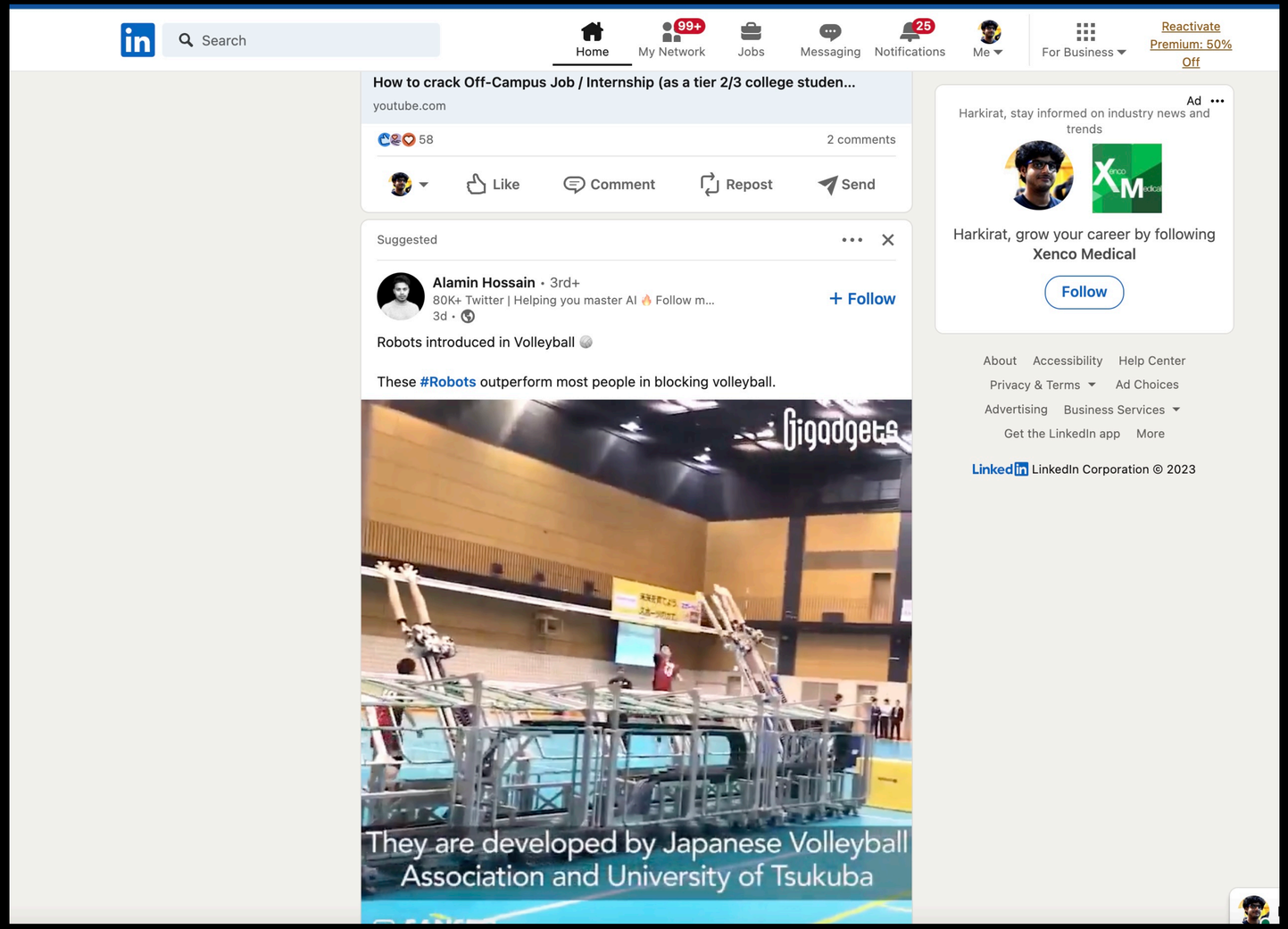
4.2 - Why frontend frameworks

Reconcilers and Intro to React

Jargon - DOM Manipulation

What happens when you scroll down



Jargon - DOM Manipulation

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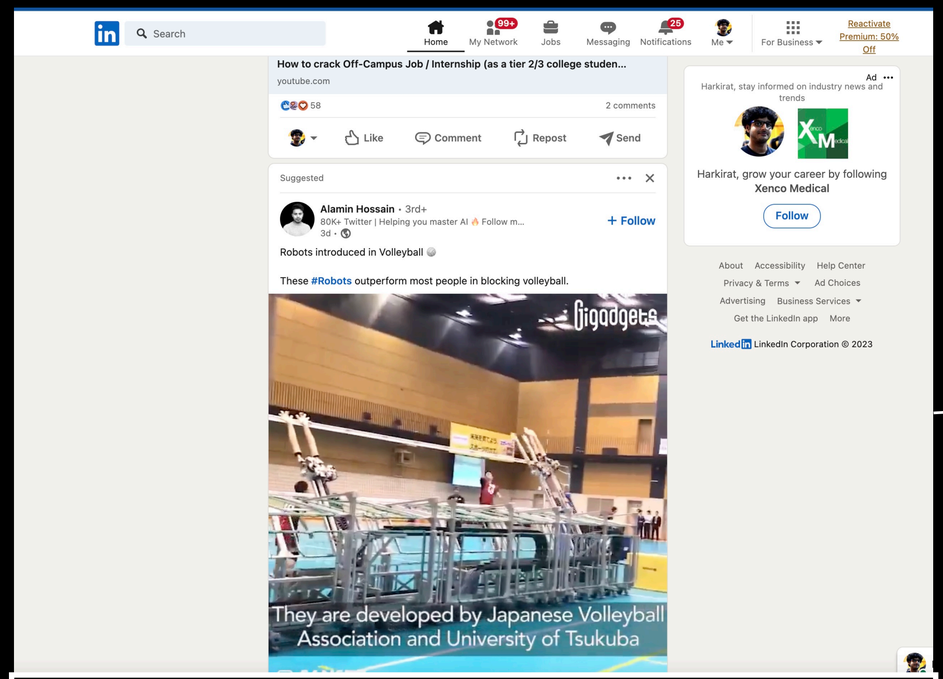
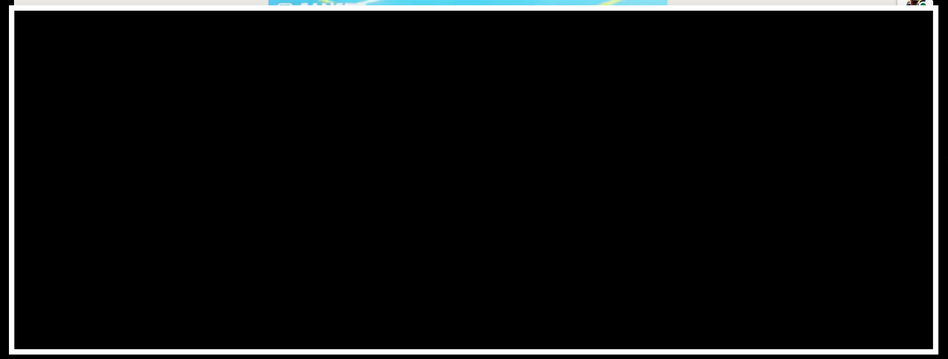
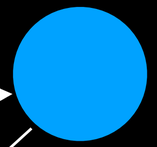


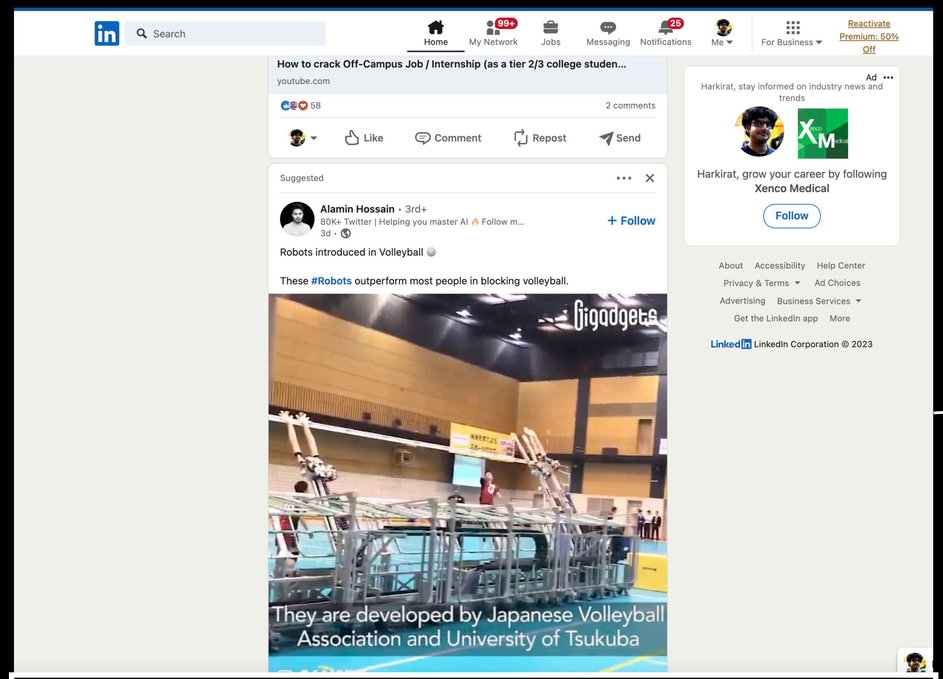


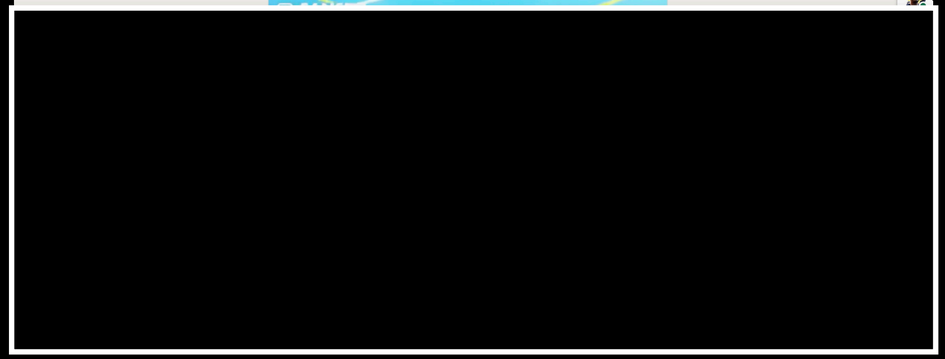
getNextPosts



New Items get pushed to the DOM

Jargon - DOM Manipulation





getNextPosts

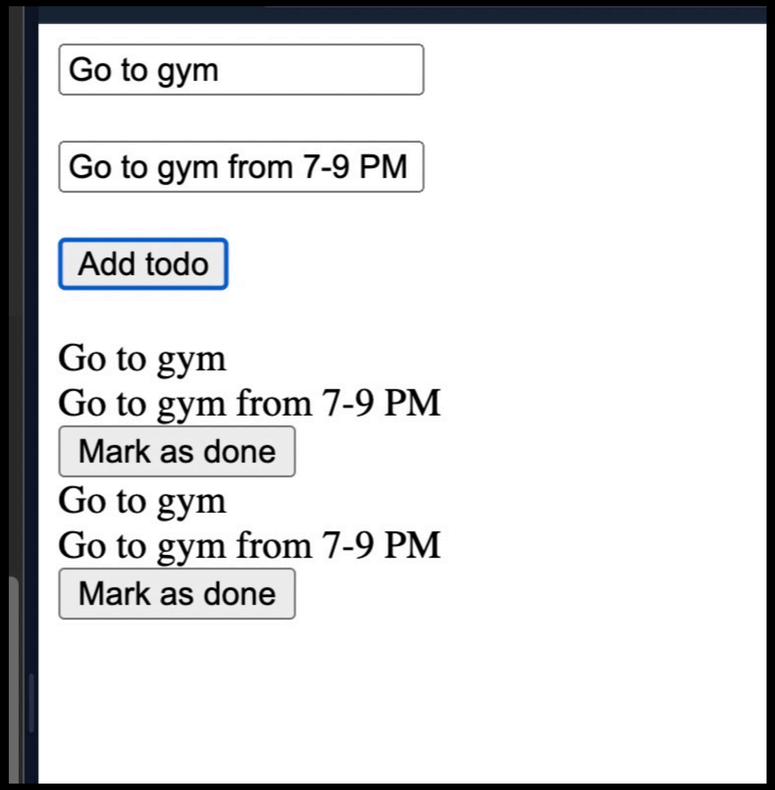
New Items get pushed to the DOM

This is called DOM manipulation

DOM manipulation is very hard to write as a developer
Making dynamic websites, with the primitives that DOM provides you is very hard

Let’s try to create a TODO application using DOM manipulation

document.createElement
document.appendChild
element.setAttribute
element.children



https://gist.github.com/hkirat/e61655a7d93ce06810488be402adebee

Let’s try to create a TODO application using DOM manipulation

JS

```
<script>
  let globalId = 1;

  function markAsDone(todoId) {
    const parent = document.getElementById(todoId);
    parent.children[2].innerHTML = "Done!"
  }

  function createChild(title, description, id) {
    const child = document.createElement("div");
    const firstGrandParent = document.createElement("div");
    firstGrandParent.innerHTML = title;
    const secondGrandParent = document.createElement("div");
    secondGrandParent.innerHTML = description;
    const thirdGrandParent = document.createElement("button");
    thirdGrandParent.innerHTML = "Mark as done";
    thirdGrandParent.setAttribute("onclick", `markAsDone(${id})`);
    child.appendChild(firstGrandParent);
    child.appendChild(secondGrandParent);
    child.appendChild(thirdGrandParent)
    child.setAttribute("id", id);
    return child;
  }

  function addTodo() {
    const title = document.getElementById("title").value;
    const description = document.getElementById("description").value;
    const parent = document.getElementById("todos");

    parent.appendChild(createChild(title, description, globalId++));
  }
</script>
```

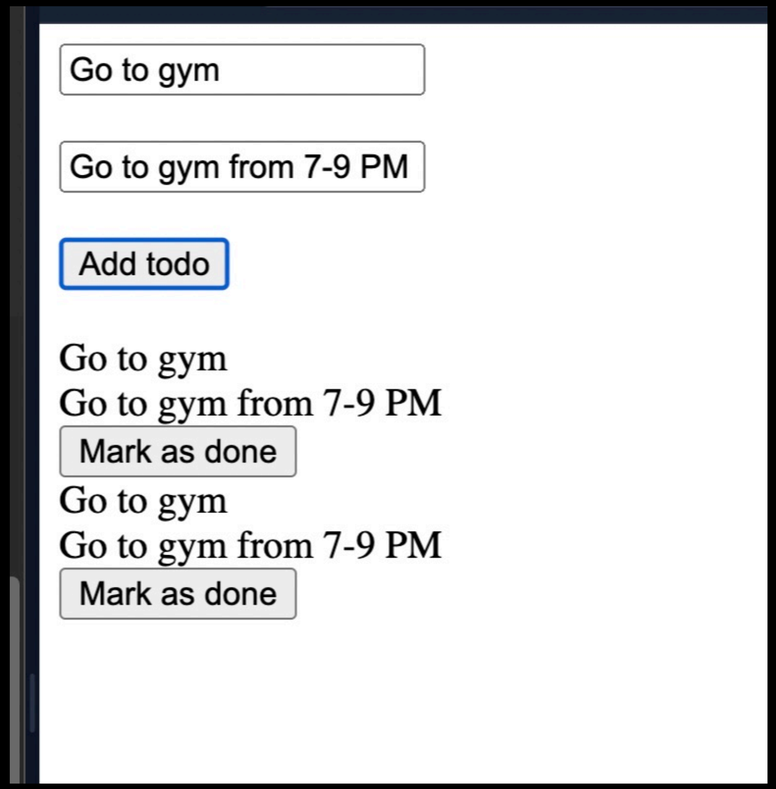
HTML

```
<body>
  <input type="text" id="title" placeholder="Todo title"></input> <br /><br />
  <input type="text" id="description" placeholder="Todo description"></input> <br /><br />
  <button onclick="addTodo()">Add todo</button>
  <br /> <br />

  <div id="todos">

  </div>
</body>
```

Let’s try to create a TODO application using DOM manipulation

Problem with this approach - Very hard to add and remove elements
No central State

What if there is a server where these todos are put
What if you update a TODO from your mobile app
You will get back the new array of TODOs on the frontend
How will you update the DOM then?
You only have a addTodo function
You don’t have an updateTodo or removeTodo function yet



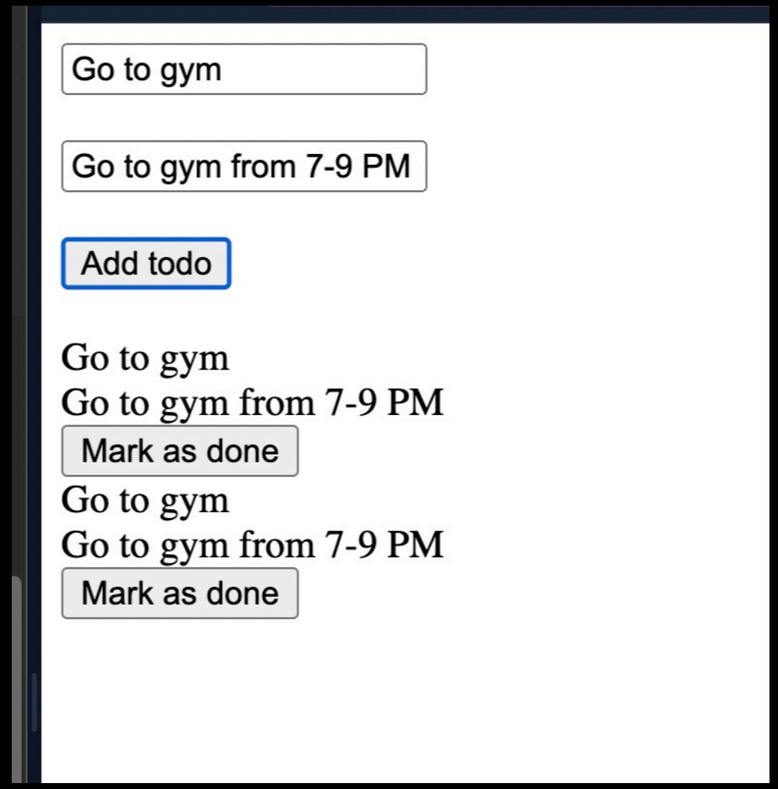
Let’s try to create a TODO application using DOM manipulation

What do I mean when I say State

state

```
[
  {
    Id: 1,
    title: “Go to Gym”,
    description: “Go to Gym from 7-9 PM”
  },
  {
    id: 1,
    title: “Go to Gym”,
    description: “Go to Gym from 7-9 PM”
  },
]
```

State



Let’s try to create a TODO application using DOM manipulation

What do I mean when I say State

If you can write a function, that takes this state as an input and creates the output on the right, that is much more powerful that our original approach

state

```
[
  {
    Id: 1,
    title: “Go to Gym”,
    description: “Go to Gym from 7-9 PM”
  },
  {
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  },
]
```
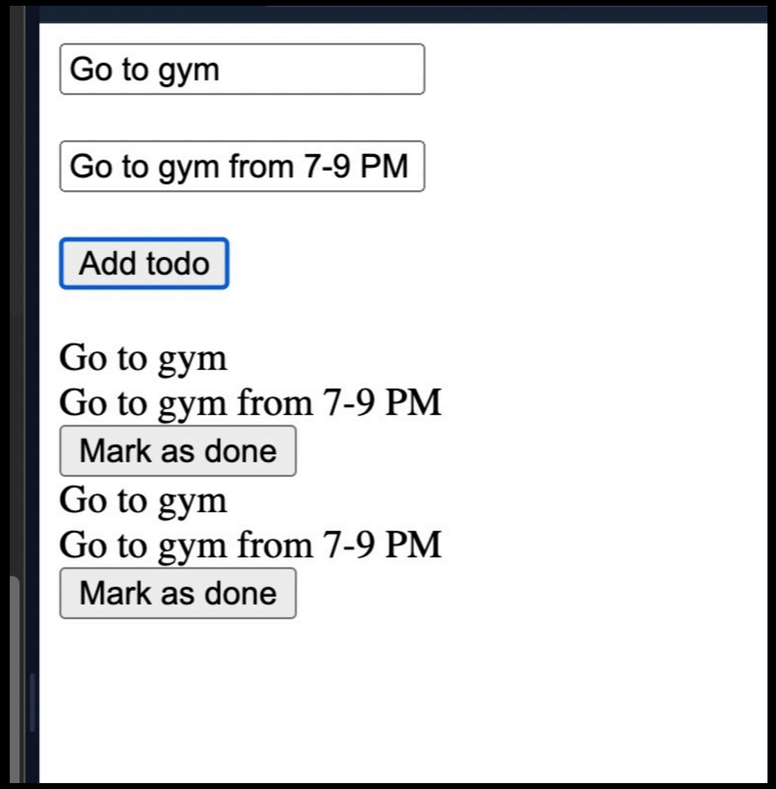
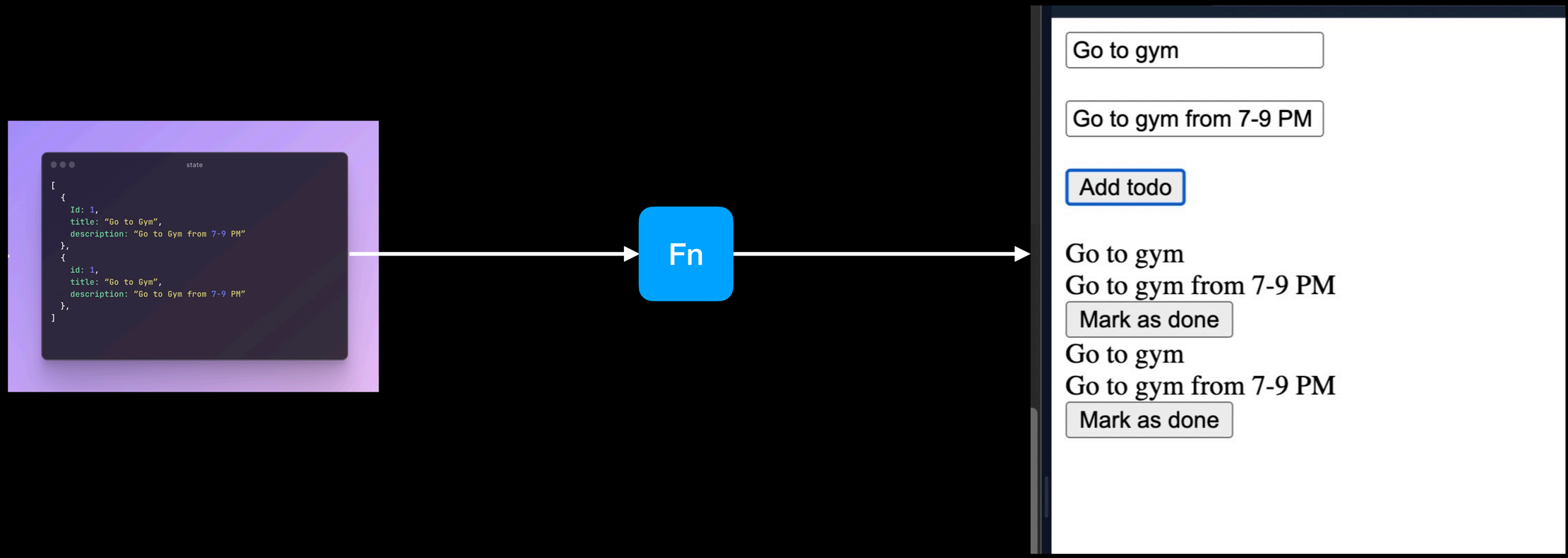



Let’s try to create a TODO application using DOM manipulation

What do I mean when I say State

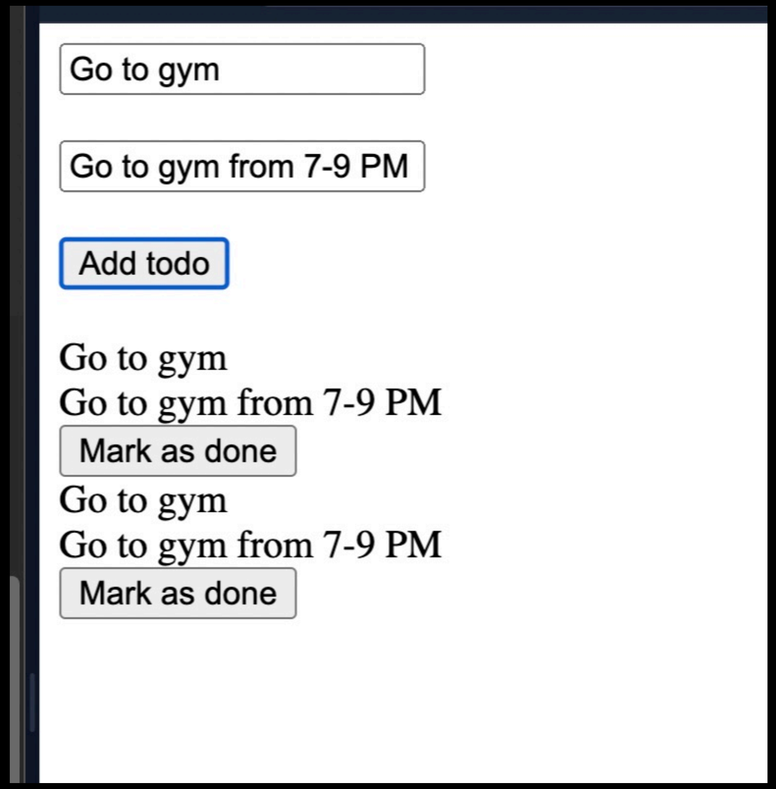


Let’s try to create a TODO application using DOM manipulation

What do I mean when I say State

Untitled-1

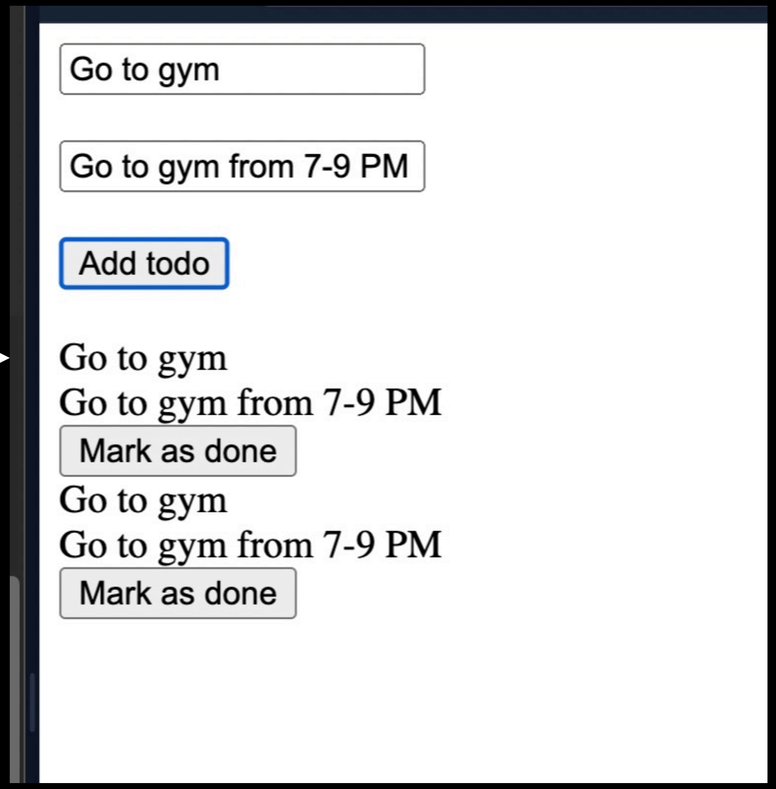
```html
<!DOCTYPE html>
<html>

<head>
  <script>
    let todoState = [];
    function addTodo() {
      const title = document.getElementById("title").value;
      const description = document.getElementById("description").value;
      todoState.push({
        title: title,
        description: description,
        id: globalId++
      })
      updateState(todoState);
    }
  </script>
</head>

<body>
  <input type="text" id="title" placeholder="Todo title"></input> <br /><br />
  <input type="text" id="description" placeholder="Todo description"></input> <br /><br />
  <button onclick="addTodo()">Add todo</button>
  <br /> <br />

  <div id="todos">

  </div>
</body>

</html>
```



Let’s try to create a TODO application using DOM manipulation

Dumb Solution

Fn



1. Clear the parent element
2. Call addTodo on every element

https://gist.github.com/hkirat/cb9d7e2f75617ac281427276e20a691c

Let’s try to create a TODO application using DOM manipulation

Better Solution

Don’t clear the DOM upfront, update it based on what has changed.

Question is, how does it calculate what all has changed?
Has a todo been marked as complete?
Has a todo been removed from the backend?

Let’s try to create a TODO application using DOM manipulation

Better Solution

Don’t clear the DOM upfront, update it based on what has changed.

Question is, how does it calculate what all has changed?
Has a todo been marked as complete?
Has a todo been removed from the backend?

By remembering the old todos in a variable (Virtual DOM)

Let’s try to create a TODO application using DOM manipulation

Better Solution (Take home assignment)

```
<body>
  <input type="text" id="title" placeholder="Todo title"></input> <br /><br />
  <input type="text" id="description" placeholder="Todo description"></input> <br
/><br />
  <button onclick="addTodo()">Add todo</button>
  <br /> <br />

  <div id="todos">

  </div>
</body>
```

https://gist.github.com/hkirat/ed34df967f162d152e35537cb8215144

```
<!DOCTYPE html>
<html>

<head>
  <script>
    let globalId = 1;
    let todoState = [];
    let oldTodoState = [];

    function addTodo() {
      // big function we wrote in the beginning
    }

    function removeTodo(todo) {
      const element = document.getElementById(todo.id);
      element.parent.removeChild(element);
    }

    function updateTodo(oldTodo, newTodo) {
      const element = document.getElementById(oldTodo.id);
      element.children[0].innerHTML = newTodo.title;
      element.children[1].innerHTML = newTodo.description;
      element.children[0].innerHTML = newTodo.completed ? "Mark as done" : "Done";
    }

    function updateState(newTodos) {
      // calculate the diff b/w newTodos and oldTodos.
      // More specifically, find out what todos are -
      // 1. added
      // 2. deleted
      // 3. updated
      const added = [];
      const deleted = [];
      const updated = [];
      // calculate these 3 arrays
      // call addTodo, removeTodo, updateTodo functions on each of the
      // elements
      oldTodoState = newTodos;
    }

    function addTodo() {
      const title = document.getElementById("title").value;
      const description = document.getElementById("description").value;
      todoState.push({
        title: title,
        description: description,
        id: globalId++,
      })
      updateState(todoState);
    }
  </script>

</html>
```

What is the easiest way to create a dynamic frontend website?

1. Update a state variable
2. Delegate the task of figuring out diff to a hefty function
3. Tell the hefty function how to add, update and remove elements

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```

Usually done by the FE developer

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Usually done by the React

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        title: title,
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        id: globalId++,
      })
      updateState(todoState);
    }
  </script>

</html>
```

Let’s see how you would do the same thing in React

```
npm create vite@latest
```