```
{
    "name" : "Kiwi",
    "group" : "Fruits",
    "subgroup" : "Tropical fruits",
    "nutrients" : {
        "Carbohydrate" : 20945.0,
        "Energy" : 176.0,
        "Fat" : 1955.0,
        "Fiber" : 1925.0,
        "Proteins" : 1421.3
    },
    "description" : "
        The kiwifruit, often shortened to kiwi in many parts of the world,
        is the edible berry of a woody vine in the genus Actinidia.
        The most common cultivar group of kiwifruit (''Hayward'') is oval,
        about the size of a large hen''s egg (5?8 centimetres in length
        and 4.5?5.5 centimetres in diameter). It has a fibrous, dull
        greenish-brown skin and bright green or golden flesh with rows of
        tiny, black, edible seeds. The fruit has a soft texture and a sweet
        but unique flavor, and today is a commercial crop in several
        countries, such as Italy, New Zealand, Chile, Greece and France.
        "
}'
```

JSON Types	https://www.postgresql.org/docs/current/datatype-json.html
JSON Functions and Operators	https://www.postgresql.org/docs/current/functions-json.html
JSONPATH Type	https://www.postgresql.org/docs/current/datatype-json.html#DATATYPE-JSONPATH
SQL/JSON Path Language	https://www.postgresql.org/docs/current/functions-json.html#FUNCTIONS-SQLJSON-PATH

```
create table food (
    doc jsonb
);
```

```
insert into food values('{
    "name" : "Kiwi",
    "group" : "Fruits",
    "subgroup" : "Tropical fruits",
    "nutrients" : {
        "Carbohydrate" : 20945.0,
        "Energy" : 176.0,
        "Fat" : 1955.0,
        "Fiber" : 1925.0,
        "Proteins" : 1421.3
    },
    "description" : "
        The kiwifruit, often shortened to kiwi in many parts of the world,
        is the edible berry of a woody vine in the genus Actinidia.
        The most common cultivar group of kiwifruit (''Hayward'') is oval,
        about the size of a large hen''s egg (5?8 centimetres in length
        and 4.5?5.5 centimetres in diameter). It has a fibrous, dull
        greenish-brown skin and bright green or golden flesh with rows of
        tiny, black, edible seeds. The fruit has a soft texture and a sweet
        but unique flavor, and today is a commercial crop in several
        countries, such as Italy, New Zealand, Chile, Greece and France.
        "
}');
```

```
select doc from food;
```

doc
{"name": "Kiwi", "group": "Fruits", "subgroup": "Tropical fruits", "nutrients": {"Fat": 1955.0, "Fiber": 1925.0, "Energ
{"name": "Onion", "group": "Vegetables", "subgroup": "Onion-family vegetables", "nutrients": {"Fat": 0.0, "Fiber"
{"name": "Garlic", "group": "Herbs and Spices", "subgroup": "Herbs", "nutrients": {"Fat": 0.0, "Fiber": 3850.000, "E
{"name": "Cashew nut", "group": "Nuts", "subgroup": "Nuts", "nutrients": {"Fat": 15466.667, "Fiber": 2381.818, "Er
{"name": "Pineapple", "group": "Fruits", "subgroup": "Tropical fruits", "nutrients": {"Fat": 2188.600, "Fiber": 705.26
{"name": "Peanut", "group": "Nuts", "subgroup": "Nuts", "nutrients": {"Fat": 14543.900, "Fiber": 6891.892, "Energy
{"name": "Horseradish", "group": "Herbs and Spices", "subgroup": "Spices", "nutrients": {"Fat": 700.000, "Fiber": 3
{"name": "Asparagus", "group": "Vegetables", "subgroup": "Shoot vegetables", "nutrients": {"Fat": 2150.000, "Fibe
{"name": "Brazil nut", "group": "Nuts", "subgroup": "Nuts", "nutrients": {"Fat": 67459.500, "Fiber": 4266.667, "Ener
{"name": "Common beet", "group": "Vegetables", "subgroup": "Leaf vegetables", "nutrients": {"Fat": 0.0, "Fiber":

```
select
  doc->>'name' as fname,
  doc->>'group' as fgroup,
  doc->'nutrients' as nutrients
from food;
```

fname	fgroup	nutrients
Kiwi	Fruits	{"Fat": 1955.0, "Fiber": 1925.0, "Energy": 176.0, "Proteins": 1421.3, "Carbohydrate": 20945.0}
Onion	Vegetables	{"Fat": 0.0, "Fiber": 2296.154, "Energy": 345.333, "Proteins": 2150.741, "Carbohydrate": 18057.407}
Garlic	Herbs and Spices	{"Fat": 0.0, "Fiber": 3850.000, "Energy": 770.333, "Proteins": 8301.667, "Carbohydrate": 50898.333}
Cashew nut	Nuts	{"Fat": 15466.667, "Fiber": 2381.818, "Energy": 1622.625, "Proteins": 13402.857, "Carbohydrate": 33540.993}
Pineapple	Fruits	{"Fat": 2188.600, "Fiber": 705.263, "Energy": 179.613, "Proteins": 542.857, "Carbohydrate": 17650.476}
Peanut	Nuts	{"Fat": 14543.900, "Fiber": 6891.892, "Energy": 1571.563, "Proteins": 22098.293, "Carbohydrate": 19706.341}
Horseradish	Herbs and Spices	{"Fat": 700.000, "Fiber": 3600.000, "Energy": 229.000, "Proteins": 4557.500, "Carbohydrate": 22922.500}
Asparagus	Vegetables	{"Fat": 2150.000, "Fiber": 1276.471, "Energy": 58.364, "Proteins": 2872.889, "Carbohydrate": 4725.000}
Brazil nut	Nuts	{"Fat": 67459.500, "Fiber": 4266.667, "Energy": 2082.000, "Proteins": 11679.000, "Carbohydrate": 11897.863}
Common beet	Vegetables	{"Fat": 0.0, "Fiber": 2327.273, "Energy": 102.500, "Proteins": 1490.000, "Carbohydrate": 9100.909}

food - Extraktion geschachtelter Daten

Prof. Dr. Ingo Claßen

Freitag, 11. März 2022 09:39

```
select
  doc->>'name' as fname,
  (doc->'nutrients'->>'Fat')::float as fat
from food;
```

ABC fname	123 fat
Kiwi	1.955
Onion	0
Garlic	0
Cashew nut	15.466,667
Pineapple	2.188,6
Peanut	14.543,9
Horseradish	700
Asparagus	2.150
Brazil nut	67.459,5
Common beet	0

food - Aggregation mit Schachtelung

Prof. Dr. Ingo Claßen

Freitag, 11. März 2022 09:56

```
select
  doc->>'group' as fgroup,
  sum((doc->'nutrients'->>'Fat')::float) as fat
from food
group by doc->>'group';
```

ABC fgroup	123 fat
Nuts	97.470,067
Herbs and Spices	700
Fruits	4.143,6
Vegetables	2.150

tracks - data / jsonpath 1

Prof. Dr. Ingo Claßen

Donnerstag, 24. März 2022 09:24

```
create table tr (
  jsondata jsonb
);


insert into tr values (
  '{
    "track": {
      "segments": [
        {
          "location":   [ 47.763, 13.4034 ],
          "start time": "2018-10-14 10:05:14",
          "HR": 73
        },
        {
          "location":   [ 47.706, 13.2635 ],
          "start time": "2018-10-14 10:39:21",
          "HR": 135
        }
      ]
    }
  }'
);
```

```
$ ist die Wurzel des JSON-Ausdrucks

select
  jsonb_path_query(
    jsondata,
    '$'
  )
from tr;
```

```
{
    "track": {
        "segments": [
            {
                "HR": 73,
                "location": [
                    47.763,
                    13.4034
                ],
                "start time": "2018-10-14 10:05:14"
            },
            {
                "HR": 135,
                "location": [
                    47.706,
                    13.2635
                ],
                "start time": "2018-10-14 10:39:21"
            }
        ]
    }
}
```

Pfade werden durch "." gebildet

```
select
  jsonb_path_query(
    jsondata,
    '$.track.segments'
  )
from tr;
```

```
[
    {
        "HR": 73,
        "location": [
            47.763,
            13.4034
        ],
        "start time": "2018-10-14 10:05:14"
    },
    {
        "HR": 135,
        "location": [
            47.706,
            13.2635
        ],
        "start time": "2018-10-14 10:39:21"
    }
]
```

Zugriff auf alle Listenelemente

```
select
  jsonb_path_query(
    jsondata,
    '$.track.segments[*]'
  )
from tr;
```


```
{
    "HR": 73,
    "location": [
        47.763,
        13.4034
    ],
    "start time": "2018-10-14 10:05:14"
}
{
    "HR": 135,
    "location": [
        47.706,
        13.2635
    ],
    "start time": "2018-10-14 10:39:21"
}
```


Zugriff auf ein Listenelement

```
select
  jsonb_path_query(
    jsondata,
    '$.track.segments[0]'
  )
from tr;
```


```
{
    "HR": 73,
    "location": [
        47.763,
        13.4034
    ],
    "start time": "2018-10-14 10:05:14"
}
```

Zugriff auf Bestandteile der Listenelemente

```
select
  jsonb_path_query(
    jsondata,
    '$.track.segments[*].location'
  )
from tr;
```

```
[47.763, 13.4034]
[47.706, 13.2635]
```

Anwendung einer Funktion

```
select
  jsonb_path_query(
    jsondata,
    '$.track.segments.size()'
  )
from tr;
```

```
2
```

```
Filterausdrücke - ? (Bedingung)
@ Zugriff auf Elemente
select
  jsonb_path_query(
    jsondata,
    '$.track.segments[*].HR ? (@ > 130)'
  )
from tr;

135

Fortsetzung des Pfades nach der Filterung
select
  jsonb_path_query(
    jsondata,
    '$.track.segments[*] ? (@.HR > 130)."start time"'
  )
from tr;

"2018-10-14 10:39:21"


Hintereinanderschaltung von Filterausdrücken
select
  jsonb_path_query(
    jsondata,
    '$.track.segments[*] ? (@.location[1] < 13.4) ? (@.HR > 130)."start time"'
  )
from tr;

"2018-10-14 10:39:21"
```

Filterausdrücke auf verschiedenen Schachtelungsebenen

```
select
  jsonb_path_query(
    jsondata,
    '$.track.segments[*] ? (@.location[1] < 13.4).HR ? (@ > 130)'
  )
from tr;
```

```
135
```

Schachtelung von Filterausdrücken

```
select
  jsonb_path_query(
    jsondata,
    '$.track ? (exists(@.segments[*] ? (@.HR > 130))).segments.size()'
  )
from tr;
```

```
2
```

```
select * from gm;
```

	kunden
1	{"kname": "Hampe", "bestellungen": [{"produkt": [{"bez": "Dennis-Klappstuhl", "laenge": null}], "gesa
2	{"kname": "Eck", "bestellungen": [{"produkt": [{"bez": "Lucca-Esstisch", "laenge": null}, {"bez": "Stehti
3	{"kname": "Gleich", "bestellungen": [{"produkt": [{"bez": "Picknicktisch/Bank-Kombination", "laenge"
4	{"kname": "Haenel", "bestellungen": [{"produkt": [{"bez": "Stehtisch eckig", "laenge": null}, {"bez": "Ga
5	{"kname": "Mann", "bestellungen": [{"produkt": [{"bez": "Larum-Esstisch", "laenge": 210}, {"bez": "Sier

```
select
  kunden->> 'kname' as kname,
  jsonb_path_query(
    kunden,
    '$.bestellungen.size()'
  )::integer as anzahl_bestellungen
from gm;
```

	kname	anzahl_bestellungen
1	Hampe	6
2	Eck	6
3	Gleich	5
4	Haenel	6
5	Mann	6

```
select jsonb_pretty(jsonb_agg(kunden)) from gm;
```


```
[
    {
        "kname": "Hampe",
        "bestellungen": [
            {
                "produkt": [
                    {
                        "bez": "Dennis-Klappstuhl",
                        "laenge": null
                    }
                ],
                "gesamtpreis": 95.25,
                "bestelldatum": "2017-07-04"
            },
            {
                "produkt": [
                    {
                        "bez": "Stehtisch rund",
                        "laenge": null
                    },
                    {
                        "bez": "Pflanztopf Lanz",
                        "laenge": null
                    }
                ],
                "gesamtpreis": 322.25,
                "bestelldatum": "2018-05-02"
            },
            {
                "produkt": [
                    {
                        "bez": "Lucca-Esstisch",
                        "laenge": null
                    },
```


…

589 Zeilen

```
select jsonb_pretty (jsonb_build_object (
  'kname', kunden #> '{kname}',
  'bestellungen',
   json_build_array (
    kunden #> '{bestellungen, 0}',
    kunden #> '{bestellungen, 1}'
    )
  ))
from gm
where kunden->>'kname'='Hampe';
```

```
{
    "kname": "Hampe",
    "bestellungen": [
        {
            "produkt": [
                {
                    "bez": "Dennis-Klappstuhl",
                    "laenge": null
                }
            ],
            "gesamtpreis": 95.25,
            "bestelldatum": "2017-07-04"
        },
        {
            "produkt": [
                {
                    "bez": "Stehtisch rund",
                    "laenge": null
                },
                {
                    "bez": "Pflanztopf Lanz",
                    "laenge": null
                }
            ],
            "gesamtpreis": 322.25,
            "bestelldatum": "2018-05-02"
        }
    ]
}
```

```
select jsonb_build_object (
  'kname', kunden #> '{kname}',
  'bestellungen',
   jsonb_build_object (
      'Anzahl',
      jsonb_path_query(
        kunden,
        '$.bestellungen[0].produkt.size()'
      )
   )
) as anz_produkte
from gm;
```

	anz_produkte
1	{"kname": "Hampe", "bestellungen": {"Anzahl": 1}}
2	{"kname": "Eck", "bestellungen": {"Anzahl": 6}}
3	{"kname": "Gleich", "bestellungen": {"Anzahl": 3}}
4	{"kname": "Haenel", "bestellungen": {"Anzahl": 6}}
5	{"kname": "Mann", "bestellungen": {"Anzahl": 4}}

#> Zugriff auf Elemente über einen Pfad

```
select  kunden->>'kname',
  jsonb_path_query(
    kunden,
    '$.bestellungen[*] ? (@.gesamtpreis > 300).produkt.bez ? (@ like_regex "tisch$")'
  ):: text
from gm;
```

	?column?	jsonb_path_query
1	Hampe	"Lucca-Esstisch"
2	Hampe	"Siena-Esstisch"
3	Hampe	"Draan Standard Planztisch"
4	Eck	"Lucca-Esstisch"
5	Eck	"Merlin Pflanztisch"
6	Eck	"Merlin Pflanztisch"
7	Gleich	"Siena-Esstisch"
8	Haenel	"Siena-Esstisch"
9	Haenel	"Draan Standard Planztisch"
10	Haenel	"Siena-Esstisch"
11	Mann	"Merlin Pflanztisch"