**Libraries & Packages**

**✅ Frontend (React)**

| **Library** | **Purpose** |
| --- | --- |
| react | Core React library for building UI |
| axios | API requests to backend server |
| react-router-dom | Routing/navigation between pages |
| formik | Handling forms and validation |
| yup | Schema-based form validation |
| react-toastify | Notifications and alerts |
| bootstrap or tailwindcss | UI styling framework |

**✅ Backend (Node.js + Express.js)**

| **Library** | **Purpose** |
| --- | --- |
| express | Web server and route handling |
| mongoose | MongoDB object modeling and schema |
| jsonwebtoken | JWT-based authentication |
| bcryptjs | Password hashing for user security |
| multer | Handling image upload |
| cors | Enabling Cross-Origin Resource Sharing |
| dotenv | Managing environment variables |

**✅ AI / Model (Python & ML)**

| **Library** | **Purpose** |
| --- | --- |
| tensorflow / keras | Model development, training, and inference |
| opencv-python | Image processing and manipulation |
| matplotlib | Plotting training metrics |
| pandas / numpy | Data manipulation and preprocessing |
| scikit-learn | Evaluation metrics (accuracy, confusion matrix) |
| tensorflow\_hub (optional) | For importing pre-trained models |
| flask or fastapi (if using Python API) | Lightweight backend to serve model |

**✅ Dev Tools & Utilities**

| **Tool / Package** | **Purpose** |
| --- | --- |
| nodemon | Auto-reload Node.js server during dev |
| concurrently | Run frontend and backend servers together |
| eslint / prettier | Code formatting and linting |
| jest, supertest | Backend testing |
| react-testing-library | Frontend testing |