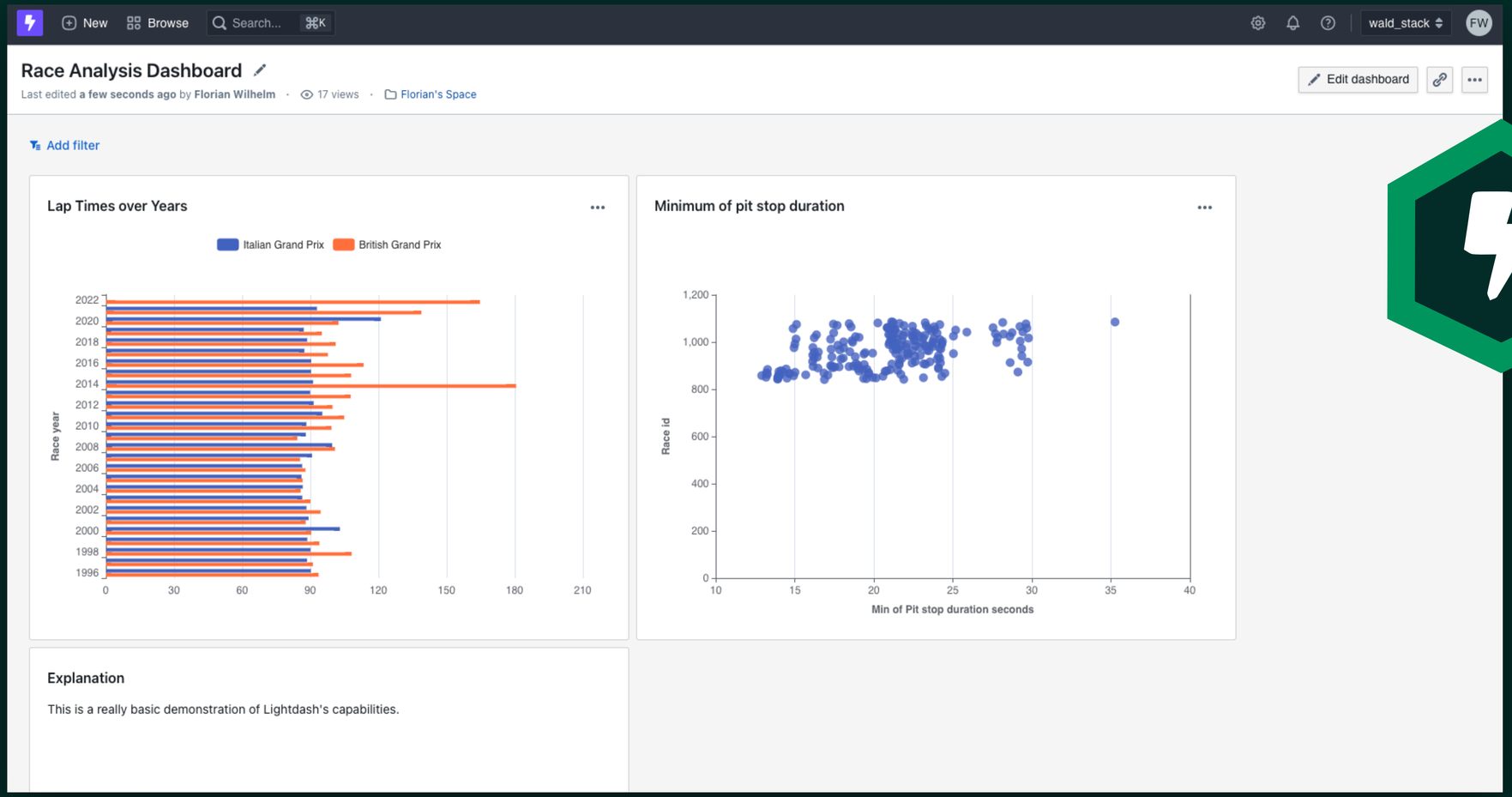
LIGHTDASH

Example of a Simple Dashboard



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FORMULA 1

Analysis and Position Prediction

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One more thing...

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ON MORE THING ON...

Streamlit

- provides faster way to build and share data apps
- was recently acquired by Snowflake
- might be a nice addition to Lightdash for interactive data apps

snowflake

Streamlit

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WALD STACK

Conclusion

The WALD stack combines 4 powerful technologies that work very well together.

The WALD stack is flexible enough for many use-cases from analytics to building a full-fledged end-to-end data product at scale.

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Dr. Florian Wilhelm, 2023

CHEERS TO THE COMMUNITY

Credits & Resources

- python-snowpark-formula Github repo by Hope Watson from dbt labs
- kind support by Michael Gorkow & Marko Cavar from Snowflake
- these awesome slides by Michael Hofmann from inovex

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PyConDE / PyData 2023

Thank you!

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