STA470 — Introduction to Statistical Consulting

Large Language Models and Other Digital Assistants as Aids for Statistical Consulting?

Outline

- Client Engagement Process
- Procedural Tasks
- Task Relevant Tools
- What the Tools are Good at
- Their Weaknesses
- The Residents Exam Case Study
- Assignment

(SCC) Consulting Engagement Process

- Intake: Interview the client, assess needs, define and set engagement scope.
- Planning I: Brainstorm strategies and approaches that address each aspect of the request.
- Background Research: Identify relevant references, approaches taken to similar problems and available (computational/data) resources.
- Planning II: Determine final approach and structure of the recommendations.
- Analysis: Carry out data analyses (if requested); test/compare recommended methods on synthetic data.
- Prepare Deliverables: Complete reports, annotate scripts, prepare presentation.
- Final Meeting: Present recommendations, provide overview of deliverables.

Non–Administrative Procedural Tasks Amenable to Digital Assistance

- Research: Identify client-appropriate references relevant to project background and recommmendations.
- Synthesize Research: summarize and "interogate" manuscript PDFs.
- *De Novo* Writing: compose a first draft of the written report (and presentation slides).
- Editing: corrections, revisions, rewrites.
- Programming: generating useable, commented R code when needed.

(A Few) Task Relevant AI Tools

- Text General: Microsoft's Bing Chat, OpenAI's ChatGPT, Anthropic's Claude, Google's Bard.
- Text Summary: ChatPDF, ExplainPaper
- Research: Bing (Bard, too?) can be convinced (by you) to access the internet and provide references; no doubt, there are other tools.
- Coding: GitHub Copilot, OpenAI Codex (Deprecated).
- There are many more categories of tools, tools within category and add–ons. Here is a A 'curated list'.
- This is clearly a dynamically evolving landscape.

Weaknesses (from learninginnovation.duke.edu)

- Bias ‘ Its output is only as good as its input. AI retains all of the biases of the information it intakes, including the stereotypes and misinformation present on the internet.”
- Inequity: “Depending on the future funding models for AI assistants, there may be a gap between who does and does not have access to them.”
- Inaccuracies “AI-generated content may contain factual errors, incomplete quotes and erroneous findings.”

Weaknesses, Ctd

- Intellectual Property. "'It is not clear who owns AI generated content or the prompts created by users. Some AI technologies have been shown to plagiarize from other sources when creating 'original' content."

- Ethics "Training AI models can produce negative impacts on the environment. AI models have been used to unethically replace workers and there have also been concerns that unethical labor was used to develop and maintain these tools."

Benefits and Stregths (Also from Duke Learning Innovation)

- Efficiency "AI can help draft emails, blog posts, cover letters, article summaries allowing for time savings in everyday tasks."
- Stimulate Thinking One " could annotate an AI–generated text, use it to search for counter arguments or brainstorm an idea for a new project."
- Editing "Used judiciously, AI can improve writing and debug code."
- Accessibility "Students might benefit from using AI as a tutoring aid. For example, it could help neurodiverse students who may struggle to initiate work. "

The Residents Exam Case Study — Outline

1. Background & overview text.
2. Describe logistic link glm models for binomial data, the problem of overdispersion and the quasi–binomial model.
3. Describe linear regression models and their relevance to the client's dataset.
4. Provide a justification for choosing linear regression over the quasi–binomial approach.
5. Describe a testing framework for differences in success rates tied to the reforms.

Assignment (More on Tuesday)

- Research and summarize verifiable! references that support our recommendations and provide additional background related to the project. These should be "client–accessible." (Bard, Bing).
- Research Synthesis. Use AI to assist in reading and synthesizing a given list of technical and non–technical references (ChatPDF, ExplainPaper).
- Compose a *de novo* first report draft (Bard, Claude, Bing).
- Edit, rewrite, improve an existing draft. Check for and correct errors, etc. (Bard, Claude, Bing).
- Coding. Create a clearly annotated and correct R script to analyze the client's data and generate usable summaries of the analysis (GitHub Copilot, other?).