NIA Project Annual Progress Report Document

Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

Network Licensees must publish the required Project Progress information on the Smarter Networks Portal by 31st July 2014 and each year thereafter. The Network Licensee(s) must publish Project Progress information for each NIA Project that has developed new learning in the preceding relevant year.

Date of Submission

Jul 2024

Project Reference Number

NIA2_NGESO064

Project Progress

Project Title

Generative AI Discovery

Project Reference Number

NIA2_NGESO064

Funding Licensee(s)

NG ESO - National Grid ESO

Project Start Date

February 2024

Project Duration

0 years and 2 months

Nominated Project Contact(s)

Vikaran Khanna

Scope

This project will utilise representative public data sets for the development and lab testing of the use cases. Benchmarking of lab testing outputs will be performed were possible by comparing with existing quantitative or qualitative data available from business owners, considering the time, effort, and quality of existing outputs.

In-scope: Generating unstructured text data, interpreting plots, graphs and figures embedded within reports, and synthetic data generation/exploration (tabular data containing text and numeric data) are marked as in-scope.

Out of Scope: Generating images/audio/video are marked as out-of-scope, as those solutions will require more sophisticated generative models and evaluation.

Objectives

The objective of this project is to identify and test use cases for Gen AI technology across a range of core ESO roles: knowledge management, stakeholder engagement and customer operations. Prototyping use cases will identify additional business uses and ways of working responsibly with the technology and uncover limitations and opportunities of using Gen AI in workflows.

Success Criteria

The following will be considered when assessing whether the project is successful:

- The project delivers against objectives, timescales and budgets as defined in the proposal.
- 15 relevant use cases clearly documented, and 3 high priority use cases agreed for lab testing.
- Lab testing using smaller public datasets completed.
- Necessary technical and data enablement details for scalable implementation documented.
- Successful benchmarking against existing quantitative or qualitative business data.

Performance Compared to the Original Project Aims, Objectives and Success Criteria

National Grid Electricity System Operator ("NGESO") has endeavoured to prepare the published report ("Report") in respect of Generative AI, NIA2_NGESO064 ("Project") in a manner which is, as far as possible, objective, using information collected and compiled by NG and its Project partners ("Publishers"). Any intellectual property rights developed in the course of the Project and used in the Report shall be owned by the Publishers (as agreed between NG and the Project partners).

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This project was delivered across 3 work packages:

- Discovery and write up of minimum 15 use cases for which the use of Generative AI could be applied.
- Lab testing of 3 high priority use cases.
- High level business case development for Generative AI.

Representative public datasets were used for all lab testing, and the solutions were built and tested on the supplier's IT environment. To ensure data security and privacy, data from the lab tests are not available to OpenAI, are not used to improve OpenAI models, are not used to improve any Microsoft or 3rd party products or services, and are not use for automatically improving azure OpenAI models.

The project objectives from the work packages set out were achieved:

- 16 use cases were identified across the themes of stakeholder engagement, knowledge management and customer operations. An additional 2 use cases were identified in code development and network planning.
- 3 use cases were prototyped, leading to the identification of opportunities for productivity gains and recognition of the technology's limitations in performing calculations, extracting insights from images (e.g. plots) and inaccurate outputs.

The 3 use cases selected for prototyping included using Gen AI to query and summarise stakeholder feedback, external publications, and other knowledge bases. To ensure that we could meet the project timescales, we picked use cases with publicly accessible data and internal subject matter experts with good availability over the project duration. The prototypes had commonalities with other use cases, so the learning from them was transferable.

All success criteria were met.

Required Modifications to the Planned Approach During the Course of the Project

No modifications were required.

Lessons Learnt for Future Projects

- The prototypes were an extremely effective way to engage internal teams and inspire ideas for further use cases.
- The Retrieval Augmented Generation framework ('LLM + RAG') used for the model architecture gave transparency in data sources and citations, which built trust in the prototypes and significantly addressed the limitations of the technology such as inaccurate outputs.
- The model had limitations in handling image data, presenting a challenge for the analysis of mixed image and text datasets (e.g. reports including plots).

Note: The following sections are only required for those projects which have been completed since 1st April 2013, or since the previous Project Progress information was reported.

The Outcomes of the Project

The project results were an input to an ESO Horizon Scanning report on Generative AI (Gen AI) that identified the following opportunities and threats:

Key Opportunities

- GenAI is a powerful productivity tool, especially in the areas of code development, customer operations, stakeholder engagement and knowledge management. Most benefits in these areas can be realised by adopting general purpose tools or through relatively low levels of development to combine third-party foundation models with our own trusted sources of data, in the Retrieval Augmented Generation (RAG) framework.
- GenAI has the potential to be a transformational technology in the energy sector. Several research institutions are exploring integration of GenAI with situational awareness tools to address cognitive overload in Control Centres. In this safety-critical context careful research and testing is needed before evolving workflows. Energy-specific foundation models (trained on energy-related datasets) could also offer new opportunities for system operators, by providing a broad representation of energy system data that can be applied to many different scenarios and tasks.

Key Limitations & Threats

- GenAI has significant limitations and requires a 'human-in-the-loop'. GenAI is known to 'hallucinate', i.e. provide outputs which look very credible but are factually incorrect. There are technical approaches to mitigating this risk, such as data augmentation and adversarial training, but human review and declaring use of GenAI remain essential.
- GenAI presents a threat to cybersecurity. Cyber-attacks, such as phishing emails and targeted scams, are known to be much more effective when personalised. GenAI offers bad actors an opportunity to create personalised and credible attacks at higher volumes than are possible via human generation.
- GenAI could threaten diversity of thought. If multiple organisations use GenAI across similar tasks, with similar data sources, results will not be differentiated. Instead, we can gain competitive advantage by building large volumes of proprietary, high-quality and domain-specific data, but it will be crucial to protect the role of human ideation.

The results were also used as evidence to support the report's recommendations that ESO:

- Adopts general purpose tools that leverage Gen AI, whilst training staff on their limitations and creating appropriate use policies.
- Sets up capability ('LLMOps') and processes for rapid experimentation and deployment of Gen AI to aid resource intensive, text-based tasks, that are specific to the ESO context.
- Closely follows external progress on the use of Gen AI in safety-critical contexts and the development of energy-specific foundation models. Be prepared to exploit these technologies once concepts are validated.

Data Access

Details on how network or consumption data arising in the course of NIA funded projects can be requested by interested parties, and the terms on which such data will be made available by National Grid can be found in our publicly available "Data sharing policy related to NIC/NIA projects" and www.nationalgrideso.com/innovation.

National Grid Electricity System Operator already publishes much of the data arising from our NIC/NIA projects at www.smarternetworks.org. You may wish to check this website before making an application under this policy, in case the data which you are seeking has already been published.

Foreground IPR

No foreground IP was generated during this project however a final report summarising the approach and findings will be shared on the Smarter Networks Portal