Building Your First Statistical Webapp

STA2002: Probability and Statistics II

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Outline

1. Introduction
2. Prerequisites & Setup
3. Creating the React Project
4. Configuration Files
5. Running the Application
6. Copying the Application Code
7. Deployment
8. Troubleshooting Guide
9. Next Steps

What We're Building

- **Interactive Statistical Webapp**
- Distribution generator (Normal, Exponential, Binomial, Poisson, Uniform)
- Real-time data visualization
- Parameter estimation (MLE & Method of Moments)
- Summary statistics calculation
- Educational content with formulas

Modern UI
TypeScript
React + Tailwind

Learning Objectives

1. Understand modern web development with React and TypeScript
2. Implement statistical algorithms for data generation
3. Create interactive visualizations
4. Compare parameter estimation methods (MLE vs MoM)
5. Deploy a professional web application
6. Learn to troubleshoot common development issues

Prerequisites

Important

You don't need programming experience! We'll use AI code editors to help.

Required:

- Computer with internet
- Node.js 18+ installed
- Git installed
- GitHub account
- AI code editor (Cursor/VS Code)

Helpful:

- Basic command line knowledge
- Understanding of statistics concepts
- Patience for troubleshooting

Step 1: Install Node.js

Critical Step

Download and install Node.js from nodejs.org

```
# Check Node.js version
node --version
# Should show v18.x.x or higher

# Check npm version
npm --version
# Should show 9.x.x or higher
```

Listing 1: Verify Installation

Troubleshooting

If commands not found:

- Restart your terminal/command prompt
- Check if Node.js is in your PATH

Step 2: Create Project Directory

```
# Navigate to your desired location
cd Desktop
# or wherever you want the project

# Create project folder
mkdir statistical-webapp-project
cd statistical-webapp-project
```

Listing 2: Create Project Folder

Important

Use a simple path without spaces or special characters. Avoid paths like:

- C:\Users\YourName\MyDocuments
- C:\ProgramFiles\Projects

Step 3: Create React Project

PowerShell Users

If you’re using PowerShell and get interactive prompts:

- Type y and press Enter when asked ”Ok to proceed?”
- Select **React** when asked for framework
- Select **TypeScript** when asked for variant

```
# Create React project with TypeScript
npm create vite@latest statistical-webapp -- --template react-ts

# Navigate to project
cd statistical-webapp

# Install dependencies
npm install
```

Listing 3: Create React App

Step 4: Install Additional Packages

```
# Install Tailwind CSS and dependencies
npm install -D tailwindcss@^3.4.0 postcss autoprefixer

# Install charting library
npm install recharts

# Install icons
npm install lucide-react

# Initialize Tailwind
npx tailwindcss init -p
```

Listing 4: Install Required Packages

Common Issues

- If `npx` command fails, try: `npm install -g npx`
- If permission errors, try: `npm install --legacy-peer-deps`

Step 5: Configure Tailwind CSS

```
/** @type {import('tailwindcss').Config} */
export default {
  content: [
    "./index.html",
    "./src/**/*.{js,ts,jsx,tsx}",
  ],
  theme: {
    extend: {
      colors: {
        primary: {
          50: '#eff6ff',
          500: '#3b82f6',
          600: '#2563eb',
          700: '#1d4ed8',
        }
      }
    },
  },
  plugins: [],
```

Step 6: Update CSS File

```css
@tailwind base;
@tailwind components;
@tailwind utilities;

@import url('https://fonts.googleapis.com/css2?family=Inter:wght@300;400;500;600;700&display=swap');

@layer base {
  html {
    font-family: 'Inter', system-ui, sans-serif;
  }

  body {
    @apply bg-gray-50 text-gray-900;
  }
}

@layer components {
  .btn-primary {
```

Step 7: Start Development Server

```
# Start development server
npm run dev
```

Listing 7: Start the App

Expected Output

You should see:

```
> statistical-webapp@0.0.0 dev
> vite

  VITE v7.1.5  ready in 675 ms

  Local:   http://localhost:5173/
  Network: use --host to expose
```

Success!

Open your browser and go to: `http://localhost:5173/` You should see the default React

Common Issues & Solutions

Port Already in Use:

- Try: `npm run dev -- --port 3000`
- Or kill the process using port 5173

Module Import Errors:

- Clear browser cache (Ctrl+F5)
- Restart development server
- Check file paths and exports

Tailwind Not Working:

- Check `tailwind.config.js`
- Verify CSS imports
- Restart development server

PowerShell Issues:

- Use Command Prompt instead
- Or enable QuickEdit mode
- Avoid complex paths

Step 8: Get the Application Code

Important

Don't try to write the code from scratch! We'll provide the complete working code.

1. Download the provided `App.tsx` file
2. Replace the existing `src/App.tsx` with the new code
3. Save the file
4. Refresh your browser

What You'll See

- Beautiful statistical webapp interface
- Distribution selection panel
- Parameter controls with sliders
- Data generation functionality
- Summary statistics display

Step 9: Test the Application

1. Select "Normal Distribution"
2. Adjust mean and standard deviation sliders
3. Set sample size to 1000
4. Click "Generate Data"
5. Observe the results!

Expected Behavior

- Sliders should update values in real-time
- "Generate Data" button should create new data
- Statistics should appear in the right panel
- No console errors in browser developer tools

Step 10: Deploy to GitHub Pages

```
# Initialize git repository
git init

# Add all files
git add .

# Create initial commit
git commit -m "Initial statistical webapp"

# Add remote repository (replace with your GitHub repo)
git remote add origin https://github.com/yourusername/statistical-webapp.git

# Push to GitHub
git push -u origin main
```

Listing 8: Initialize Git Repository

Step 11: Configure GitHub Pages

1. Go to your GitHub repository
2. Click "Settings" tab
3. Scroll to "Pages" section
4. Select "GitHub Actions" as source
5. The provided workflow will automatically deploy your app

Deployment Workflow

The repository includes a `.github/workflows/deploy.yml` file that:

- Builds your React app
- Deploys to GitHub Pages
- Updates automatically on every push

Common Problems & Solutions

Import Errors:

- Check file paths
- Verify exports exist
- Restart development server
- Clear browser cache

Tailwind Issues:

- Use Tailwind v3.4.0 (not v4)
- Check config file syntax
- Verify CSS imports

PowerShell Problems:

- Use Command Prompt
- Enable QuickEdit mode
- Avoid spaces in paths

Port Issues:

- Try different port
- Kill existing processes
- Check firewall settings

Getting Help

AI Code Editor:

- Ask AI to explain errors
- Request code fixes
- Get step-by-step guidance

Resources:

- React documentation
- Tailwind CSS docs
- Vite documentation
- Stack Overflow

Pro Tips

- Read error messages carefully
- Check browser developer console
- Test incrementally (don't change everything at once)
- Use version control (git) to track changes

What's Next?

1. **Customize the UI**: Change colors, fonts, layout
2. **Add New Distributions**: Chi-square, t-distribution, F-distribution
3. **Enhance Visualizations**: Add box plots, Q-Q plots
4. **Implement Confidence Intervals**: Add CI calculations
5. **Add Hypothesis Testing**: t-tests, chi-square tests
6. **Create Data Export**: Download data as CSV/JSON

Future Enhancements

As you learn more statistics, you can add:

- ANOVA analysis
- Linear regression
- Bootstrap methods
- Central Limit Theorem demonstrations

Assessment & Submission

What to Submit:

- GitHub repository URL
- Live deployed website
- Brief README explaining features
- Screenshots of your app

Evaluation Criteria:

- Functionality (does it work?)
- UI/UX design
- Code organization
- Educational value
- Creativity & extensions

Deadline

Submit your GitHub repository URL and deployed website link by [DATE].

Questions & Support

Questions?

Office Hours:

- Fangda Song: Tue 3:30-4:30 pm, Rm 420d
- Ka Wai Tsang: Mon 10:30-11:30 am, Rm 505b

Teaching Assistants:

- Ruicong Wang: Mon 10:00-11:00 am
- Wendi Ren: Thu 4:00-5:00 pm
- Bokun Yu: Thu 4:00-5:00 pm

Online Support: Tencent Meeting: 748-5967-3028

Good Luck!

Build something amazing!

Remember: Start simple, test often, ask for help!