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ExpAn - A Python library for advanced statistical analysis of A/B tests
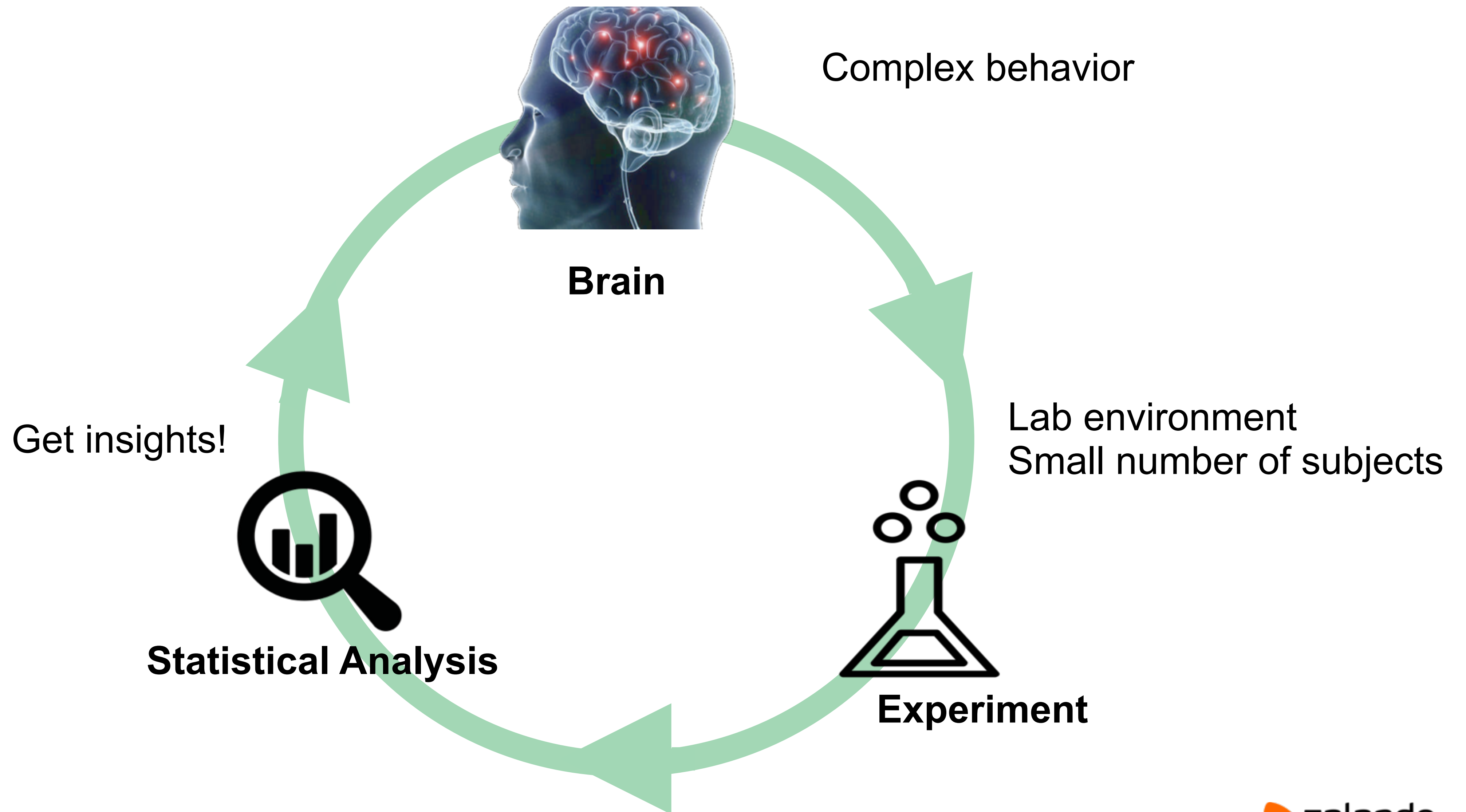
https://github.com/zalando/expan

DOMINIC HEGER

06-06-2016

SCIENTIFIC EXPERIMENTATION

Complex behavior

Brain

Lab environment
Small number of subjects

Get insights!

Statistical Analysis

Experiment

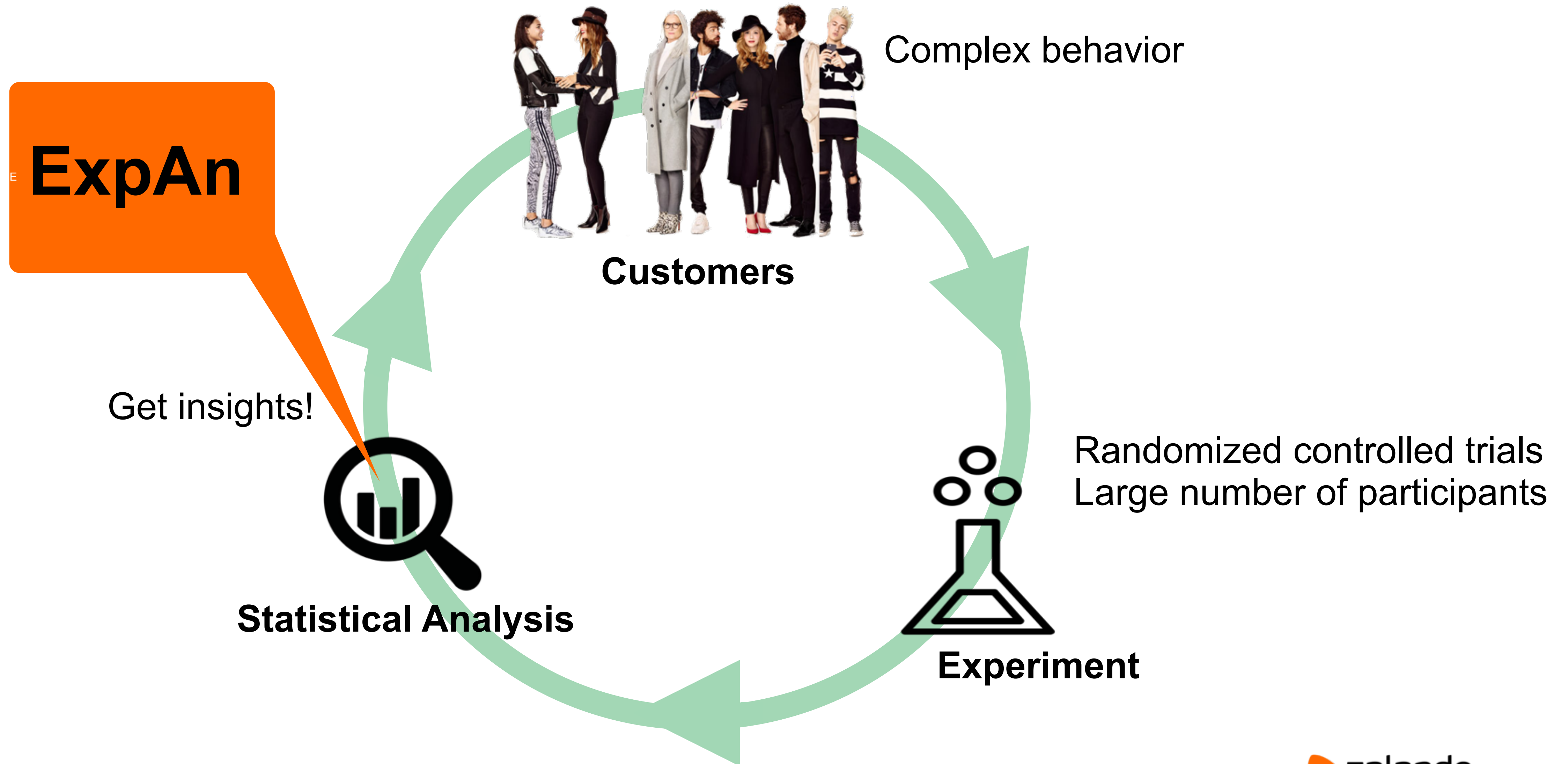ExpAn - A Python library for advanced statistical analysis of A/B tests

BUSINESS EXPERIMENTATION

ExpAn

Complex behavior

Customers

Get insights!

Randomized controlled trials
Large number of participants

Statistical Analysis

Experiment

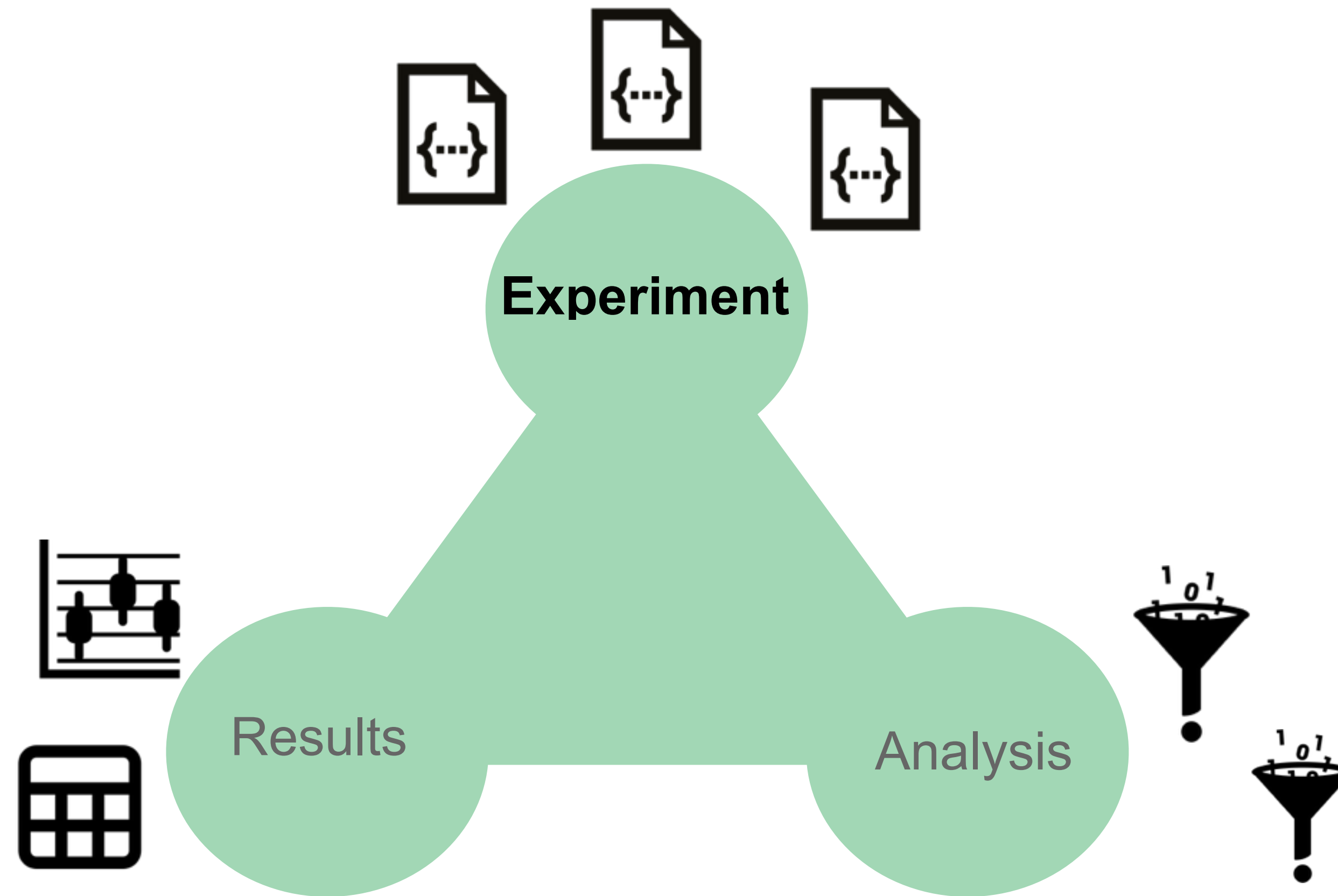zalando

ExpAn - EXPERIMENT ANALYSIS

What is **ExpAn?**

- Analysis of A/B and multi-variant tests
- Handles different kinds of metrics
- Open source
- Python

What **ExpAn** is NOT

- Randomization to assign different variants
- Data retrieval process

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COMPONENTS OF THE LIBRARY

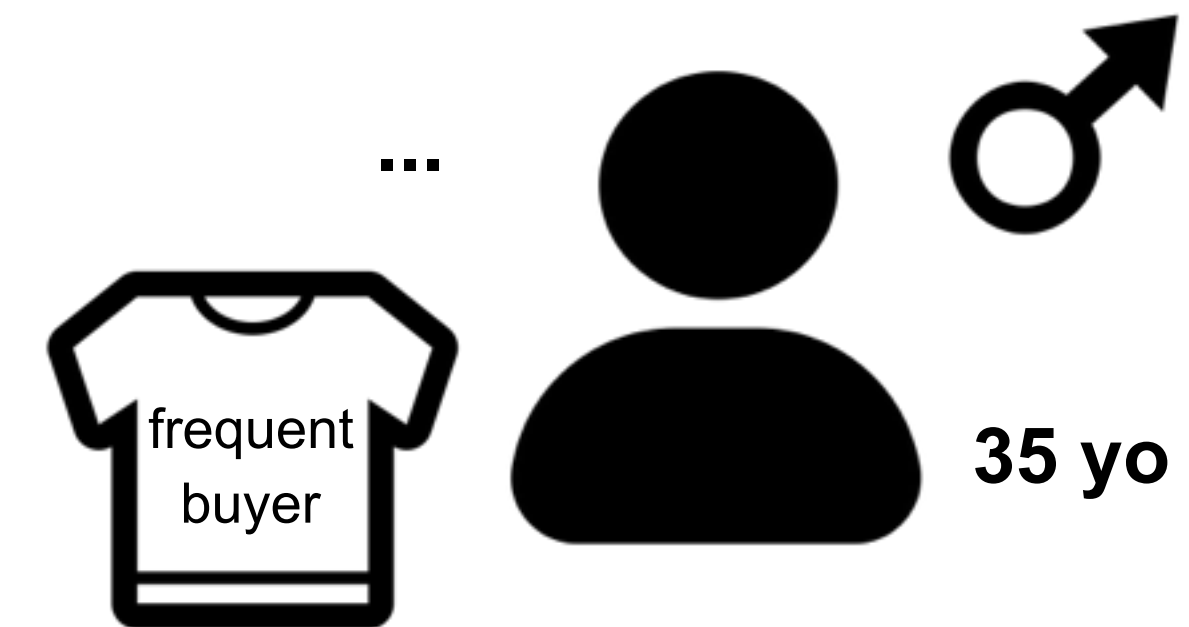ExpAn - A Python library for advanced statistical analysis of A/B tests

METADATA AND FEATURES

1. Metadata
- Additional information about the experiment
- Examples: Experiment ID, experiment name, data sources, units, …

2. Features
- Properties of entities (e.g. customers)
- Do not change throughout the experiment
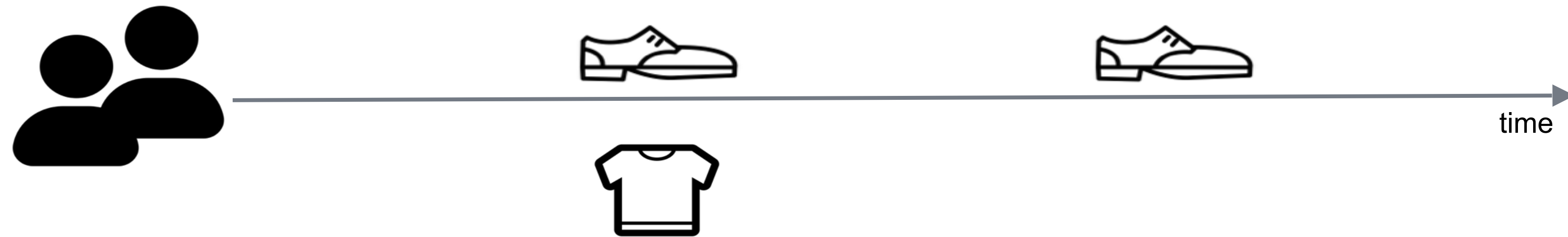- Measured *before* the treatment start

…

frequent buyer

35 yo

entity	age	featureX	gender	treatment start time
ec0231efh	32	932.92	f	2015-02-23H12:00CEST
f387534e2	65	23.44	m	2015-02-23H12:00CEST

KEY PERFORMANCE INDICATORS [KPIs]

3. KPIs

- Show the effects of the different variants
- Measured *after* the treatment start
- Can be time resolved

variant	entity	[time_since_treatment]	revenue	KPIx
A	ec0231efh	0	23.23	1
A	ec0231efh	1	250.32	2
B	f387534e2	0	-	0

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LOADING INTO ExpAn

Experiment data/object consists of

- baseline variant,
- KPI/feature data,
- metadata

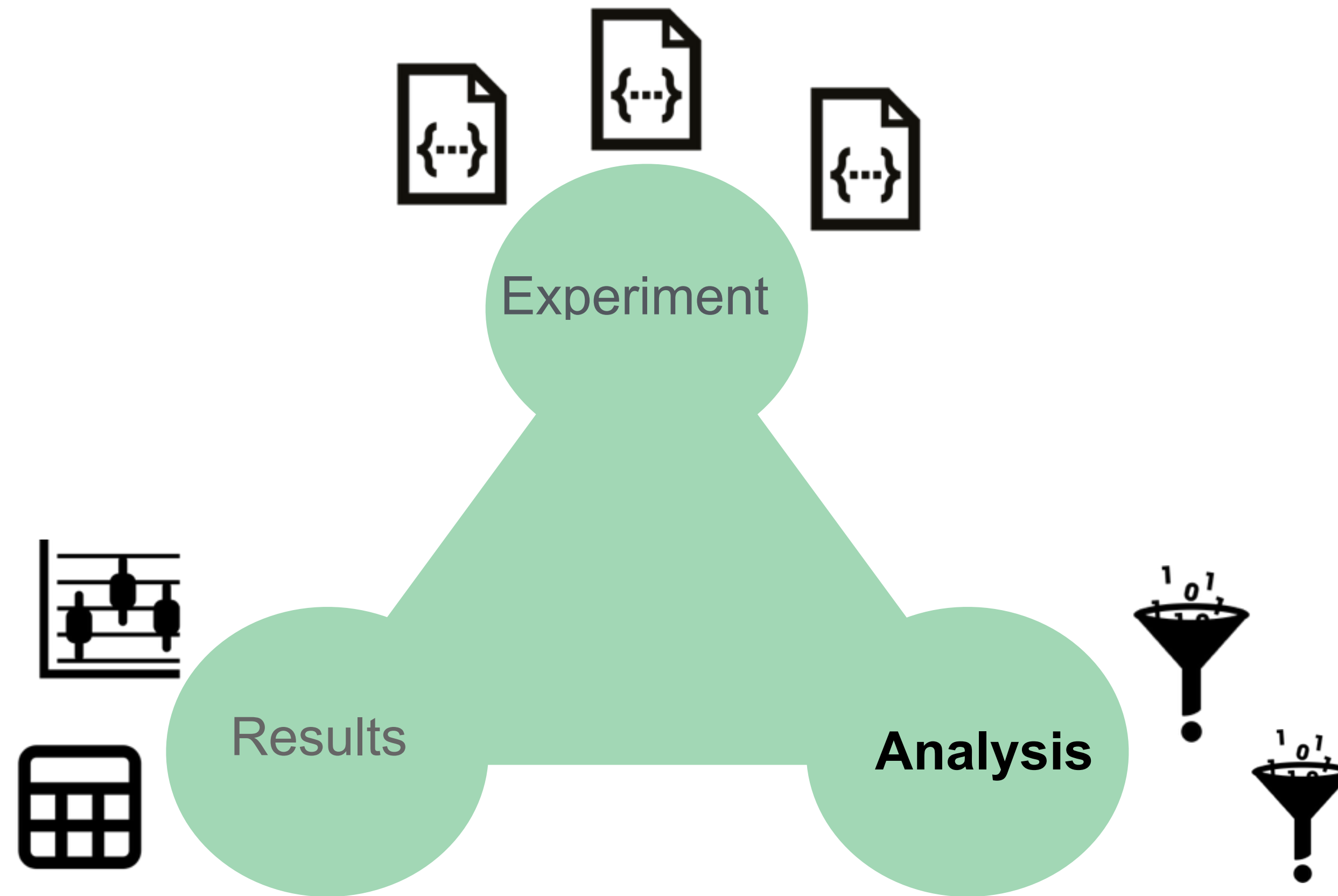Can be retrieved in a customized fashion, or loaded from csv/HDF5/…

```
[1]: from expan.core.experiment import Experiment

[2]: exp = Experiment('A', metric_df, metadata)

[3]: print exp

Experiment 'my_fancy_experiment' with 2 features and 4 KPIs

(primary: 'revenue'), 10000 entities, 2 variants: *A*, B
```
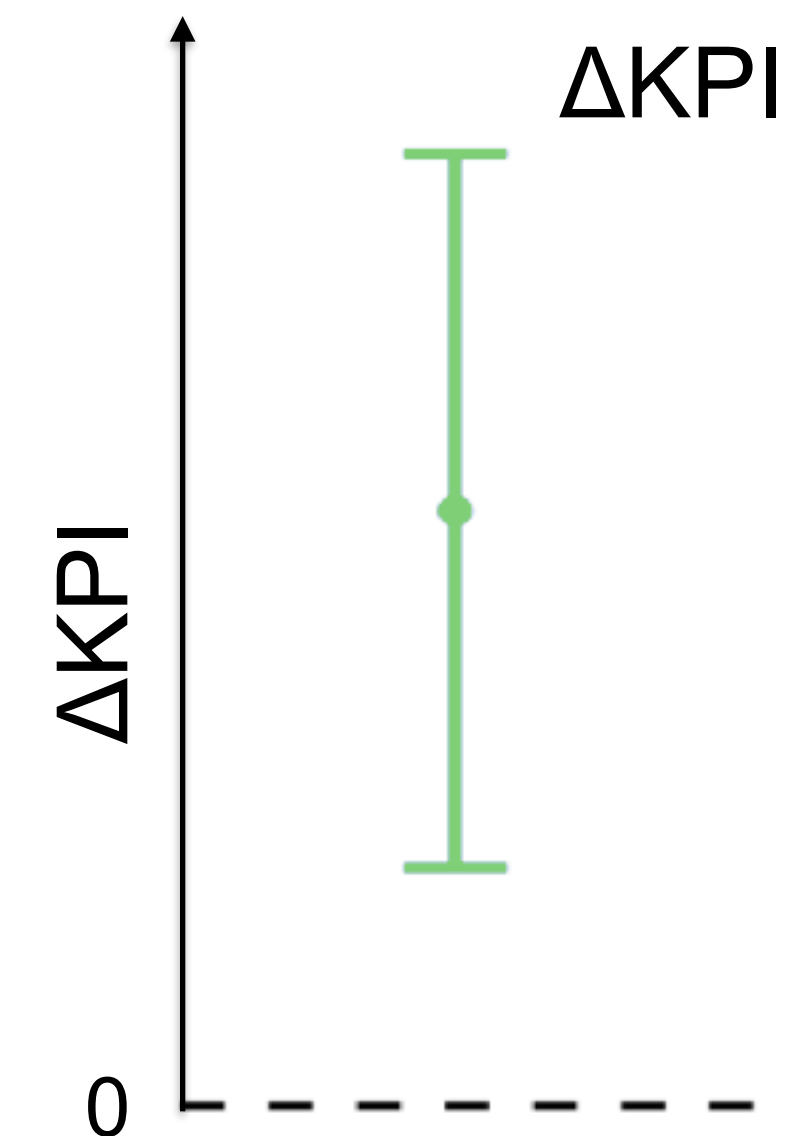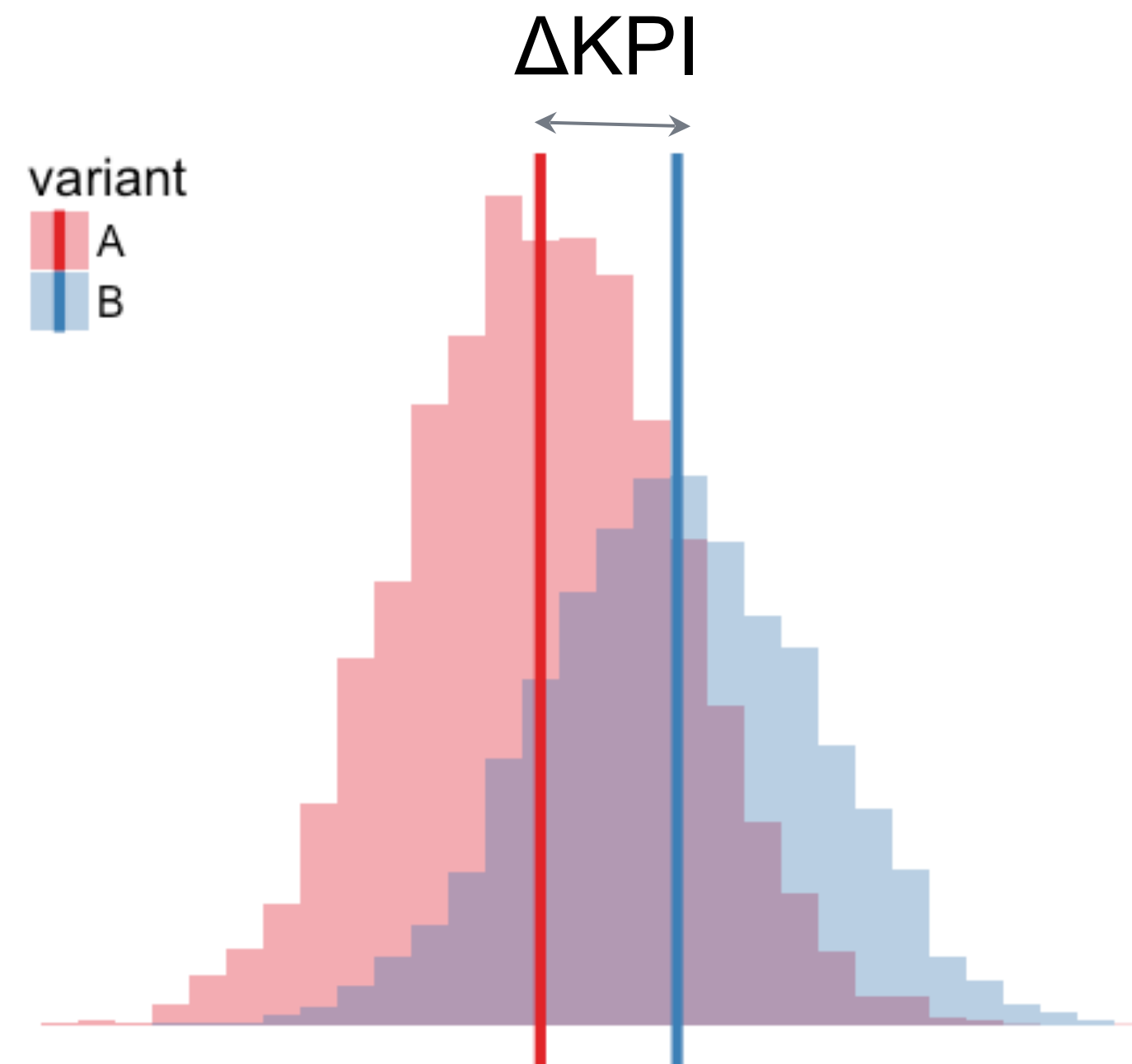
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`exp.delta()`

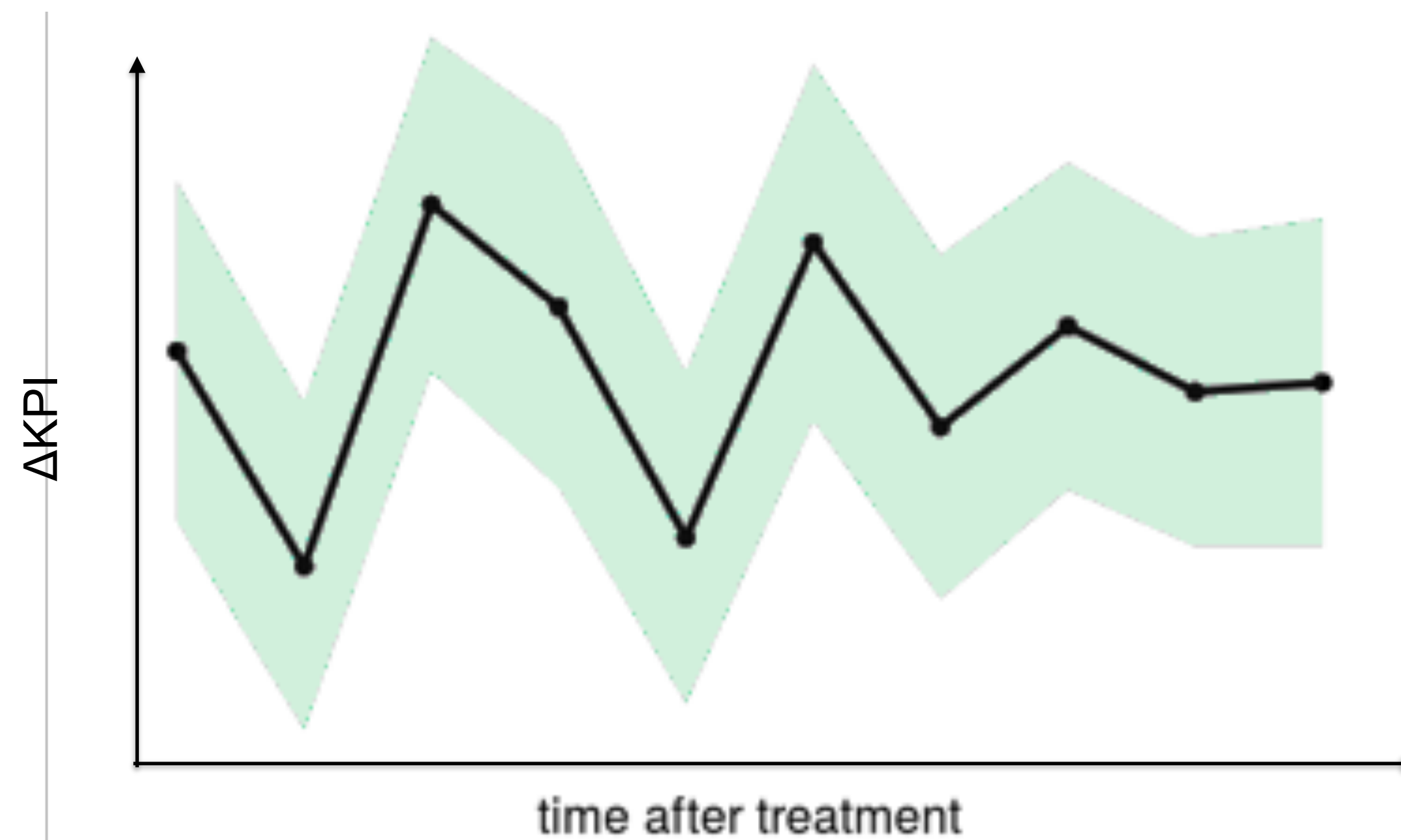Identify **significant differences** between the variants
- Calculate the point estimate and the error margin of the change between different variants (delta) for a given metric

`exp.trend()`

How the delta of a given metric and its confidence interval **evolves over time**
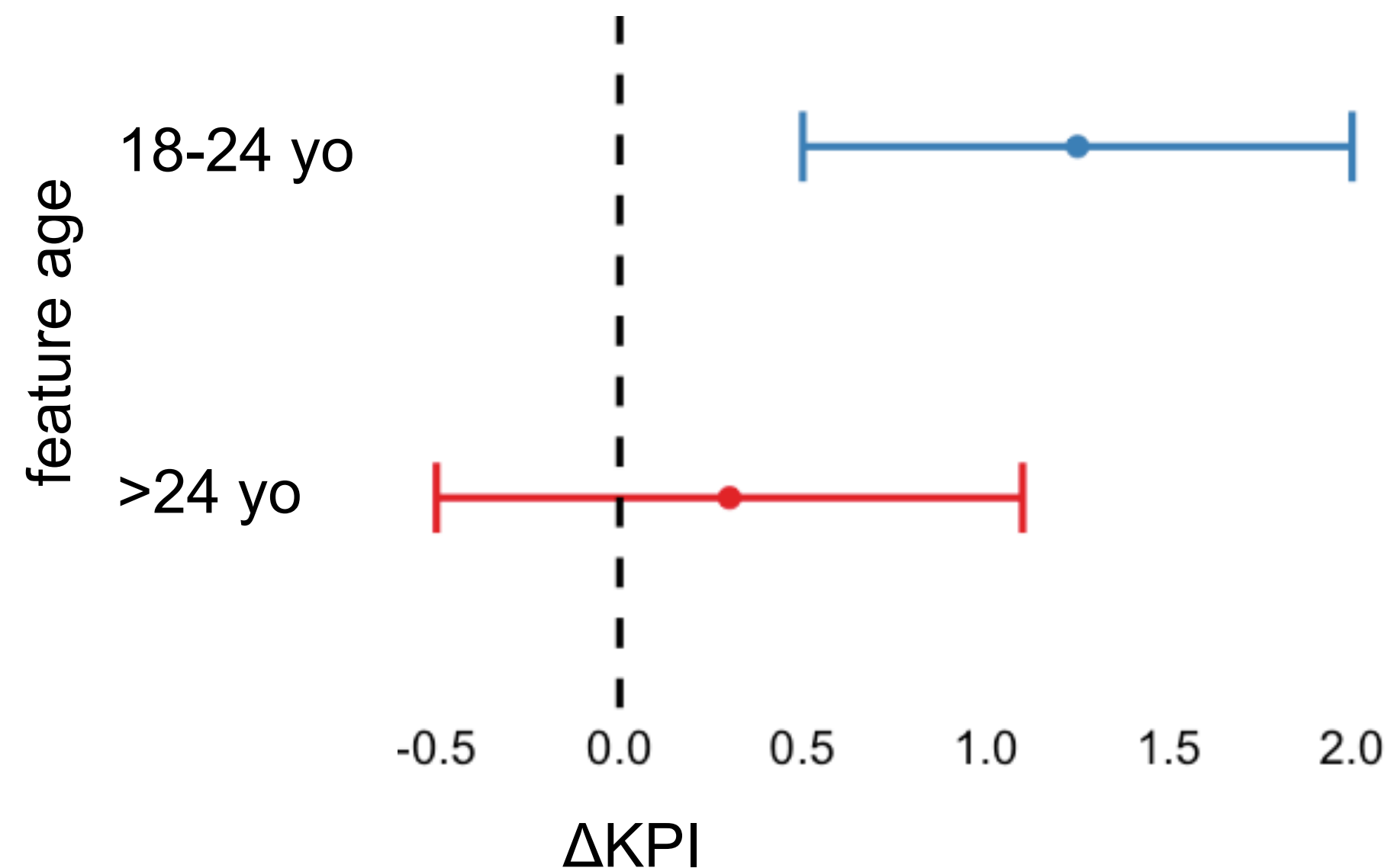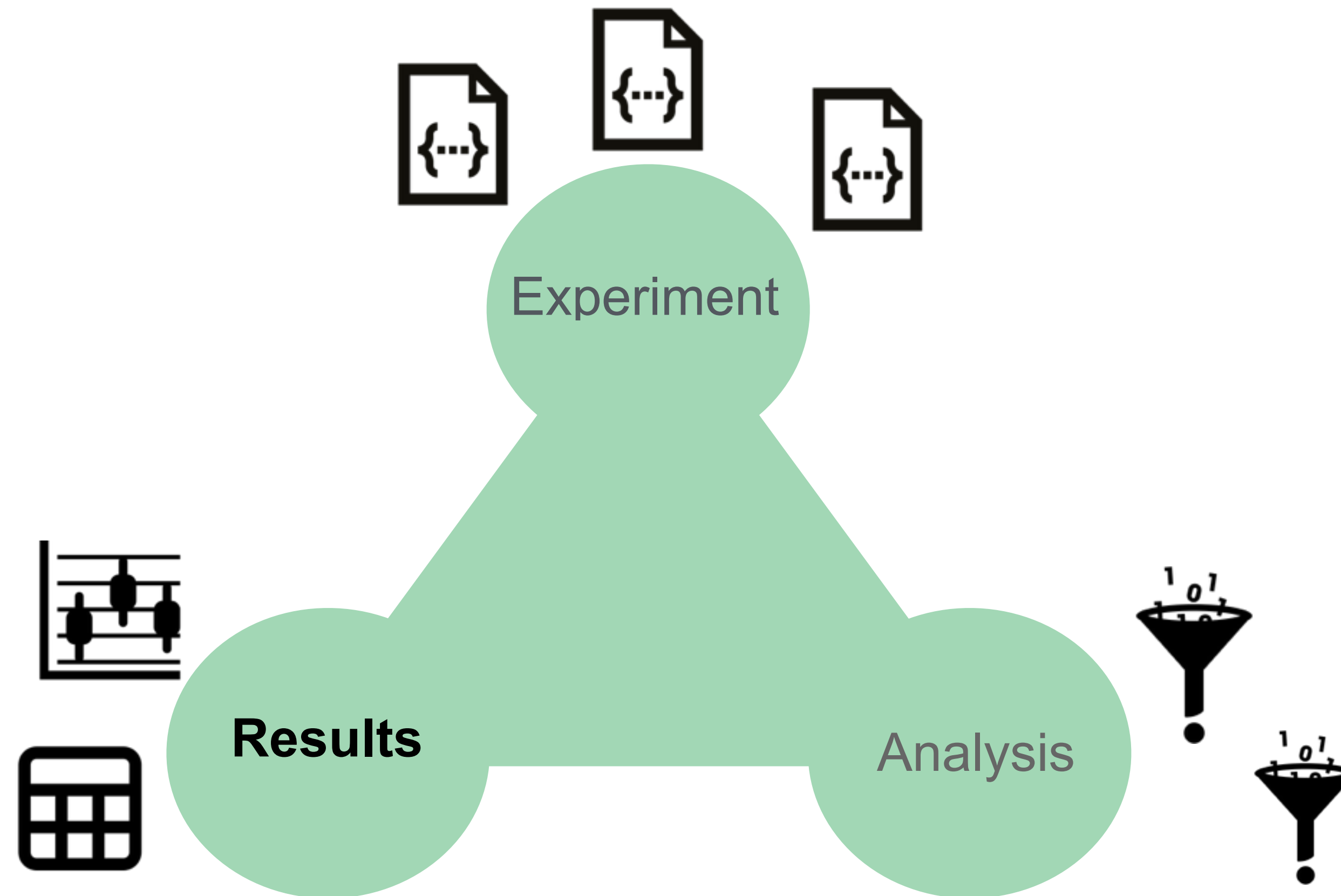- Seasonal pattern
- Short-term vs. long-term impact estimation

`exp.sga()` [subgroup analysis]

Quantify **differential treatment effects of subgroups** of the entities (e.g. customers)
- Breakdown of effect on KPIs according to features
- Identify interesting customer groups

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THE RESULTS OBJECT

Generic data structure for all analyzes results of an **Experiment** object

index						variant	
metric	subgroup_ metric	subgroup	time_since_ treatment	**statistic**	**percentile**	***A***	**B**
revenue	age	20-30	1	uplift	-	0	3.5
				sample_size	-	1000	5000
				uplift_pctile	2.5	-4.3	1.3
				uplift_pctile	97.5	4.7	7.4
				variant_mean	-	20	23.5

⋮   ⋮   ⋮

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IN A NUTSHELL

What **ExpAn** offers so far:
- Standardized input/output format
- A battery of statistical analysis methods
- Parametric statistics and bootstrapping
- Easy usage by both human and microservice
- Available on **github.com** and **PyPI**

Next steps:
- Visualization
- Bayesian statistics
- …

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THANK YOU !!!

Please reach out or contribute to ExpAn

https://github.com/zalando/expan

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- Jie Bao
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- …
- You?

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