**ReactJS Notes**

**What is React**

* a JavaScript library for building user interfaces
* client-side (runs on the user browser)
* the page doesn’t need to refresh as it does not need to request a new html page, making it super fast
* reduces code needed
* uses components which has dedicated, but small task
* we use react mainly for single page applications. Sometimes when we click a new tab, it looks like we requested a new html page, but we just changed what is visible
* there is html code in js code, which browser cannot understand which is why there is a ‘build’ process which makes the code readable from the browser, so the code we write is not exactly the same as the code the browser reads. Babel helps to convert JSX to plain JS.

**Installing React**

* You can use npx or npm
* npx is an npm package runner which gets installed when we install node. This is why we are able to directly run create-react-app.
* npm installs the create-react-app package globally and then use the package to generate the projects.
* Graphical user interface, text, application

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* Using npx is likely preferred since we don’t have to install create-react-app package globally
* Installing using npx:
  + You’ll need to have Node >= 14.0.0 and npm >= 5.6 on your machine.
  + check nodejs is installed by typing node -v into the cmd. If you don’t have it, go to <https://nodejs.org/en/> and download the latest version
  + open cmd and cd into a folder where you want the react app to be (such as desktop)
  + run in cmd: npx create-react-app INSERT\_APP\_NAME
  + once it says happy hacking, you are done
  + run in cmd: cd INSERT\_APP\_NAME
  + run in cmd: npm start (as long as you keep this up, the website will update depending on code changes)
  + this should open a tab on your browser at <http://localhost:3000/>
  + A picture containing logo

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  + npm start starts our development server which live reloads itself anytime we save changes to files
  + npm run build takes our application and builds/optimizes/compiles it so it is much quicker. We only want to do this when we are deploying our application to a production server.

**Connecting to Github**

* create a repo on github.com
* git init
* git remote add origin <https://github.com/ChenGrant/REPO_NAME.git> which connects the local files to github
* git add .
* git commit -m ‘first commit’
* git push -u origin master
* Text

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* Now our repo on github.com looks like the following:
* A screenshot of a computer

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* Now if we make a branch, go to the branch, and add/delete/change some files as shown below, we get the following git message
* A screenshot of a computer

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* Text

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* We can also merge with the master branch
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* Now, our repo on github.com looks like the following:
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**Folder Structure**

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* package.json contains the dependencies and scripts for the project
* For example, we can see that we are using react version 17.0.2
* Text

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* The node\_modules folder is where all the dependencies are installed. This folder is generated when we run the create-react-app command or when we run npm install.
* The public folder contains only 1 important file, the index.html file (Manifest.json is important too, but it is too advanced of a topic for now). Index.html will be the only html file we have in our application since we are building single page applications. Normally, we don’t add any code to this file (maybe in the head tag sometimes, but definitely not the body tag since we want react to take care of the body). In runtime, react takes over the div with id = root in index.html to display all the components.
* The src folder is the folder we will work with most in development. Here, we can create a folder called components to keep track of all our components. We also have the index.js file

**Setting Up Files**

* open the react app in a code editor
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* In the src folder, delete: app.test.js, logo.svg, reportWebVitals.js, setupTests.js, and App.css
* You should be left with the following: Graphical user interface, application

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* In src, go to index.js and make it look like the following
* Text

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* In src, go to index.css and remove all of it
* Graphical user interface, application, Teams

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* In src, go to app.js and make it the following
* Graphical user interface, application

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* VS Code React Extensions
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* Snippets: <https://marketplace.visualstudio.com/items?itemName=burkeholland.simple-react-snippets>

**JSX**

* JSX (JavaScript XML) is a syntax extension to JavaScript which is combines HTML syntax with JS syntax.
* JSX is not understood by browsers. Thus, tools like Babel which is a JS compiler/transpiler converts JSX to browser readable JS Code. This conversion is done behind the scenes.
* JSX isn’t mandatory in React, but JSX makes the code a lot cleaner.
* Ex: 
* JSX is also really safe since we can put text that is user generated inside HTML elements. In normal JS, not only does creating an element/adding it to the DOM take many lines, but the user could also inject some scripts if we used .innnerHTML.

**import React from ‘react’**

* This allows us to use Hooks and other exports that React provides
* Before, we had to import React from ‘react’ for components because the JSX is converted into regular Javascript that use react's React.createElement method.
* Ex:
  + 
  + So behind the scenes, the above line is turned into the below line.
  + 
* React has introduced a new JSX transform with the release of React 17 which automatically transforms JSX without using React.createElement (as mentioned above). Thus, no longer need to import React for simple functional components.

**Index.js**

* Index.js is the entry point of our react application and will be the first code that will be executed in our browser.
* The ReactDOM object is imported from the ‘react-dom’ library. With this ReactDOM object, we call a render method which allows us to render our own html element (the <App/> element) in the element with an id of root.
* 
* Notice if you inspect the page (use inspect and not Ctrl+U), and open the div with id root, we see code added there even though we didn’t add it directly on the index.html page.
* Text

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**Elements**

* Elements are the smallest building blocks of React apps which describe what you want to see on the screen
* 
* Elements are what components are made of.
* Unlike browser DOM elements, React elements are plain objects, and are cheap to create. React DOM takes care of updating the DOM to match the React elements.
* React elements are immutable so you cannot change it’s children or attributes. The only way to update the UI is to create a new element.

**Components**

* A component represents a part of the UI. All the components come together to make up the entire application.
* For example, we could have one component for the header, one for the sidenav, one for the footer, etc.
* We can also have a component that contains other components. An example of such is App.js since it contains many other components.
* In terms of code, a component is a JavaScript class or function that returns JSX (or we can return null).
* When creating a React component, the component's name MUST start with an upper case letter.
* React Components can only return 1 JSX element. If we want to return many JSX elements (not-nested), we can wrap the JSX elements in an empty element <> </> which is called a JSX fragment.
* We can also perform logic/console.log like we would inside a normal JS function. We have to put that before the return since the return only returns JSX.
* Components should be in their own files and are reusable bits of code. We could also have components placed in .JSX extensions instead of .js extensions but we don’t need to know that for now.
* In react, we have to component types, a stateless functional components and a stateful class component.
* Functional Components
  + Functional components are JS functions that can take in optional parameters and returns JSX.
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  + We can use normal JavaScript notation such as arrow functions (snippet shortcut: rafce)
  + Graphical user interface

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  + Text

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* Class Components
  + Class components are regular JS ES6 classes that extend the component class from the react library (meaning we also have to import React from “react”).
  + By creating an inheritance to React.Component, the component has access to React.Component's functions.
  + They must contain a render method that returns JSX.
  + Text

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* While the examples above show you how to create components, you have to connect them with the rest of the application by importing them into the files you need them in.
* Ex:
* Text

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* Notice that we used the Component1 component inside the App component by using <Component1/> which is self closing. We could also write < Component1></ Component1>, but since there is not content between it, we can self close it.
* Generally, it is preferred to use functional components whenever possible because of their predictability and conciseness. Since, they are purely presentational, their output is always the same given the same props.

**Comments**

* 
* Text

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**Props**

* Props is an immutable JS object used to pass down arguments/data from a parent to its child component.
* To pass in arguments, we add key\_name = value to the component tag.
* To access the arguments, it depends on if we are using a functional component or class component.
* For functional components, we can add a parameter called props (we can name it whatever we want) and we access the value using {props.key\_name}.
* Graphical user interface, text

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* For class components, we can access the value using {this.props.key\_name}.
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* Ex:
  + Suppose we have the following component:
  + Text

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  + We pass in props to the component tag
  + Text

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  + It displays the following
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  + NOTE: we can also pass in objects as props, it’s just that in the component we can’t just say props.key\_name which will return an error, we have to say props.key\_name.propertyName
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  + Text

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  + => Output: 
  + We will learn how to display arrays better later on
* Props Children
  + Sometimes, we don’t know what the key name for props will be, but we still want to render/change/use those props.
  + Props Children allows us to solve this problem.
  + Every component receives the props.children prop by default and props.children holds the content that is passed between the opening and closing of a component tag.
  + We can pass in elements/components in-between the opening and closing tags for a component.
  + We can access the content in between the opening and closing tag for a component through props.children
  + Functional components
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    - Here, we are passing Hello <div>Ayooo</div> to the Greet Component as the value for props.children
    - Text

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    - Here, we are accessing Hello <div>Ayooo</div> that we passed to the Greet Component via props.children and rendering them. (we also got props.my\_param since we knew the key name beforehand)
    - Output: Text

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  + Class Components
    - Text

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    - Here, we are passing Hello <div>Ayooo</div> to the Greet Component as the value for props.children
    - Text

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    - Here, we are accessing Hello <div>Ayooo</div> that we passed to the Greet Component via this.props.children and rendering them. (we also got this.props.my\_param since we knew the key name beforehand)
    - Text

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* Read-Only
  + Whether you declare a component as a function or a class, it must never modify its own props. Props are Read-only, you will get an error if you try to change their value.
  + All React components must act like pure functions with respect to their props. Such functions are called “pure” because they do not attempt to change their inputs, and always return the same result for the same inputs.
  + Ex: Pure Function
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  + Ex: Impure Function
    - Text

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  + If props.my\_param is immutable, we can simply use =
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    - => Graphical user interface, text, application

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    - Note if we did props.my\_param++ as shown below, we get an error
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  + If props.my\_param is mutable, we have to be careful.
    - If we directly changed props.my\_param as shown in the following, we would not get an error
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    - => Text

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    - Thus, we need to new an array with a different memory address.
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    - Text

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    - =>Graphical user interface, text

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    - Notice we used the spread operator to copy the array into a new array with a different memory address. Not that we cant say let copy = props.my\_param since copy makes a reference to a memory address, doesn’t take on the value stored in the memory address