An introduction to React

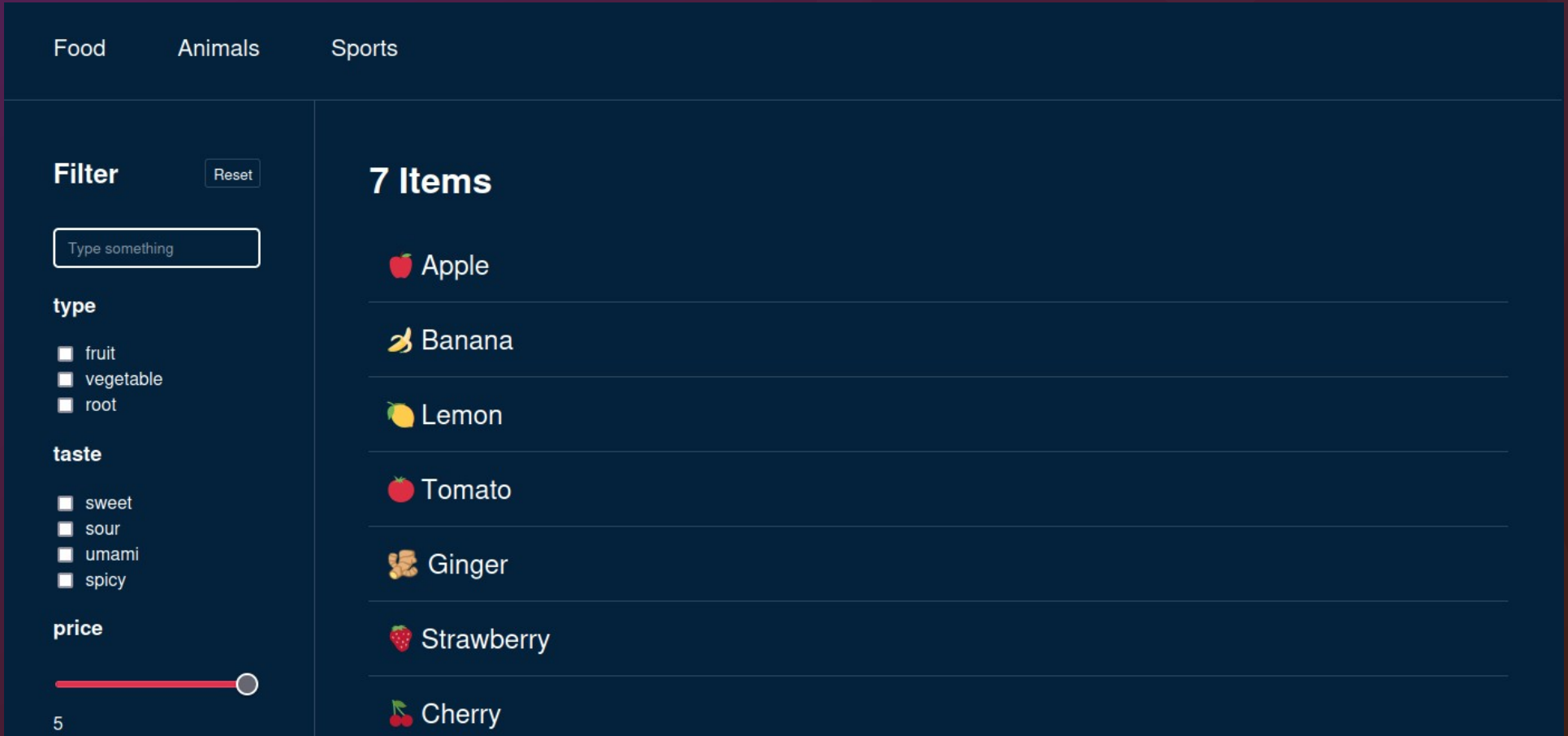
What to expect

- Hands on approach from the view of a developer
- A journey through what React has to offer
- Some Typescript
- An interactive experience

What not to expect

- A full in-depth explanation of every single feature
- Frameworks and Libraries

Let’s build a filter-app together!



Why React?

- A virtual DOM implementation
- Handle state

Quick setup with Vite

- Create-react-app
- Vite
- NextJS

HTML structure with JSX

- Conditionals
- Iterations
- Fragments
- TSX for Typescript

food animals sports

Filter

Reset

Type something

type

- fruit
- vegetable
- root

taste

- sweet
- sour
- umami
- spicy

price

5

7 Items

🍎 Apple

🍌 Banana

🍋 Lemon

🍅 Tomato

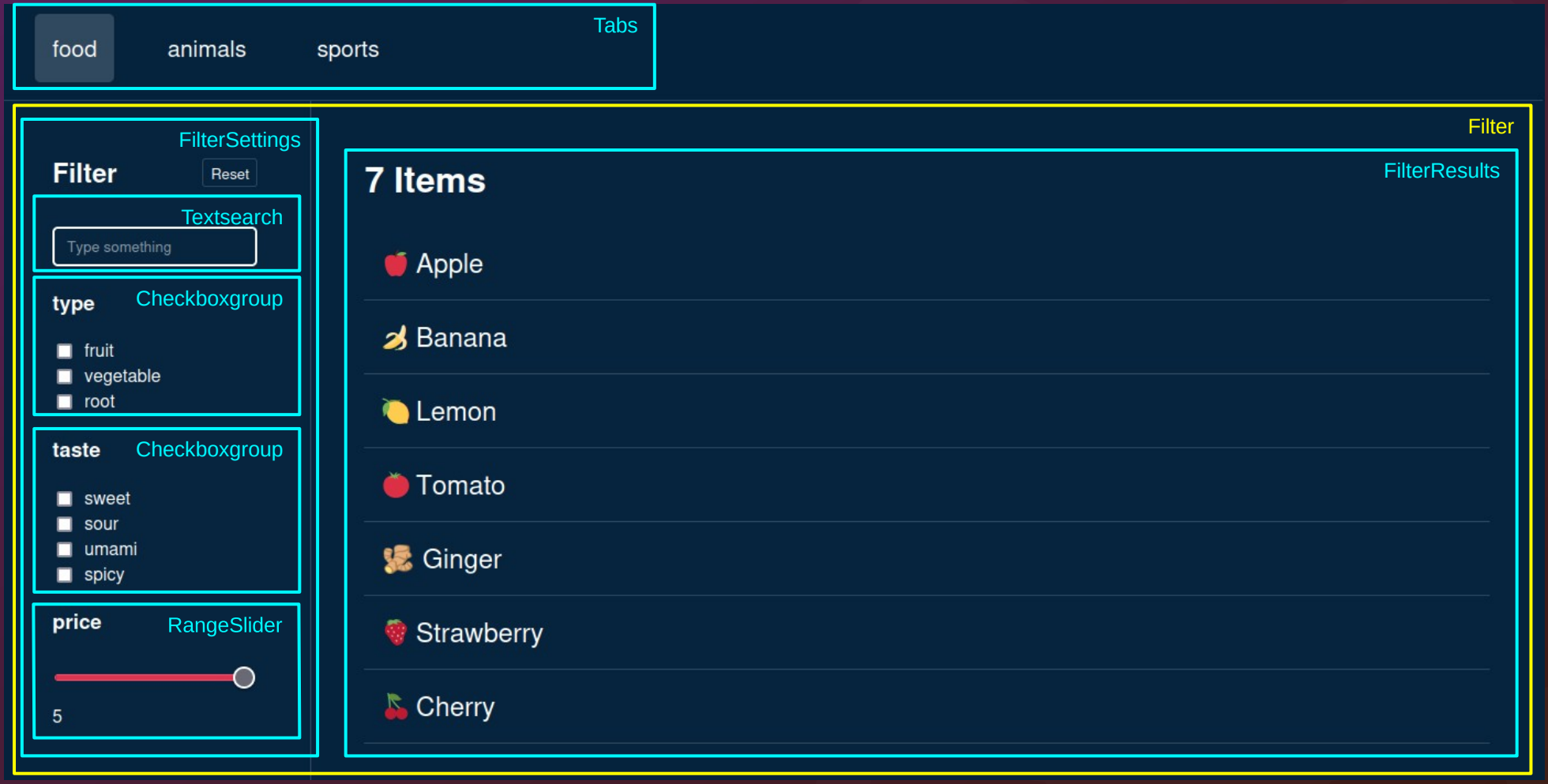
🫚 Ginger

🍓 Strawberry

🍒 Cherry

Split code into components

- Reusable
- Configurable
- Testable
- Readable


Tabs
food
animals
sports
Filter
FilterSettings
Filter
Reset
Textsearch
Type something
type
Checkboxgroup
fruit
vegetable
root
taste
Checkboxgroup
sweet
sour
umami
spicy
price
RangeSlider
5
FilterResults
7 Items
Apple
Banana
Lemon
Tomato
Ginger
Strawberry
Cherry

Components

We can build new base-level components like datepickers, or a simple input[type=”password”] and reuse them throughout our app

Tabs

food animals sports

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- 🍒 Cherry

food animals sports

Filter

Reset

Type something

type Checkboxgroup

- fruit
- vegetable
- root

taste Checkboxgroup

- sweet
- sour
- umami
- spicy

price

5

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- 🍋 Lemon
- 🍅 Tomato
- 🫚 Ginger
- 🍓 Strawberry
- 🍒 Cherry

Component properties

Ideally this component can be used anywhere

We can build new base-level components like

datepickers, or a simple input[type=”password”] and reuse them throughout our app

👆 Interactivity

```
document.querySelector('#search').addEventListener('change', (e) => {
    updateFilterResults(e.target.value);
});
```

❌

This is problematic because:

- React’s virtual DOM frequently recreates nodes
- Every render creates new event-handlers

Interactivity checklist:

- ⬜ Create a variable
- ⬜ Update the variable on user-input
- ⬜ Re-render the app after a variable updates

🪝 useState()

```
const [activeTab, setActiveTab] = useState(0);
const [search, setSearch] = useState("");
```

```
<input type="search"
    value={search}
    onChange={e => setSearch(e.target.value)}
/>
```

- Allows to save state between renders
- Tells React to re-render when state changes

Interactivity checklist

✅ Create a variable

```
const [search, setSearch] = useState("");
```

✅ Update the variable on user-input

```
<input type="search" value={search} onChange={e => setSearch(e.target.value)} />
```

✅ Re-render the app after a variable updates

```
// React re-renders automatically after state mutates!
```

Let’s use our new tools

food animals sports

Filter Reset

Textsearch

Type something

type

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🍓 Strawberry

🍒 Cherry

let, const, var

```
const search = “”

<input type="search"
    value={search}
    onChange={e => { search = e.target.value }}
/>
```

Wouldn’t work because:

- The variable gets recreated on every render
- Updating the variable won’t tell react to re-render

let, const, var

```
const [search, setSearch] = useState("");
const searchLowerCase = search.toLowerCase();
```

- Not everything needs to be defined with `useState()`
- For example: derived variables
  - They won’t need to be changed directly
  - Their origin will already cause a re-render on change

🪝 Hooks

useSyncExternalStore

useCallback

useEffect

useInsertionEffect

useReducer

useLayoutEffect

useDebugValue

useMemo

useDeferredValue

useState

useRef

useTransition

useContext

useImperativeHandle

use

useId

🪝 Hooks

- Hook are functions that let you “hook” into React’s state
- They need to run
  - inside a functional component
  - in the same order every render
  - unconditionally

Pure Functions inside React

- Always produce same output with same input
- Have no side-effects

Functional Components

- React can easily abort incomplete renders
- Results can be cached more easily
- Components can be rendered on the server

Mutating state

- Inside event handlers
- Inside `useEffect()`

Detecting state changes

We want to fetch our data when the app initializes and when the category is changed

🪝 `useEffect()`

- Run after the component has rendered
- Has a dependency array that needs to match the effects dependencies
- If dependencies are empty it only runs once
- The returned function runs when component unmounts

🪝 `useEffect()`

Can easily be missused.

- Its purpose is to synchronize with external systems
- Send analytics events
- Connect to a native (video) or external API (image gallery)

How to avoid prop drilling?

Filter.tsx

```
<div className="filter">
    <FilterSettings
        filters={filters}
        updateCategory={updateCategory}
        updateRange={updateRange}
        updateSearch={updateSearch}
        reset={reset}
    />
    <FilterResults
        items={filterResults}
        search={filters.search.value}
        reset={reset}
    />
</div>
```

FilterSettings.tsx

```
<div className="filter__settings">
    <FilterSettingsToolbar reset={reset} />

    <TextSearch
        value={filters.search.value}
        onUpdate={(e) =>
        updateSearch(e.target.value)}
    />
    ...
</div>
```

🪝 `useContext()`

- Provides a shared state to all children who subscribe with the useContext hook
- Other components in between don’t have to know the data exists
- Can lead to unintended re-renders

🪝 useContext()

Filter.tsx

```
export const FilterContext = createContext(null);
```

```
<FilterContext.Provider items={items} >
    <FilterSettings />
    <FilterResults />
</FilterContext.Provider>
```

FilterSettings.tsx &
FilterResults.tsx

```
import { FilterContext } from './Filter.tsx'
```

```
items = useContext(FilterContext)
```

🪝 useContext()

```
<div className="filter">
    <FilterSettings
        filters={filters}
        updateCategory={updateCategory}
        updateRange={updateRange}
        updateSearch={updateSearch}
        reset={reset}
    />
    <FilterResults
        items={filterResults}
        search={filters.search.value}
        reset={reset}
    />
</div>
```

➡

```
<div className="filter">
    <FilterContextProvider items={items}>
        <FilterSettings />
        <FilterResults />
    </FilterContextProvider>
</div>
```

Filter.tsx:8

🪝 `useRef()`

- Changing ref.current doesn’t cause a rerender!

Bug report

We’re updating the items, but the Filter still shows the old data.

key attribute

- Whenever the key attribute changes, React will treat it like a different element and cause a rerender.

How to handle complex state

The filtersettings are increasing in complexity and we want a better way than useState to handle it in a unified way.

🪝 `useReducer()`

- UseReducer() is similar to useState() but it can provide multiple functions to update the state it holds

JS mutations

	copy	mutating
add	.concat(), [...arr]	.push(), .unshift()
remove	.filter(), slice()	.pop(), .shift(), .splice()
replace	.map()	.splice(), arr[i] =
sort	[...arr] => arr.sort()	.reverse(), .sort()

Source: https://react.dev/learn/updating-arrays-in-state

Copying deeply nested state

Copying nested state can become very tedious and hard to read:

```
case "SET_RANGE":
    return {
    ...state,
    ranges: {
        ...state.ranges,
        [action.payload.id]: {
            ...state.ranges[action.payload.id],
            value: action.payload.value,
        },
    },
};
```

useFilter.tsx:41

Immer (Framework)

- Immer allows state to be mutated directly
  - Replace `useState()` with `useImmer()`
  - Replace `useReducer()` with `immerReducer()`

```
case "SET_RANGE":
    return {
    ...state,
    ranges: {
        ...state.ranges,
        [action.payload.id]: {
            ...state.ranges[action.payload.id],
            value: action.payload.value,
        },
    },
};
```

```
case "SET_RANGE":
    state.ranges[action.payload.id].value =
    action.payload.value;
    break;
```

🪝 Custom hooks

- Need to start with use
- Only are considered hooks if they wrap around React hooks, otherwise they're just functions
- Are essentially just wrappers like functions

⚠️ Performance issues

If we had complex filters with thousands of items, slower devices might run into performance issues

🪝 useMemo()

```
const filterResults = useMemo(() => {
// costly filter operation

return filtereditems;
}, [filters, items]);
```

useFilterContext.tsx:30

- Cache the result of a heavy computation
- Not needed for simple calculations
- Only updates when dependency array changes

🪝 `useCallback()`

- Like `useMemo()` but it returns a function instead of a value
- Referential equality

Typescript

State Management

- SWR
- React Query
- Redux & Redux Toolkit
- Zustand
- Jotai

Routing

- React-Router
- NextJS

Next steps & Ideas

- Add routing for detailviews
- Save the filter-state in url for deep linking
- Extract Filter types into separate modules

Recommendations

- Official React.dev - Learn & Documentation
  https://react.dev/learn
- Jack Herrington - Typescript & React
  https://www.youtube.com/watch?v=j8AVXNozac8
- Web Dev Simplified – React Hooks Explained
  https://www.youtube.com/watch?v=O6P86uwfdR0

Thank you!