ON THIS PAGE

Describing the UI

React is a JavaScript library for rendering user interfaces (UI). UI is built from small units like buttons, text, and images. React lets you combine them into reusable, nestable *components*. From web sites to phone apps, everything on the screen can be broken down into components. In this chapter, you'll learn to create, customize, and conditionally display React components.

In this chapter

Your first component

React applications are built from isolated pieces of UI called *components*. A React component is a JavaScript function that you can sprinkle with markup. Components can be as small as a button, or as large as an entire page. Here is a `Gallery` component rendering three `Profile` components:

App.js

Download Reset Fork

```
function Profile() {
  return (
    <img
      src="https://i.imgur.com/MK3eW3As.jpg"
      alt="Katherine Johnson"
    />
  );
}

export default function Gallery() {
  return (
    <section>
      <h1>Amazing scientists</h1>
      <Profile />
      <Profile />
      <Profile />
    </section>
  );
}

```

Amazing scientists

Show less

Ready to learn this topic?

Read **Your First Component** to learn how to declare and use React components.

Read More >

Gallery.js Profile.js

Reset Fork

```
export default function Profile() {
  return (
    <img
      src="https://i.imgur.com/QIrZWGIs.jpg"
      alt="Alan L. Hart"
    />
  );
}

```

Amazing scientists

Importing and exporting components

You can declare many components in one file, but large files can get difficult to navigate. To solve this, you can *export* a component into its own file, and then *import* that component from another file:

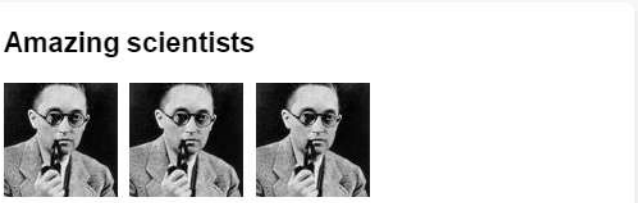
Gallery.js | Profile.js

Reset | Fork

```
import Profile from './Profile.js';

export default function Gallery() {
  return (
    <section>
      <h1>Amazing scientists</h1>
      <Profile />
      <Profile />
      <Profile />
    </section>
  );
}

```



Ready to learn this topic?

Read **Importing and Exporting Components** to learn how to split components into their own files.

Read More ›

Writing markup with JSX

Each React component is a JavaScript function that may contain some markup that React renders into the browser. React components use a syntax extension called JSX to represent that markup. JSX looks a lot like HTML, but it is a bit stricter and can display dynamic information.

If we paste existing HTML markup into a React component, it won't always work:

App.js

Download Reset Fork

```
export default function TodoList() {
  return (
    // This doesn't quite work!
    <h1>Hedy Lamarr's Todos</h1>
    <img
      src="https://i.imgur.com/yXOvdOSs.jpg"
      alt="Hedy Lamarr"
      class="photo"
    >
    <ul>
      <li>Invent new traffic lights
      <li>Rehearse a movie scene
      <li>Improve spectrum technology
    </ul>
  );
}

```

Error

```
/src/App.js: Adjacent JSX elements must be wrapped in an
enclosing tag. Did you want a JSX fragment <>...</>?
(5:4)

  3 |     // This doesn't quite work!
  4 |     <h1>Hedy Lamarr's Todos</h1>
> 5 |     <img
    |     ^
  6 |       src="https://i.imgur.com/yXOvdOSs.jpg"
  7 |       alt="Hedy Lamarr"
  8 |       class="photo"
```

Show less

If you have existing HTML like this, you can fix it using a converter:

App.js

Download Reset Fork

```
export default function TodoList() {
  return (
    <>
      <h1>Hedy Lamarr's Todos</h1>
      <img
        src="https://i.imgur.com/yXOvdOSs.jpg"
        alt="Hedy Lamarr"
        className="photo"
      />
      <ul>
        <li>Invent new traffic lights</li>
        <li>Rehearse a movie scene</li>
        <li>Improve spectrum technology</li>
      </ul>
    </>
  );
}

```

Hedy Lamarr's Todos

- Invent new traffic lights
- Rehearse a movie scene
- Improve spectrum technology

Show less

Ready to learn this topic?

Read **Writing Markup with JSX** to learn how to write valid JSX.

Read More ›

JavaScript in JSX with curly braces

JSX lets you write HTML-like markup inside a JavaScript file, keeping rendering logic and content in the same place. Sometimes you will want to add a little JavaScript logic or reference a dynamic property inside that markup. In this situation, you can use curly braces in your JSX to “open a window” to JavaScript:

App.js

Download Reset Fork

```
const person = {
  name: 'Gregorio Y. Zara',
  theme: {
    backgroundColor: 'black',
    color: 'pink'
  }
};

export default function TodoList() {
  return (
    <div style={person.theme}>
      <h1>{person.name}'s Todos</h1>
      <img
        className="avatar"
        src="https://i.imgur.com/7vQD0fPs.jpg"
        alt="Gregorio Y. Zara"
      />
      <ul>
        <li>Improve the videophone</li>
        <li>Prepare aeronautics lectures</li>
        <li>Work on the alcohol-fuelled engine</li>
      </ul>
    </div>
  );
}

```

Ready to learn this topic?

Read **JavaScript in JSX with Curly Braces** to learn how to access JavaScript data from JSX.

Read More ›

Passing props to a component

React components use *props* to communicate with each other. Every parent component can pass some information to its child components by giving them props. Props might remind you of HTML attributes, but you can pass any JavaScript value through them, including objects, arrays, functions, and even JSX!

App.js utils.js Reset Fork

```
import { getImageUrl } from './utils.js'

export default function Profile() {
  return (
    <Card>
      <Avatar
        size={100}
        person={{
          name: 'Katsuko Saruhashi',
          imageId: 'YfeOqp2'
        }}
      />
    </Card>
  );
```

```
16
17 function Avatar({ person, size }) {
18   return (
19     <img
20       className="avatar"
21       src={getImageUrl(person)}
22       alt={person.name}
23       width={size}
24       height={size}
25     />
26   );
27 }
28
29 function Card({ children }) {
30   return (
31     <div className="card">
32       {children}
33     </div>
34   );
35 }
36
37
```

Show less

Ready to learn this topic?

Read **Passing Props to a Component** to learn how to pass and read props.

Read More ›

Conditional rendering

Your components will often need to display different things depending on different conditions. In React, you can conditionally render JSX using JavaScript syntax like `if` statements, `&&`, and `? :` operators.

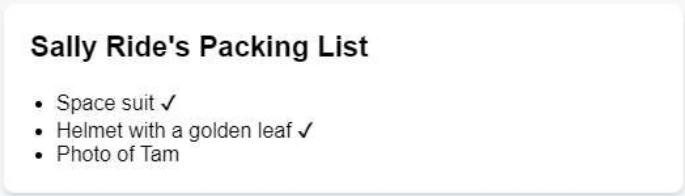
In this example, the JavaScript `&&` operator is used to conditionally render a checkmark:

App.js

Download Reset Fork

```
function Item({ name, isPacked }) {
  return (
    <li className="item">
      {name} {isPacked && '✓'}
    </li>
  );
}

export default function PackingList() {
  return (
    <section>
      <h1>Sally Ride's Packing List</h1>
      <ul>
        <Item
          isPacked={true}
          name="Space suit"
        />
        <Item
          isPacked={true}
          name="Helmet with a golden leaf"
        />
        <Item
          isPacked={false}
          name="Photo of Tam"
        />
```



```
25          />
26        </ul>
27      </section>
28    );
29  }
30
```

Sally Ride's Packing List

- Space suit ✓
- Helmet with a golden leaf ✓
- Photo of Tam

Show less

Ready to learn this topic?

Read **Conditional Rendering** to learn the different ways to render content conditionally.

Read More >

Rendering lists

You will often want to display multiple similar components from a collection of data. You can use JavaScript's `filter()` and `map()` with React to filter and transform your array of data into an array of components.

For each array item, you will need to specify a `key`. Usually, you will want to use an ID from the database as a `key`. Keys let React keep track of each item's place in the list even if the list changes.

App.js data.js utils.js

Reset Fork

```
import { people } from './data.js';
import { getImageUrl } from './utils.js';

export default function List() {
  const listItems = people.map(person =>
    <li key={person.id}>
      <img
        src={getImageUrl(person)}
        alt={person.name}
      />
      <p>
        <b>{person.name}:</b>
        {' ' + person.profession + ' '}
        known for {person.accomplishment}
      </p>
    </li>
  );
  return (
    <article>
      <h1>Scientists</h1>
      <ul>{listItems}</ul>
    </article>
  );
}
```

Scientists

Creola Katherine Johnson: mathematician known for spaceflight calculations

Mario José Molina-Pasquel Henríquez: chemist known for discovery of Arctic ozone hole

Mohammad Abdus Salam: physicist known for electromagnetism theory

Percy Lavon Julian: chemist known for pioneering cortisone drugs, steroids and birth control pills

Subrahmanyan Chandrasekhar: astrophysicist known for white dwarf star mass calculations

Show less

App.js data.js utils.js

Reset Fork

```
export const people = [{
  id: 0,
  name: 'Creola Katherine Johnson',
  profession: 'mathematician',
  accomplishment: 'spaceflight calculations',
  imageId: 'MK3eW3A'
}, {
  id: 1,
  name: 'Mario José Molina-Pasquel Henríquez',
  profession: 'chemist',
  accomplishment: 'discovery of Arctic ozone hole',
  imageId: 'mynHUSa'
}, {
  id: 2,
  name: 'Mohammad Abdus Salam',
  profession: 'physicist',
  accomplishment: 'electromagnetism theory',
  imageId: 'bE7W1ji'
}, {
  id: 3,
  name: 'Percy Lavon Julian',
  profession: 'chemist',
  accomplishment: 'pioneering cortisone drugs, steroids and birth
  imageId: 'IOjWm71'
}, {
  id: 4,
  name: 'Subrahmanyan Chandrasekhar',
  profession: 'astrophysicist',
  accomplishment: 'white dwarf star mass calculations',
  imageId: 'lrWQx8l'
}];

```

Scientists

Creola Katherine Johnson: mathematician known for spaceflight calculations

Mario José Molina-Pasquel Henríquez: chemist known for discovery of Arctic ozone hole

Mohammad Abdus Salam: physicist known for electromagnetism theory

Percy Lavon Julian: chemist known for pioneering cortisone drugs, steroids and birth control pills

Subrahmanyan Chandrasekhar: astrophysicist known for white dwarf star mass calculations

App.js data.js utils.js

Reset Fork

```
export function getImageUrl(person) {
  return (
    'https://i.imgur.com/' +
    person.imageId +
    's.jpg'
  );
}

```

Scientists

Creola Katherine Johnson: mathematician known for spaceflight calculations

Mario José Molina-Pasquel Henríquez: chemist known for discovery of Arctic ozone hole

Mohammad Abdus Salam: physicist known for electromagnetism theory

Percy Lavon Julian: chemist known for pioneering cortisone drugs, steroids and birth control pills

Subrahmanyan Chandrasekhar: astrophysicist known for white dwarf star mass calculations

Show less

Ready to learn this topic?

Read **Rendering Lists** to learn how to render a list of components, and how to choose a key.

Read More ›

Keeping components pure

Some JavaScript functions are *pure*. A pure function:

- **Minds its own business.** It does not change any objects or variables that existed before it was called.
- **Same inputs, same output.** Given the same inputs, a pure function should always return the same result.

By strictly only writing your components as pure functions, you can avoid an entire class of baffling bugs and unpredictable behavior as your codebase grows. Here is an example of an impure component:

App.js

Download Reset Fork

```
let guest = 0;

function Cup() {
  // Bad: changing a preexisting variable!
  guest = guest + 1;
  return <h2>Tea cup for guest #{guest}</h2>;
}

export default function TeaSet() {
  return (
    <>
```

Tea cup for guest #2

Tea cup for guest #4

Tea cup for guest #6

```
    <>
      <Cup />
      <Cup />
      <Cup />
    </>
  );
}

```

Tea cup for guest #4

Tea cup for guest #6

Show less

You can make this component pure by passing a prop instead of modifying a preexisting variable:

App.js

Download Reset Fork

```
function Cup({ guest }) {
  return <h2>Tea cup for guest #{guest}</h2>;
}

export default function TeaSet() {
  return (
    <>
      <Cup guest={1} />
      <Cup guest={2} />
      <Cup guest={3} />
    </>
  );
}

```

Tea cup for guest #1

Tea cup for guest #2

Tea cup for guest #3

Ready to learn this topic?

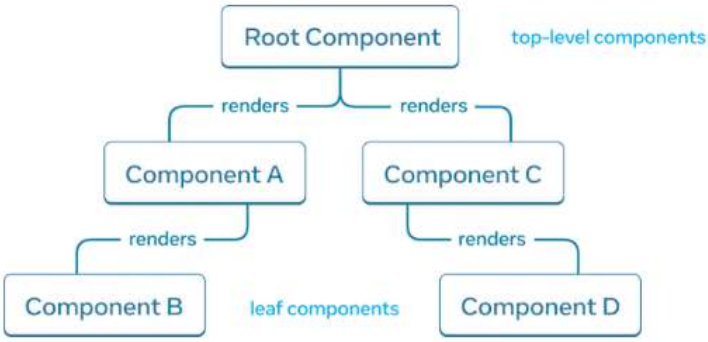
Read **Keeping Components Pure** to learn how to write components as pure, predictable functions.

Read More ›

Your UI as a tree

React uses trees to model the relationships between components and modules.

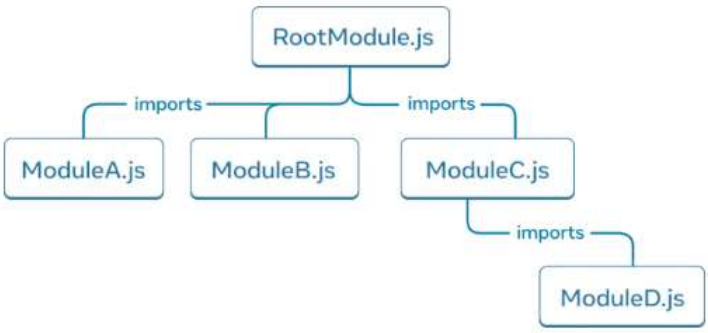
A React render tree is a representation of the parent and child relationship between components.



An example React render tree.

Components near the top of the tree, near the root component, are considered top-level components. Components with no child components are leaf components. This categorization of components is useful for understanding data flow and rendering performance.

Modelling the relationship between JavaScript modules is another useful way to understand your app. We refer to it as a module dependency tree.



An example module dependency tree.

A dependency tree is often used by build tools to bundle all the relevant JavaScript code for the client to download and render. A large bundle size regresses user experience for React apps. Understanding the module dependency tree is helpful to debug such issues.

Ready to learn this topic?

Read **Your UI as a Tree** to learn how to create a render and module dependency trees for a React app and how they're useful mental models for improving user experience and performance.

Read **Your UI as a Tree** to learn how to create a render and module dependency trees for a React app and how they're useful mental models for improving user experience and performance.

Read More ›

What's next?

Head over to Your First Component to start reading this chapter page by page!

Or, if you're already familiar with these topics, why not read about Adding Interactivity?

NEXT
Your First Component ›