We develop and distribute Nuclear-Ready AI software

https://nuclearn.ai

Roses are red
violets are blue,
the remainder of this poem was generated with Nuclear AI,
and it has been sent to the NRC for review.

Applicability of large language models in Nuclear

NuclearN

Previously started Palo Verde's Data Science Team in 2017

Prior Work at Palo Verde:
Auto PO&C Labeling, Equipment Anomaly Detection, DIANA Network Analysis, CAP AutoScreening, Supply Chain Forecasting & Optimization

Recipients of 2020 Nuclear Energy Institute's Top Innovative Practice Award for *Process Automation using Machine Learning*

Jerrold Vincent

B.S. Business Economics

M.S. Computer Science

10 years in Utility Data Science and Business Intelligence, PVNGS

Bradley Fox

B.S. Materials Science & Engineering

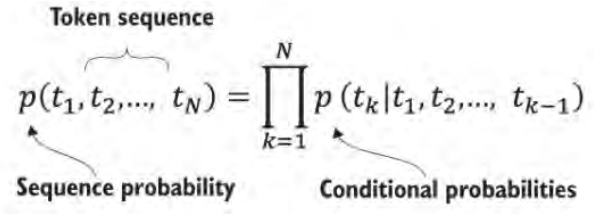
6 years Nuclear Engineering & 6 years Data Science & Software, PVNGS

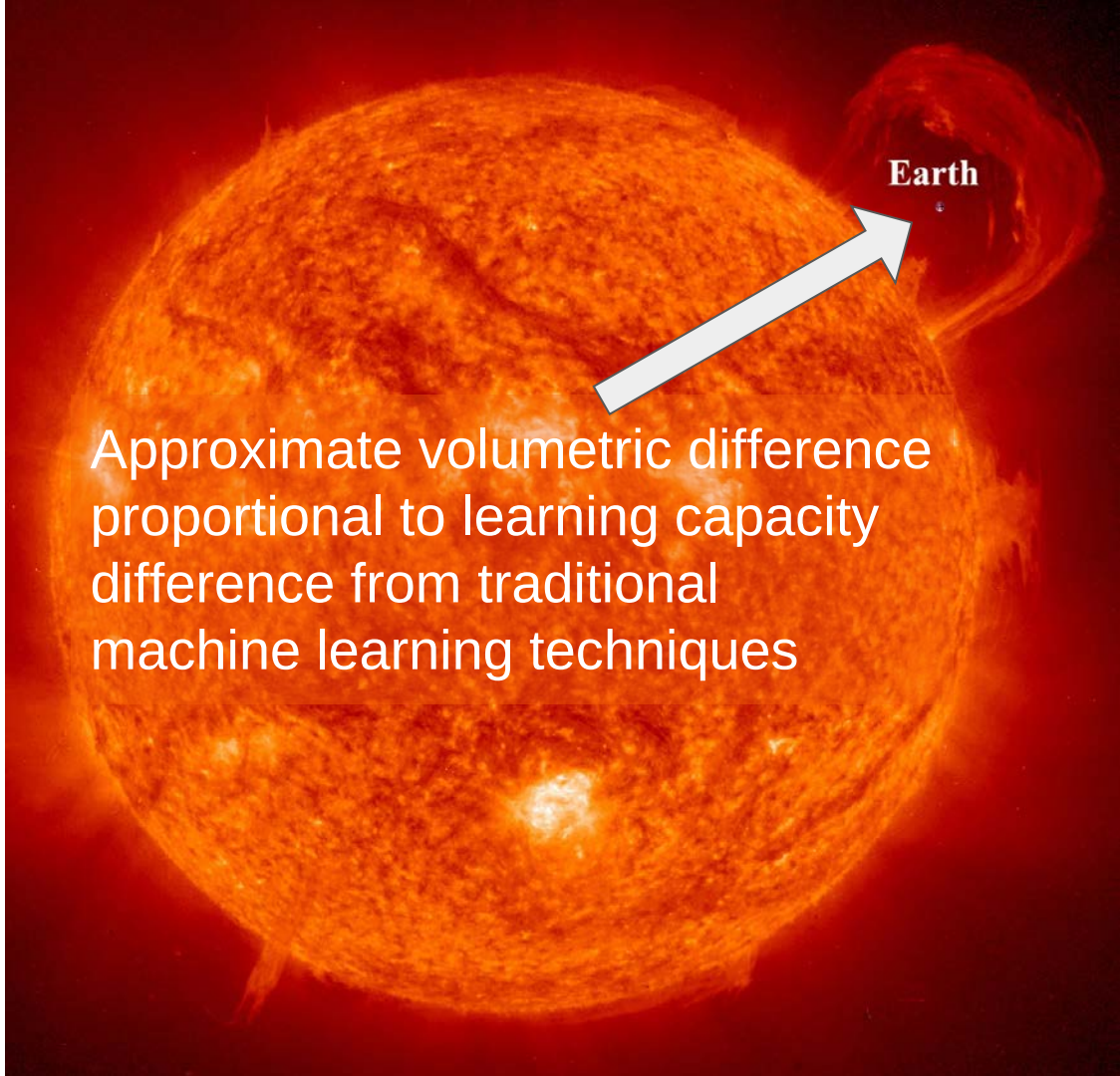
What are Large Language Models?

Specialized neural networks for modeling general natural language trained on HUGE amounts of data

Broad (English), domain specific (Medical) or task specific (Q&A)

Single model can answer questions, generate novel passages, classify text, perform translations, summarize content



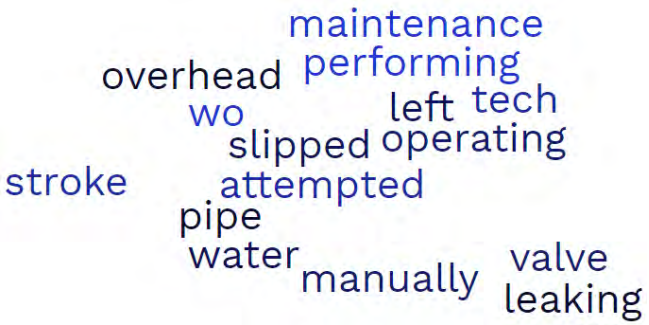


Revolution in Natural Language Approaches

Move data pipeline complexity and feature engineering into the language model

Old School

- Manually clean text to reduce number of extraneous words and identify “phrases” and “keywords” that matter
- Train Naive Bayes/Boosted Tree/Simple Neural Network on features
- Accuracy is lower than humans



Large Language Model Era

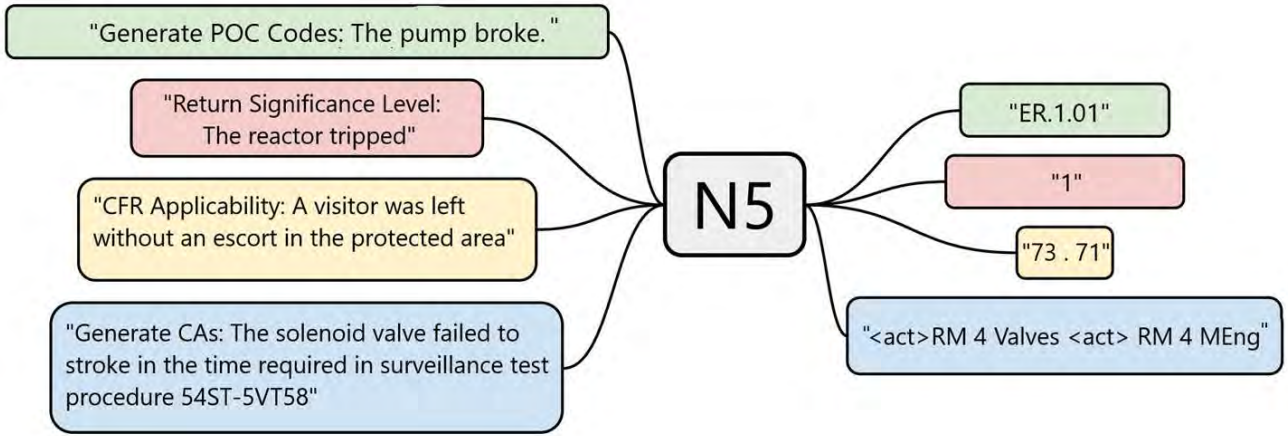
- Pre-trained models can perform many tasks without any additional training
- Models can be “fine-tuned” to specific problems to achieve superior performance
- Models “read” an entire passage, and use the entire context to “understand” the natural language
- 4.3x reduction in number of errors[1]

After performing WO 1234567, maintenance tech attempted to stroke the valve. While manually operating the valve, the tech slipped on water left from a leaking overhead pipe.

1.https://gluebenchmark.com/leaderboard

What can we do with these models?

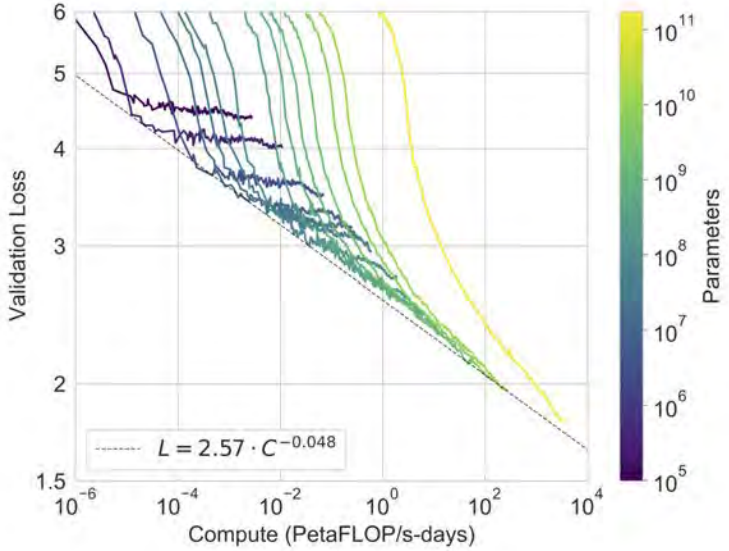
- More accurately auto-screen a higher proportion of issues utilizing improved classification abilities
- Improve the quality of reports using intelligent autocomplete with Nuclear-specific terms and phrases
- Evaluate whether an issue report contains sufficient information as it is being written



https://www.youtube.com/watch?v=K3SdC909bnc

Large Language Models are still improving.

- Next generation predicted to be 200x size of current generation
- Models will achieve superhuman performance on a broad range of natural language and general AI tasks
- Services such as Github Copilot already leverage advanced auto-complete functionality for millions of users
- Gartner predicts that by 2025 generative AI will account for 10% of all data produced worldwide



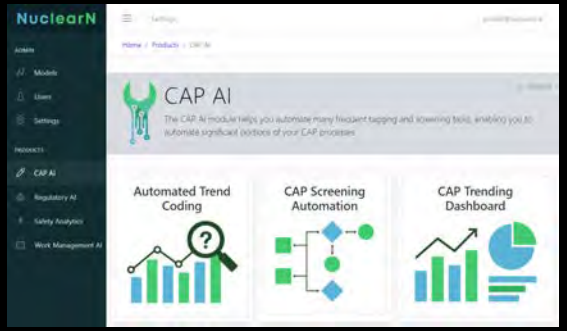
For the first time in the history of Machine Learning, there is no evidence of decreasing returns from increasing model size. The only limiting factor is compute resources.

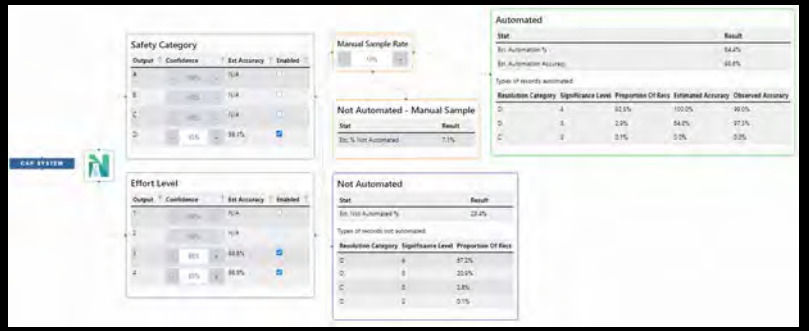
Future Use Cases and Research

- Intelligent auto-completion of procedures and work instructions, including generation of entire work steps
- “Query” large Nuclear texts for answers (e.g. FSAR, design documents, etc.)
- Chatbots for creating Issue Reports, Work Orders, Scheduling
- Automatic summarization of site schedules and daily issues
- We plan to release a Nuclear-specific Large Language Model in the future

Large Language Models are used in Nuclearn platform and products

- CAP Screening Automation
- Automated Trend Coding
- CAP Trending Dashboard
- 10CFR50 Section Applicability





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Questions?

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