



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

EXPERIMENT- 4

Student Name: Ashlin James

Semester: 6th

UID: 23BAI70722

Date of Performance: 04/02/26

Branch: BE CSE AIML

Subject Name: FULLSTACK-II

Section/Group: 23AIT_KRG-G1

Subject Code: 23CSH-382

AIM:

To optimize the performance of the EcoTrack React application using memoization techniques and code splitting, and to enhance the user interface using enterprise-grade Material UI components.

OBJECTIVES:

After completing this experiment, the student will be able to:

1. Understand the causes of unnecessary re-renders in React applications
2. Optimize React components using React.memo to prevent avoidable re-renders
3. Apply useMemo to efficiently compute derived data and avoid redundant calculations
4. Use useCallback to memoize event handler functions and improve component performance
5. Implement lazy loading of components and routes using React.lazy and Suspense
6. Reduce initial bundle size and improve application load performance through code splitting
7. Enhance the visual appearance and usability of the EcoTrack application using Material UI components
8. Design a clean, consistent, and responsive user interface using Material UI layouts and typography



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

IMPLEMENTATION/CODE:

Header.js

```
0 | import React from "react";
1 | import { Link, Navigate, useNavigate } from "react-router-dom";
2 | import { Typography } from "@mui/material";
3 | import { useAuth } from "../context/auth";
4 |
5 | const Header = () => {
6 |   const { isAuthenticated, setIsAuthenticated } = useAuth();
7 |   const navigate = useNavigate();
8 |
9 |   const handleLogout = () => {
10 |     setIsAuthenticated(false);
11 |     navigate('/login');
12 |   };
13 |
14 |   const navLinkClass = ({ isActive }) => `nav-item ${isActive ? "nav-item--active" : ""}`;
15 |
16 |   return (
17 |     <header className="header-banner">
18 |       <Typography component="h1" variant="h4" className="header-title">ECO
19 |         TRACK</Typography>
20 |         <nav className="nav-links">
21 |           {!isAuthenticated ? (
22 |             <NavLink to="/login" className={navLinkClass}>Login</NavLink>
23 |           ) : (
24 |             <>
25 |               <NavLink to="/summary" end className={navLinkClass}>Summary</NavLink>
26 |               <NavLink to="/analytics" className={navLinkClass}>Analytics</NavLink>
27 |               <NavLink to="/logs" className={navLinkClass}>Logs</NavLink>
28 |               <button onClick={handleLogout} className="logout-btn">Logout</button>
29 |             </>
30 |           )
31 |         </nav>
32 |       );
33 |     );
34 |
35 |   export default React.memo(Header);
```

1)SUM :

Dashboard_layout.jsx-

```
0 | import React from "react";
1 | import { Outlet } from "react-router-dom";
2 | import { Container, Grid, Typography } from "@mui/material";
3 |
4 | const Dashboard_layout = () => {
5 |   return (
6 |     <Container className="container" maxWidth="md">
7 |       <Typography variant="h4" gutterBottom className="page-title">
8 |         DASHBOARD LAYOUT
9 |       </Typography>
10 |
11 |       <Grid container spacing={2}>
12 |         <Grid item xs={12}>
```



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
13|           <Outlet />
14|       </Grid>
15|     </Grid>
16|   </Container>
17| );
18| };
19|
20| export default React.memo(Dashboard_layout);
```

DashboardAnalytics.jsx

```
0 | import React from "react";
1 | import { Box, Typography } from "@mui/material";
2 |
3 | const DashboardAnalytics = () => {
4 |   return (
5 |     <Box>
6 |       <Typography variant="h6">Dashboard Analytics</Typography>
7 |     </Box>
8 |   );
9 | };
10|
11| export default React.memo(DashboardAnalytics);
```

DashboardSummary.jsx

```
0 | import React, { useEffect, useMemo } from "react";
1 | import { useSelector, useDispatch } from "react-redux";
2 | import { Box, Grid, Typography } from "@mui/material";
3 | import { fetchLogs } from "../store/logsSlice";
4 |
5 | const DashboardSummary = () => {
6 |   const dispatch = useDispatch();
7 |   const { data, loading } = useSelector((state) => state.logs);
8 |
9 |   const highEmissions = useMemo(() => data.filter((log) => log.carbon >= 4), [data]);
10|   const lowEmissions = useMemo(() => data.filter((log) => log.carbon < 4), [data]);
11|
12|   useEffect(() => {
13|     dispatch(fetchLogs());
14|   }, [dispatch]);
15|
16|   if (loading) {
17|     return (
18|       <Box>
19|         <Typography>Loading emissions summary...</Typography>
20|       </Box>
21|     );
22|   }
23|
24|   return (
25|     <Box>
26|       <Typography variant="h5" gutterBottom className="page-title">Dashboard Summary</Typography>
27|
28|       <Grid container spacing={3}>
29|         <Grid item xs={12} md={6}>
30|           <Grid container spacing={1} className="carbon-card card-high">
31|             <Grid item xs={12}>
32|               <Typography variant="h6" className="card-title">HIGH CARBON EMISSION</Typography>
33|             </Grid>
```



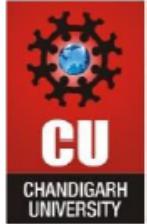
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
34 |         {highEmissions.map((log) => (
35 |             <Grid item xs={12} key={log.id}>
36 |                 <Typography className="card-item text-high">
37 |                     {log.activity} {log.carbon}
38 |                 </Typography>
39 |             </Grid>
40 |         )));
41 |     </Grid>
42 |   </Grid>
43 |
44 |   <Grid item xs={12} md={6}>
45 |     <Grid container spacing={1} className="carbon-card card-low">
46 |       <Grid item xs={12}>
47 |         <Typography variant="h6" className="card-title">LOW CARBON EMISSION</Typography>
48 |       </Grid>
49 |       {lowEmissions.map((log) => (
50 |           <Grid item xs={12} key={log.id}>
51 |               <Typography className="card-item text-low">
52 |                   {log.activity} {log.carbon}
53 |               </Typography>
54 |           </Grid>
55 |       )));
56 |     </Grid>
57 |   </Grid>
58 | </Grid>
59 | </Box>
60 | );
61 | };
62 |
63 | export default React.memo(DashboardSummary);
```

Login.jsx

```
0 | import React, { useState } from "react";
1 | import { useNavigate } from "react-router-dom";
2 | import { Container, Typography, Button as MuiButton } from "@mui/material";
3 | import { useAuth } from "../context/auth";
4 |
5 | const Login = () => {
6 |   const navigate = useNavigate();
7 |   const { isAuthenticated, setIsAuthenticated } = useAuth();
8 |   const [isRedirecting, setIsRedirecting] = useState(false);
9 |
10 |   function handleLogin() {
11 |     setIsRedirecting(true);
12 |     setIsAuthenticated(true);
13 |     navigate("/");
14 |   }
15 |
16 |   if (isRedirecting) return null;
17 |
18 |   if (isAuthenticated) {
19 |     return (
20 |       <Container>
21 |         <Typography variant="h5">You are already logged in</Typography>
22 |         <MuiButton variant="contained" onClick={() => navigate("/")}>Go to
Dashboard</MuiButton>
23 |       </Container>
24 |     );
25 |   }
26 |
27 |   return (
```



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
28|     <Container className="container login-container">
29|       <Typography variant="h5" className="page-title">Login</Typography>
30|       <button className="btn-primary" onClick={handleLogin}>Login Now</button>
31|     </Container>
32|   );
33| };
34|
35| export default React.memo(Login);
36| 
```

Logout.jsx

```
0 | import React, { useState } from "react";
1 | import { useNavigate } from "react-router-dom";
2 | import { Container, Typography, Button as MuiButton } from "@mui/material";
3 | import { useAuth } from "../context/auth";
4 |
5 | const Login = () => {
6 |   const navigate = useNavigate();
7 |   const { isAuthenticated, setIsAuthenticated } = useAuth();
8 |   const [isRedirecting, setIsRedirecting] = useState(false);
9 |
10|   function handleLogin() {
11|     setIsRedirecting(true);
12|     setIsAuthenticated(true);
13|     navigate("/");
14|   }
15|
16|   if (isRedirecting) return null;
17|
18|   if (isAuthenticated) {
19|     return (
20|       <Container>
21|         <Typography variant="h5">You are already logged in</Typography>
22|         <MuiButton variant="contained" onClick={() => navigate("/")} sx={{ marginTop: 2 }}>Go to
Dashboard</MuiButton>
23|       </Container>
24|     );
25|   }
26|
27|   return (
28|     <Container className="container login-container">
29|       <Typography variant="h5" className="page-title">Login</Typography>
30|       <button className="btn-primary" onClick={handleLogin}>Login Now</button>
31|     </Container>
32|   );
33| };
34|
35| export default React.memo(Login);
36| 
```



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

OUTPUT:

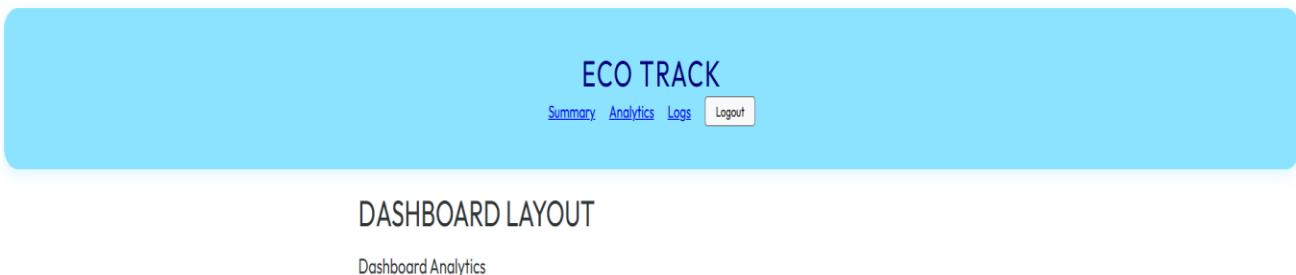
1) Login/Logout



2) Summary



3) Analytics





DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

4)Logs

The screenshot shows a user interface titled "ECO TRACK" with a navigation bar including "Summary", "Analytics", "Logs", and "Logout". The main content area is titled "ENVIRONMENTAL LOGS" and displays the following data:

Car Travel	4 kg CO ₂
Electricity Usage	6 kg CO ₂
Cycling	0 kg CO ₂

Total Carbon: 10 kg CO₂

LEARNING OUTCOMES:

1. **Analyze and identify performance bottlenecks** in React applications, particularly unnecessary component re-renders.
2. **Apply advanced memoization techniques** such as React.memo, useMemo, and useCallback to optimize component rendering and computational efficiency.
3. **Implement code splitting and lazy loading** using React.lazy and Suspense to reduce initial bundle size and improve application load time.
4. **Optimize overall application performance** by minimizing redundant calculations and improving rendering behavior in the EcoTrack React application.
5. **Design and enhance a professional, enterprise-grade user interface** using Material UI components, ensuring consistency, responsiveness, and improved user experience.