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Date of publication xxxx 00, 0000, date of current version xxxx 00, 0000.

Digital Object Identifier 10.1109/ACCESS.2024.0429000

Vega: A Chatbot Platform for Development of Internet of Things

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This paragraph of the first footnote will contain support information, including sponsor and financial support acknowledgment. For example, "This work was supported in part by the U.S. Department of Commerce under Grant BS123456."

ABSTRACT Large language models (LLMs) have revolutionized natural language processing, yet their potential in Internet of Things (IoT) applications remains largely untapped. Traditional IoT interfaces often require specialized knowledge, creating barriers for non-technical users. We present a modular system that leverages LLMs to enable intuitive, natural language control of IoT devices, specifically a Raspberry Pi (RPi) connected to various sensors and devices. Our solution comprises three key components: a physical circuit with input and output devices, an RPi integrating Control Server, and a web application integrating LLM logic. Users interact with the system through natural language commands, which the LLM interprets to call appropriate commands for the RPi. The RPi executes these instructions on the connected circuit, with outcomes communicated back to the user via LLM-generated responses. We empirically evaluate our system's performance across a range of task complexities and user scenarios, demonstrating its ability to handle complex, conditional logic without additional RPi-level coding. Our findings reveal that LLM-driven IoT control can effectively bridge the gap between complex device functionality and user-friendly interaction. We discuss the system's scalability, exploring its potential applications in diverse settings such as smart homes, industrial monitoring, and educational environments. By enabling natural language interaction with IoT devices, our approach not only enhances accessibility for non-technical users but also opens new avenues for creative and intelligent IoT applications. This research contributes to the growing body of work on interactive intelligent systems for IoT, offering insights into the design and implementation of LLM-integrated IoT interfaces.

INDEX TERMS Enter key words or phrases in alphabetical order, separated by commas. Autocorrelation, beamforming, communications technology, dictionary learning, feedback, fMRI, mmWave, multipath, system design, multipath, slight fault, underlubrication fault.

I. INTRODUCTION

THE evolution of large language models (LLM's) has led to rapid development in the realm of intelligent systems. However the application of LLM's hasn't been thoroughly explored in internet of things (IoT) and embedded systems (ESys). Traditionally, the development of IoT systems that seamlessly adapt to the user's need and tasks poses a considerable challenge Leveraging the capabilities of LLMs presents an opportunity to address this challenge and bridge the gap between technical intricacies and user accessibility.

II. BACKGROUND AND RELATED WORK

Use either SI (MKS) or CGS as primary units. (SI units are strongly encouraged.) English units may be used as secondary units (in parentheses). This applies to papers in data storage. For example, write "15 Gb/cm^2 (100 Gb/in^2)." An exception is when English units are used as identifiers in trade, such as "3$^{1/2}$-in disk drive.

A. PROGPROMPT

The SI unit for magnetic field strength H is A/m. However, if you wish to use units of T, either refer to magnetic flux density B or magnetic field strength symbolized as $\mu_0 H$. Use the center dot to separate compound units, e.g., "A·m^2."

III. METHODOLOGY

The word "data" is plural, not singular. The subscript for the permeability of vacuum μ_0 is zero, not a lowercase letter "o." The term for residual magnetization is "remanence"; the adjective is "remanent"; do not write "remnance" or "remnant." Use the word "micrometer" instead of "micron." A graph within a graph is an "inset," not an "insert." The word "alternatively" is preferred to the word "alternately" (unless you really mean something that alternates). Use the word "whereas" instead of "while" (unless you are referring to simultaneous events). Do not use the word "essentially" to mean "approximately" or "effectively." Do not use the word "issue" as a euphemism for "problem." When compositions are not specified, separate chemical symbols by en-dashes; for example, "NiMn" indicates the intermetallic compound $Ni_{0.5}Mn_{0.5}$ whereas "Ni–Mn" indicates an alloy of some composition Ni_xMn_{1-x}.

A. OVERALL ARCHITECTURE

A

B. PHYSICAL CIRCUIT DESIGN

B

C. RASPBERRY PI DESIGN

C

D. WEB APP DESIGN

D a

IV. EXPERIMENT AND RESULTS

A. COMPLEX COMMANDS

The following list outlines the different types of graphics published in IEEE journals. They are categorized based on their construction, and use of color/shades of gray:

B. AUTOMATED EVALUATION

A

C. RESULT ANALYSIS

B

D. REAL LIFE APPLICABILITY

D

V. CONCLUSION

Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

If you have multiple appendices, use the \appendices command below. If you have only one appendix, use \appendix[Appendix Title]

APPENDIX A
FOOTNOTES

Number footnotes separately in superscript numbers.[1] Place the actual footnote at the bottom of the column in which it is cited; do not put footnotes in the reference list (endnotes). Use letters for table footnotes (see Table **??**).

[1]It is recommended that footnotes be avoided (except for the unnumbered footnote with the receipt date on the first page). Instead, try to integrate the footnote information into the text.

APPENDIX B
SUBMITTING YOUR PAPER FOR REVIEW

A. FINAL STAGE

When your article is accepted, you can submit the final files, including figures, tables, and photos, per the journal's guidelines through the submission system used to submit the articlle. You may use *Zip* for large files, or compress files using *Compress, Pkzip, Stuffit,* or *Gzip.*

In addition, designate one author as the "corresponding author." This is the author to whom proofs of the paper will be sent. Proofs are sent to the corresponding author only.

ACKNOWLEDGMENT

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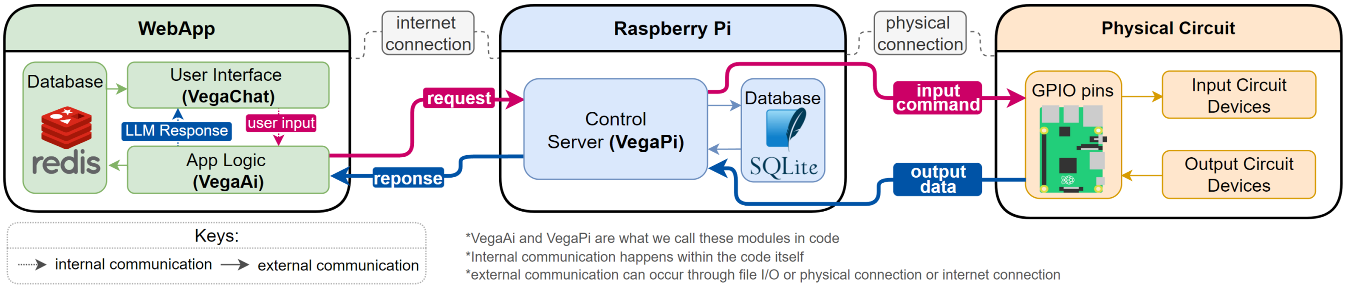

FIGURE 1. **Magnetization as a function of applied field. It is good practice to explain the significance of the figure in the caption.**

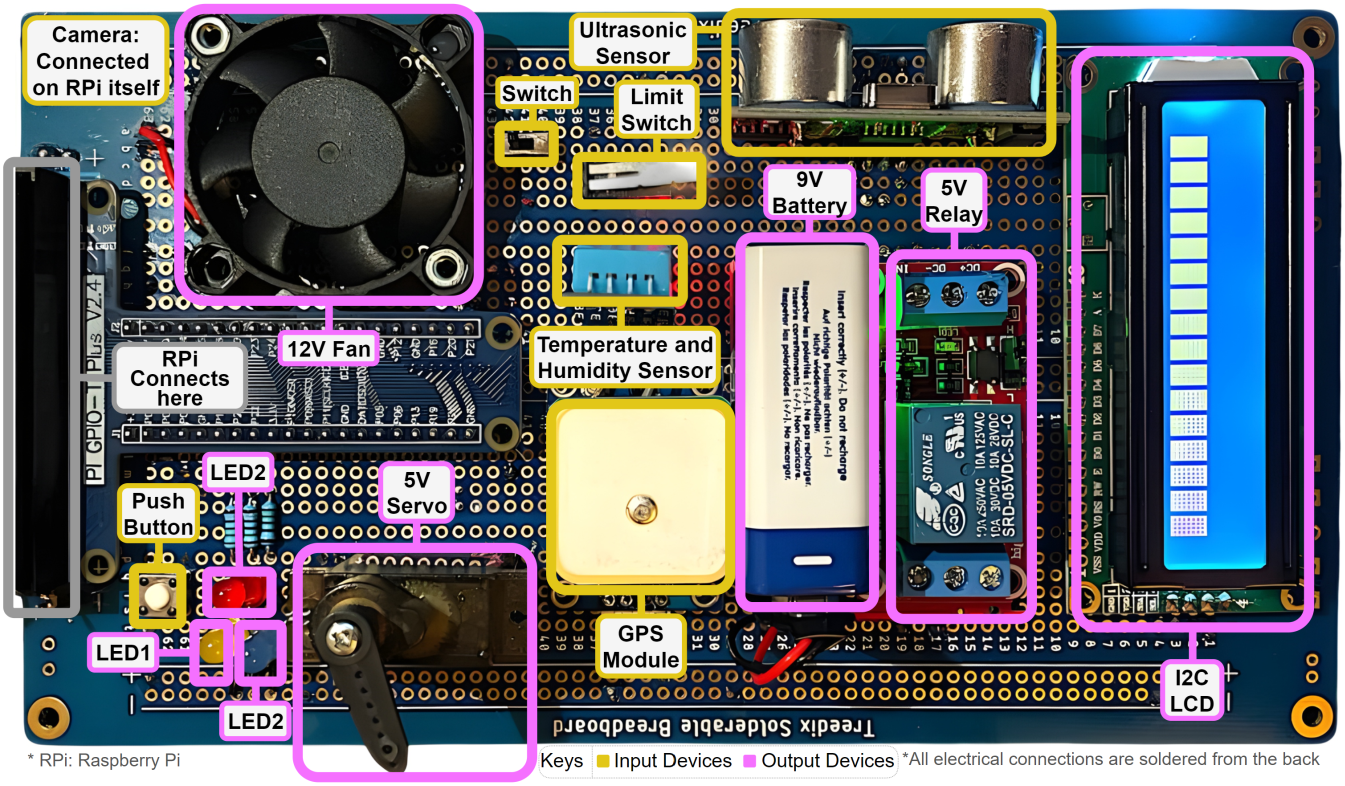

FIGURE 2. **Magnetization as a function of applied field. It is good practice to explain the significance of the figure in the caption.**

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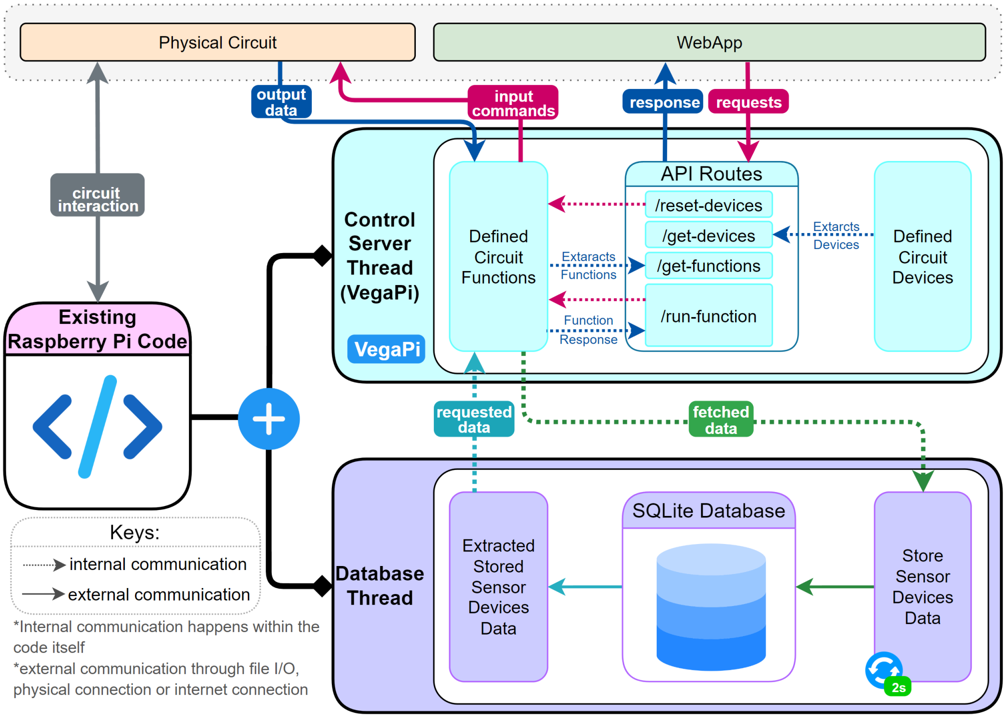

FIGURE 3. **Magnetization as a function of applied field. It is good practice to explain the significance of the figure in the caption.**

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Dr. Author was a recipient of the International Association of Geomagnetism and Aeronomy Young Scientist Award for Excellence in 2008, and the IEEE Electromagnetic Compatibility Society Best Symposium Paper Award in 2011.

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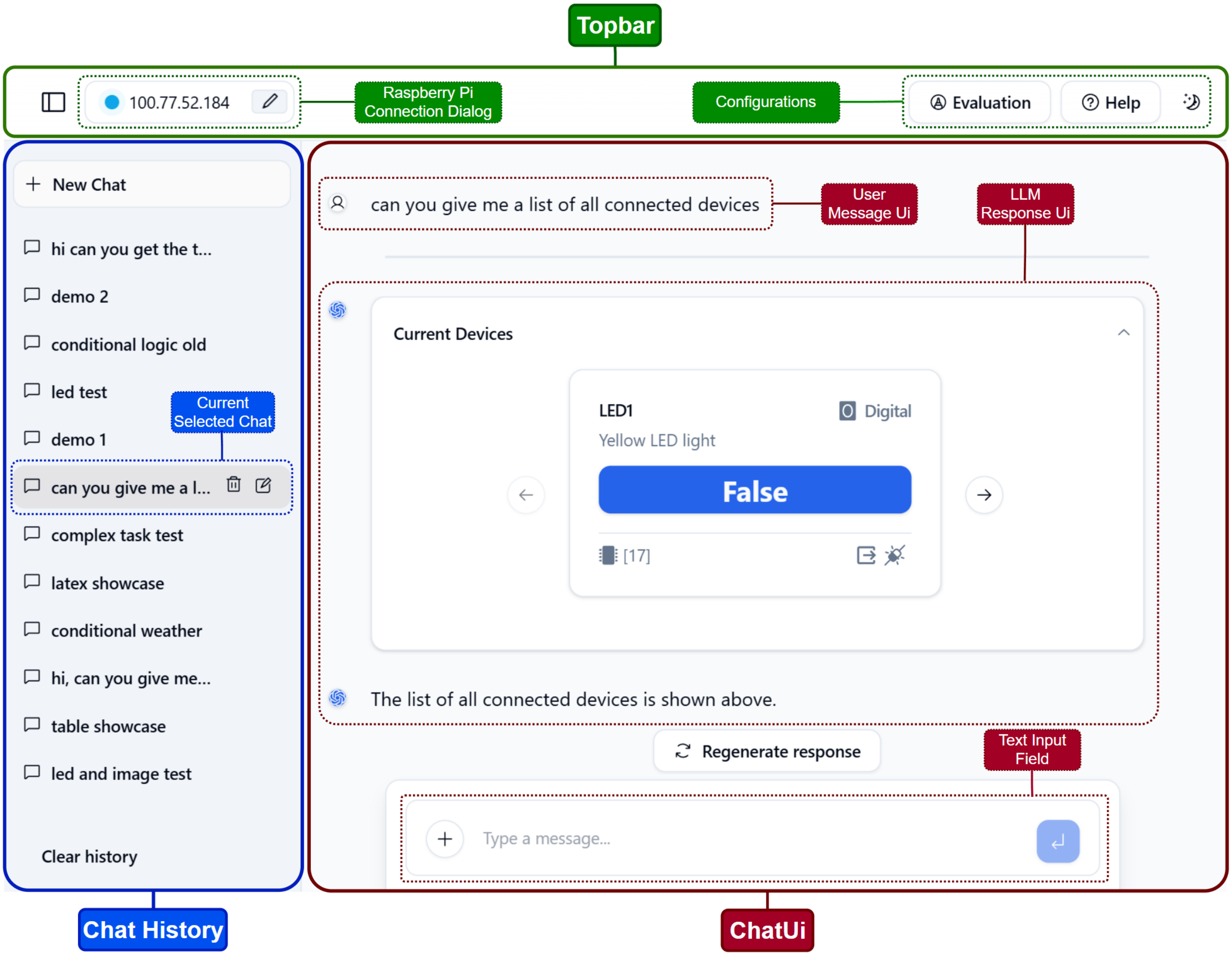

FIGURE 4. **Magnetization as a function of applied field. It is good practice to explain the significance of the figure in the caption.**

THIRD C. AUTHOR, JR. (M'87) received the B.S. degree in mechanical engineering from National Chung Cheng University, Chiayi, Taiwan, in 2004 and the M.S. degree in mechanical engineering from National Tsing Hua University, Hsinchu, Taiwan, in 2006. He is currently pursuing the Ph.D. degree in mechanical engineering at Texas A&M University, College Station, TX, USA.

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Mr. Author's awards and honors include the Frew Fellowship (Australian Academy of Science), the I. I. Rabi Prize (APS), the European Frequency and Time Forum Award, the Carl Zeiss Research Award, the William F. Meggers Award and the Adolph Lomb Medal (OSA).

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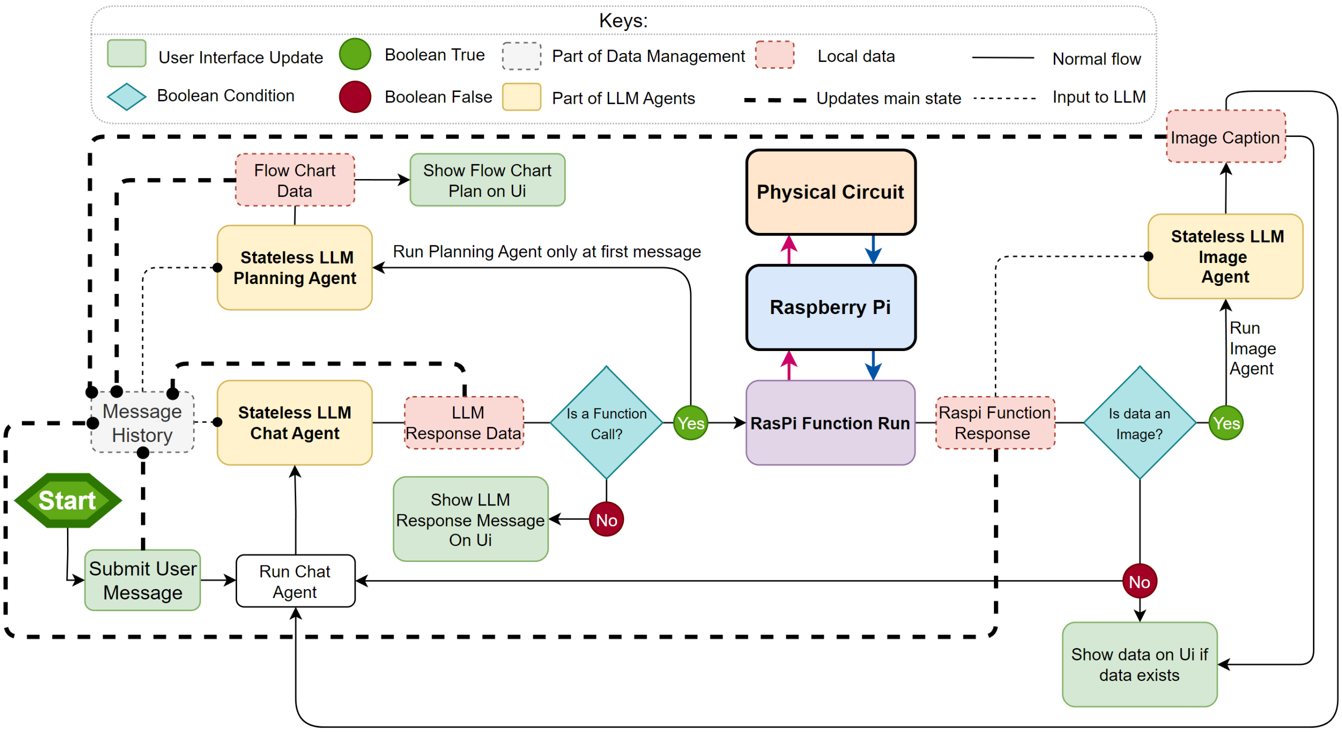

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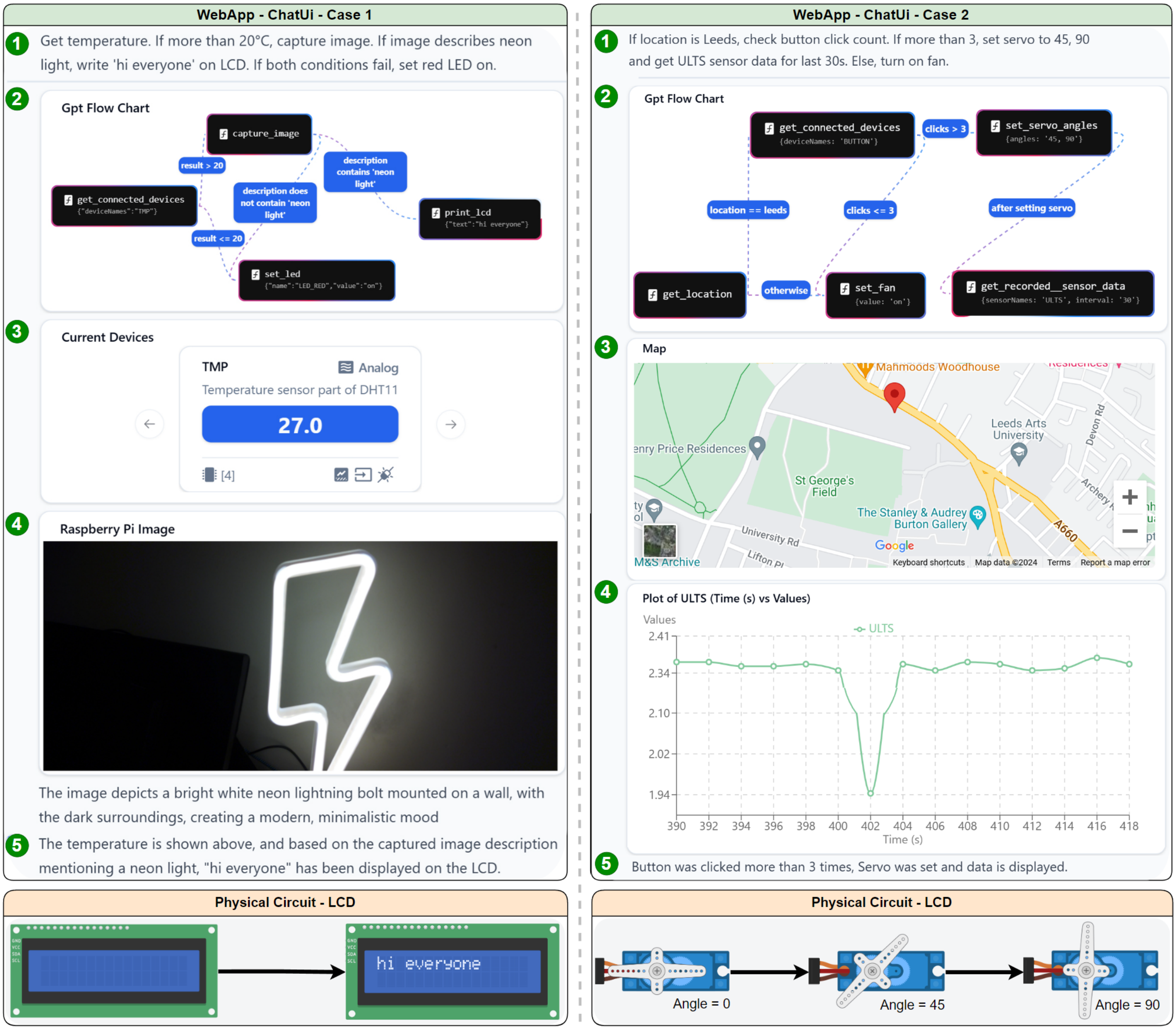
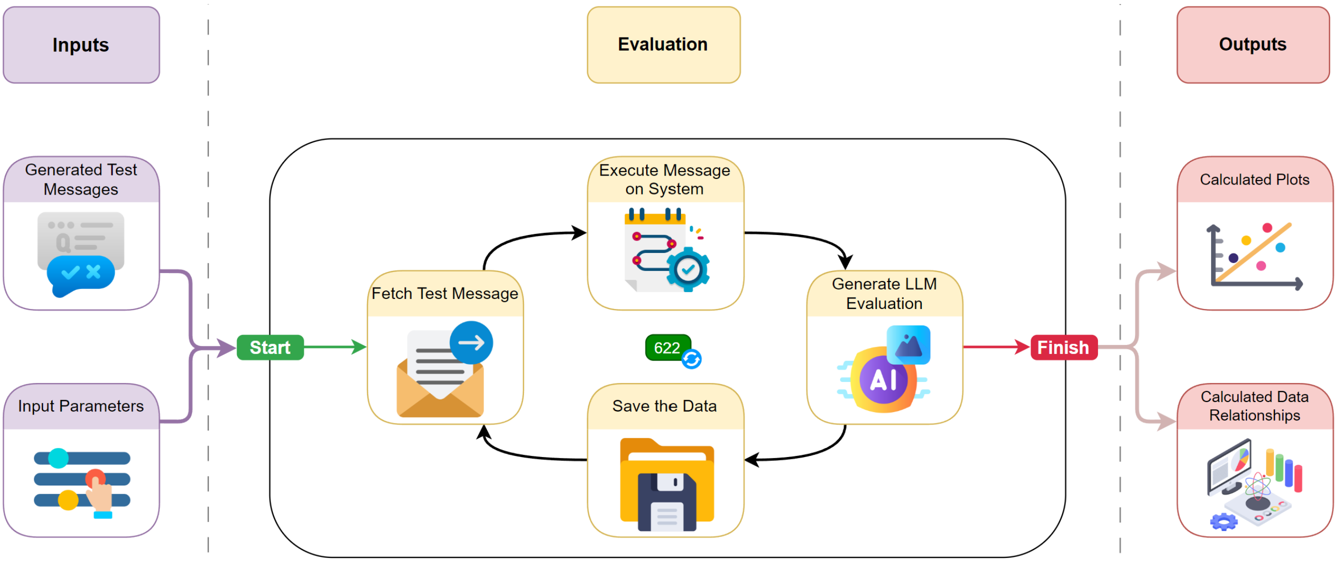


FIGURE 6. **Magnetization as a function of applied field. It is good practice to explain the significance of the figure in the caption.**



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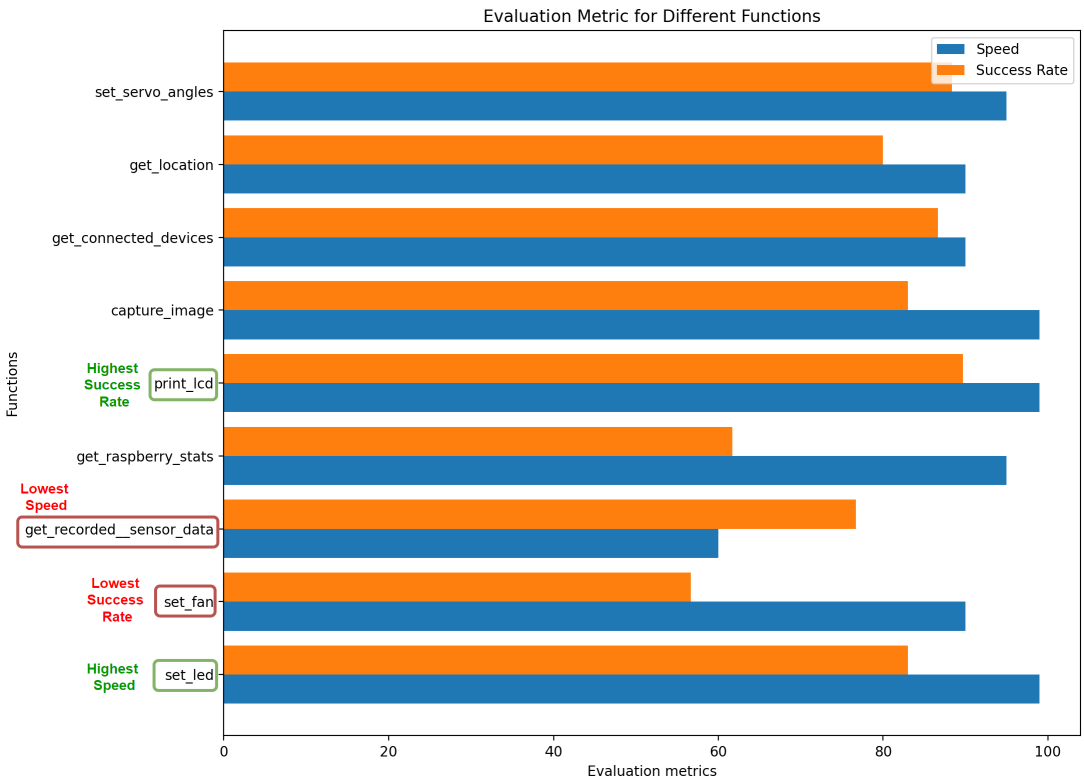


FIGURE 8. **Magnetization as a function of applied field. It is good practice to explain the significance of the figure in the caption.**

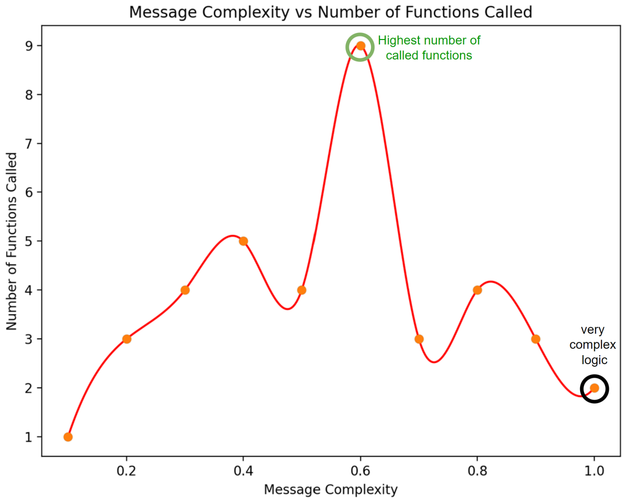


FIGURE 9. **Magnetization as a function of applied field. It is good practice**

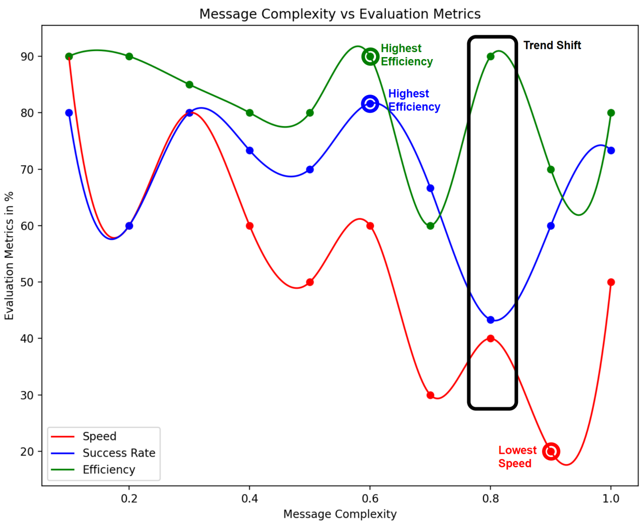
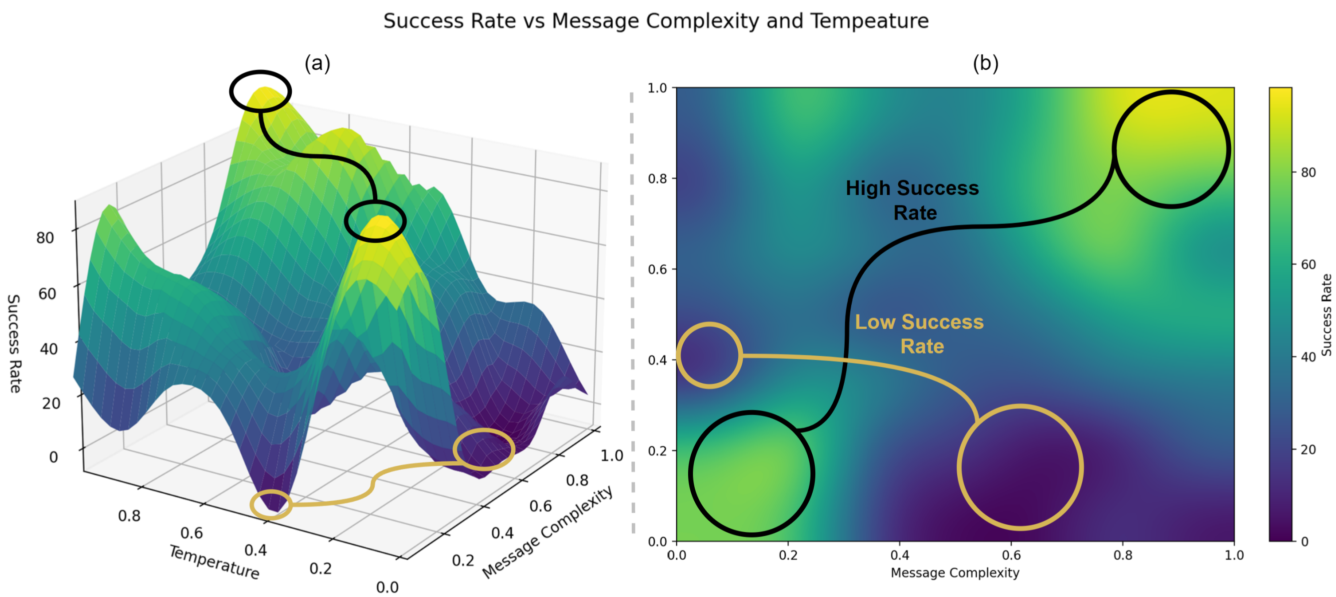


FIGURE 10. **Magnetization as a function of applied field. It is good practice**



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