AIM HIGHER CONSORTIUM

CASE STUDY

FORMLOGIC

SUBMITTED BY

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PROJECT CONSULTANTS

Carnegie Mellon Students participating in a new course called "Manufacturing Futures."

Formlogic,
55 38th Street Pittsburgh PA,
formlogic.com | ChatGPT Applications

"We're going to the next level for organizing our data, within about 6 months we should have some exciting result."

(Using Machine Learning and/or Foundational Models)

Paul Suter, Formlogic, CEO

EXECUTIVE SUMMARY

2023 can be considered the year of AI!

The company OpenAI has offered ChatGPT for public use with great fanfare. This case study considers how ChatGPT and Large Language Models might be used in the manufacturing context. A student group in a new Carnegie Mellon course explored its potential at Formlogic (a new Pittsburgh company that specializes in high precision, low volume, high mix metal part production).

CHALLENGES

Formlogic is inventing and applying new technologies to enable the rapid production of high precision metal parts. They are experiencing explosive growth, while their customer base is showing tremendous enthusiasm for cost-effective quality parts with very short delivery times.

Unfortunately, it is very difficult to find skilled employees that are experts in metal processes and are also comfortable with high technology. The challenge is to use AI to help mitigate this difficulty by: training new employees, assisting in repetitive work, offering coaching services and to answer on-the-job questions.

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HOW AIM HIGHER CONSORTIUM ASSISTED

A new CMU course in manufacturing was created called: Manufacturing Futures. This course considers how AI can be applied in manufacturing amongst other topics. At the same time, ChatGPT was exploding onto the scene. Therefore, a significant student project was developed to identify key applications for ChatGPT in manufacturing. A local company FormLogic was also critically interested in this question.

A team of professors and students visited Formlogic to learn about their needs and perspectives on AI. Based on this visit the student team came up with 6 applications that would have an immediate impact. The student team then developed a workflow using ChatGPT to address and demonstrate these applications.

The 6 Applications:

1. CNC Programming and Operations (programming assistant)
2. Technician-Machine Language Interface (hands free machine operation)
3. Automated Purchasing and Business Modeling (cross platform decision making)
4. Integration with Company Discussion Platforms (human team support0
5. Supply and Warehouse Management Optimization (cross platform decision making)
6. Adding Company Specific Data to the Foundational Model (new training)

Formlogic is both in the business of developing new technology and its application in REAL production of critical metal parts. We set out to demonstrate the practicality of this new technology for near-term use. It was surprising to be able to bring this technology to application because it has never been done before.

RESULTS, RETURN ON INVESTMENT AND FUTURE PLANS

A student group showed working demonstrations of 6 applications of ChatGPT.

These were all artificially simple applications compared to the real needs of the company. However, they were complete enough to be used as an effective place holder in a developing workflow.

There were critical lessons learned as we started to use ChatGPT in advanced manufacturing applications.

- ChatGPT has a wide understanding of most subjects, but it often does not provide key specifics necessary for working applications.
- The first answer ChatGPT gives you is not the final answer. The correct way to use ChatGPT is in a back-and-forth discussion. For example, “I don’t think you considered that we want to increase speeds and feeds and the current fixturing may not have enough clamping force to do that.” It will then offer you alternatives that will provide larger clamping forces.
- It should not be expected that ChatGPT will provide perfect answers. Once-in-a-great while the first answer it gives is complete and final. But most of the time it takes work and even hand-customization to get to a real solution. In our experience, ChatGPT saves about 50% of the effort to develop a new application. ChatGPT is best at the initial phases of a project where system and application libraries are being selected and employed. For example, ChatGPT might suggest using the OpenCV library for analyzing picture data. If you were working alone, it can take a significant amount of time to understand and select the correct functions and programming model to develop a computer vision project. ChatGPT hands you this first step on a silver platter.
- ChatGPT does NOT replace your manufacturing experts! It is like having a smart assistant with 6 months of experience standing by your side. You can ask them to get a project started and then you can identify critical missing components that you (human) can provide or coax out of your assistant through a sort-of Socratic process of questions and answers.