

Agentic AI workshop final presentation

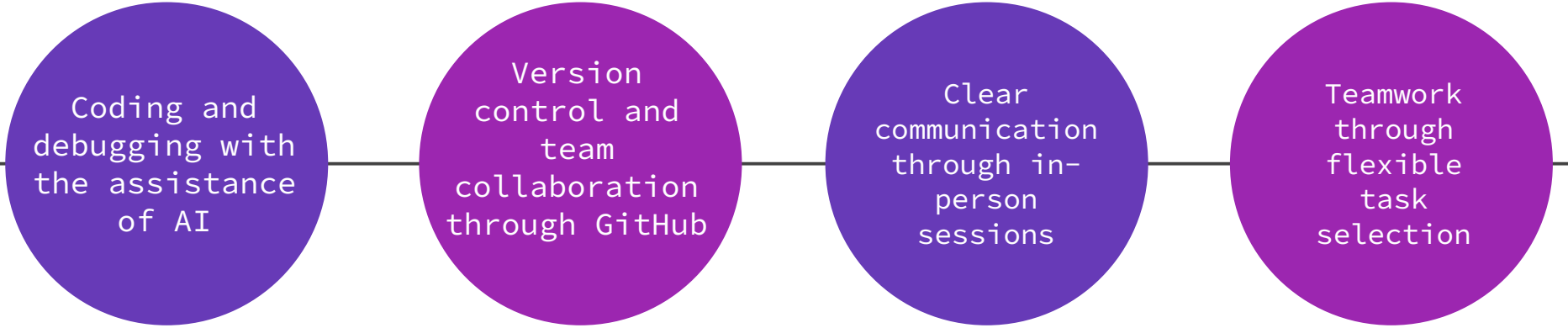
By: Kevin, Ella, Stella, Andy, Chloe, and Bryan

Project Introduction

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- Our client, Dr. Rubul Mout, is a research fellow affiliated with Harvard Medical School and Boston Children's Hospital. Recently, a paper he contributed to was published in the science journal "Cell".
- This noteworthy accomplishment caused Dr. Rubul Mout to gain attention, which increased the amount of people wanting to contact him about his works.
- His old website was outdated, and he wanted to own a personal domain, so our goal was to aid him in both of these topics.

Skills we used



Coding and
debugging with
the assistance
of AI

Version
control and
team
collaboration
through GitHub

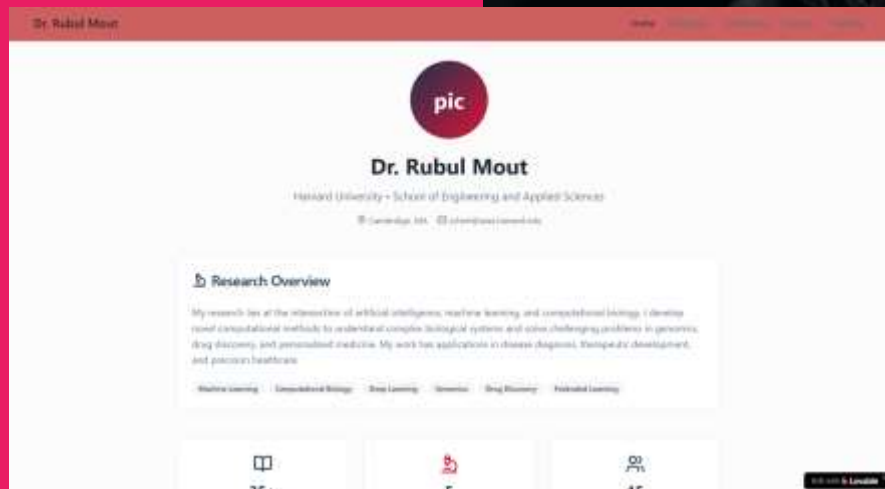
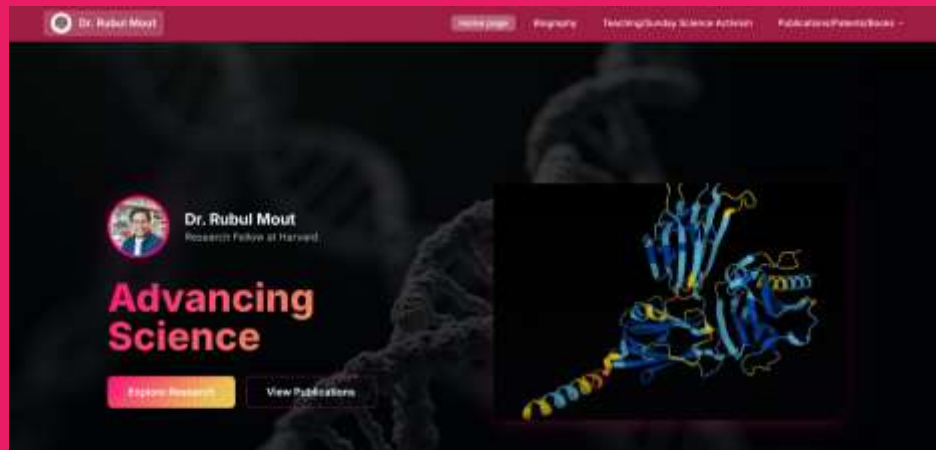
Clear
communication
through in-
person
sessions

Teamwork
through
flexible
task
selection

Example Prototype Websites

Early prototype websites generated by the Lovable AI





Ella

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- Standardizing color scheme and design elements
 - Buttons, font size, spacing, etc.
 - Working on navigation bar & creating new pages
 - Teaching, books, and news pages
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- Manually changing design elements and colors
 - Effective collaboration
 - Compromising with teammates
 - Clear communication to avoid conflicts

Color Scheme

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- Harvard maroon
- Primary accent color
- Used for navigation bar, icons, chatbot header, etc.

- Used for most elements and text boxes
- Stands out against background

#A51C30

#DF4158

- Second accent color (for dark backgrounds)
- Used for title, footer text

#F2F2F2

#151622

- Background
- Dark theme

Bryan - Things I Learned

Over these past three weeks, I've developed the following skills:



Effectively working collaboratively on a project with a team

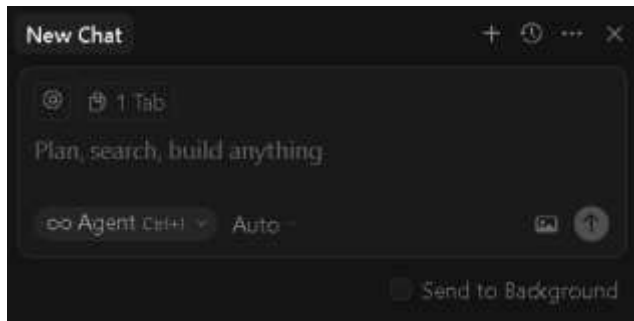


Designing a website using tools such as Github, Cursor, Lovable, Netlify, and more.



Creating a personal website that fits a client's needs and revising it based on their feedback

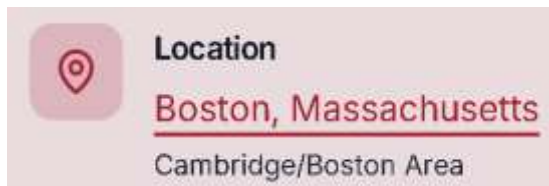
Bryan -What I Contributed



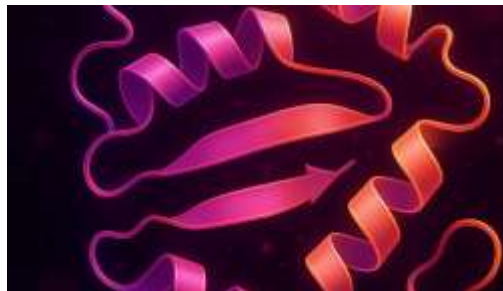
Creating prompts to have the LLM implement the desired changes accurately + quickly.



Replacing the favicon (tab icon) with a more detailed image without causing site errors.



Coding hyperlinks to redirect to a map or email app, depending on the text.



Generating images that are both aesthetically pleasing + scientifically accurate.



Hello! I'm Dr. Rubul Mout's AI assistant. I can help you with questions about Dr. Mout, or I can automatically send him an email on your behalf. Would you like to send him an email?

Type your message...



Designing a chat box window that will automatically scroll as messages are sent.

Kevin

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What I did:

- Generated original home page design
- Implemented redirection to actual publication pages under the publications tab and polished the layout of publications to highlight Dr. Rubul
- Adjusted different website pages according to Dr. Rubul's preferences

What I learned:

- Experience with resolving issues or creating website portions through vibe coding with the cursor IDE and the Lovable AI
- Deployment of a website through Netlify
- Working and collaborating on a shared project through GitHub
- Importance of effective communication with team members and Dr. Rubul

Andy – What I've built

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I did some frontend design, but my main job has been creating a functional AI agent for the website.

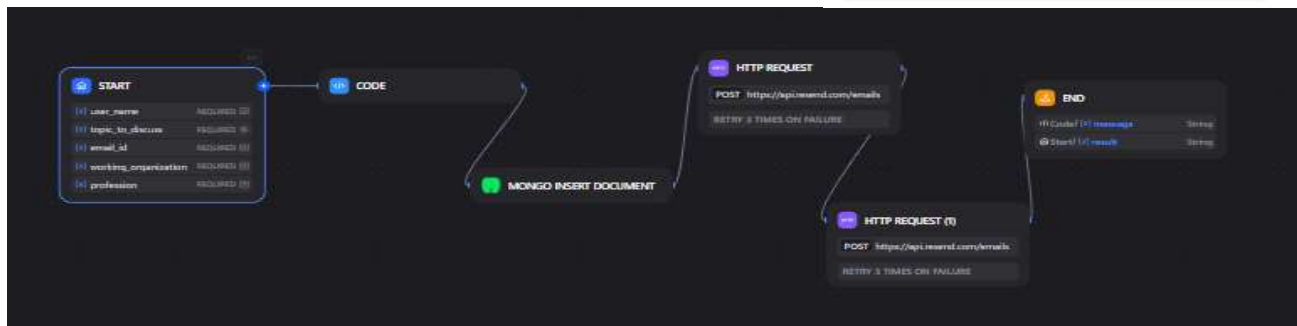
- It can answer questions about Rubul, the website, or his research
- It is also able to automatically send him emails with the user's contact information, making him much more accessible to people looking to reach out.

Chat Assistant



Hello! I'm Dr. Rubul Mout's AI assistant. I can help you with questions about Dr. Mout, or I can automatically send him an email on your behalf. Would you like to send him an email?

Type your message...



Andy – What I've learned

- I've learned that AI can be very unreliable but there are ways to work around that.
- A lot of technical work involving the email and chatbot APIs fell into my hands, allowing me to learn from that experience and broaden my understanding of automation and AI agents.
- I've learned a lot of practical skills that aren't taught in normal CS classes

Chloe

What I did

- Generated and added photos
 - Protein design
- Created original design for research page
- Adjusted different elements of the website according to Dr. Rubul's preferences

What I learned

- How to use various tools such as lovable, github, cursor, and etc.
- How to collaborate with others in a project on github

Protein Design & Engineering

Proteins are the workhorses of cellular function, performing a myriad of essential tasks from catalyzing biochemical reactions to providing structural support. Our research focuses on understanding and manipulating these molecular machines to uncover new biological functions and develop therapeutic applications.

We employ computational protein design approaches including Rosetta, RFdiffusion, and AlphaFold2/3 to engineer novel protein structures with specific functions. This includes designing proteins that can activate immune cells to target specific cancer cells and help regenerate certain immune cells to fight off various diseases. Our work involves interdisciplinary approaches in computational biology and wet lab biochemistry. We use advanced structural biology techniques to validate our designs.



Boosting Immune Cell Function in Cancer

T cells act as the immune system's frontline warriors, constantly patrolling the body to detect and eliminate abnormal cells, including cancer. Their ability to recognize tumor-associated antigens (TAAs) allows them to target and destroy cancer cells.

Unfortunately, cancer cells often escape detection because they are highly heterogeneous and may express TAAs at very low levels. In addition, tumors can actively suppress or manipulate T cells, weakening their killing ability and allowing the cancer to persist.

To overcome this, we apply breakthrough protein design technologies that create novel molecules capable of guiding T cells toward otherwise "invisible" cancer cells. These designed proteins simultaneously search for multiple, low-expressing TAAs, ensuring more reliable and comprehensive tumor detection.



Immunology & Aging

The immune system undergoes significant changes as we age, leading to increased susceptibility to infections, reduced vaccine efficacy, and higher rates of chronic inflammatory diseases. Understanding these age-related changes is crucial for developing interventions that can promote healthier aging.

Our research focuses on characterizing the molecular and cellular changes that occur in the aging immune system. This includes studying factors associated with reduced lymphoid immune cell populations, alterations in cytokine production, and modifications in immune cell function.

We are particularly interested in developing protein design strategies to rejuvenate the aging lymphoid immune system. This includes investigating the potential of various designer protein-based interventions to regenerate lymphoid cells to restore immune function in elderly mice—and eventually in human populations—and improve their response to vaccines and other treatments.



Stella

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What I did

- Generated and added photos
 - Homepage background
- Created original design for research cards
- Adjusted different tabs according to Dr. Rubul's preferences

What I learned

- How to communicate well with team members and the client for more efficiency
- Work on a collaborative project through github
- Design a website using lovable, cursor, and github



Keep in touch

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If you are interested in keeping in touch with our program and helping to shape our program going forward, here's what you can do:

Invite some of your friends to upcoming winter break session. Based on this session's feedback, we'll condense it and optimize it so it can fit into 2 weeks.

Volunteer to be team leader or project manager for next session, or we can give you opportunity to explore some more advanced features next time. (We won't charge you for future sessions)

Find any small business or organizations that need a web app or chatbot developed for free, so they can be potential clients for students to work with.