April 2022

Mega AI, an internal investment at Pacific Northwest National Laboratory, aims to develop next-generation artificial intelligence (AI) capabilities unique to the Department of Energy's national laboratories to address research gaps in large-scale multimodal representation learning, multitask inferences, and the need for increased generalizability, rapid adaptivity, and usability of AI technologies. In this newsletter, we highlight recent developments in the research community on next-generation AI technologies that focus on massive-scale model development, deployment and evaluation, data and code availability, model interactions, and new features and capabilities that are relevant to Mega AI's goals and science and security applications.

NEW MODELS AND CAPABILITIES

- **February 2 | Blog:** *Announcing GPT-NeoX-20B*. READ MORE
- **February 7 | Publication:** *DeepMind: Red Teaming Language Models with Language Models*. READ MORE
- **February 10 | Blog:** *Guiding Frozen Language Models with Learned Soft Prompts*. READ MORE
- **February 14: Publication:** *Deduplicating Training Data Mitigates Privacy Risks in Language Models*. READ MORE
- **February 15 | Publication:** *Quantifying Memorization Across Neural Language Model*. READ MORE
- **March 3 | Article:** *Vision Language models: towards multi-modal deep learning*. READ MORE

- **March 8 | Blog:** *µTransfer: A technique for hyperparameter tuning of enormous neural networks*. READ MORE
- **March 11 | Article:** *New Chinese exascale supercomputer runs 'brain-scale AI.'* READ MORE
- **March 15 | Article:** *Training a 1 Trillion Parameter Model With PyTorch Fully Sharded Data Parallel on AWS*. READ MORE
- **Blog:** *WebGPT: Improving the Factual Accuracy of Language Models through Web Browsing*. READ MORE

NEW DATASETS

- **Data:** Ai2 Benchmarking Cross-Task Generalization. HERE

NEW REPORTS AND STUDIES

- **February 4 | Publication:** *Using DeepSpeed and Megatron to Train Megatron-Turing NLG 530B, A Large-Scale Generative Language Model*. READ MORE
- **February 16 | Publication:** *Transformer Memory as a Differentiable Search Index.* READ MORE
- **February 24 | Article:** *DeepMind's Upgraded Hierarchical Perceiver is Faster, Scales to Larger Data Without Preprocessing, and Delivers Higher Resolution and Accuracy*. READ MORE
- **Publication:** *VICReg: Variance-Invariance-Covariance Regularization for Self-Supervised Learning.* READ MORE
- **Publication:** *A Neural Network Solves and Generates Mathematics Problems by Program Synthesis: Calculus, Differential Equations, Linear Algebra, and More.* READ MORE

COMMUNITY DISCUSSION

- **February 2 | Blog:** *Deepmind: Competitive programming with AlphaCode*. READ MORE
- **February 3 | Article:** *VentureBeat: The state of AI ethics: The principles, the tools, the regulations*. READ MORE
- **February 10 | Article:** *Computer Scientists Prove Why Bigger Neural Networks Do Better*. READ MORE

- **February 14 | Article:** *Researchers train neural network to recognize chemical formulas from research papers*. READ MORE
- **February 15 | Article:** *Machine Learning Becomes a Mathematical Collaborator*. READ MORE
- **February 15 | Article:** *America must win the race for A.I. ethics.* READ MORE
- **February 28 | Article:** *Princeton U's DataMUX Enables DNNs to Simultaneously and Accurately Process up to 40 Input Instances With Limited Computational Overhead*. READ MORE
- **March 3 | Article:** *Robo-writers: the rise and risks of language-generating AI*. READ MORE
- **March 4 | Article:** *Tech Xplore: Machine learning gets smarter to speed up drug discovery*. READ MORE
- **March 5 | Blog:** *Generative Flow Networks*. READ MORE
- **March 9 | Blog:** *The Limits of the Literature*. READ MORE
- **March 10 | Article:** *Will Transformers Take Over Artificial Intelligence?* READ MORE

HIGHLIGHTED TECHNICAL RESOURCES

- **Publication:** *Unsupervised word embeddings capture latent knowledge from materials science literature*. READ MORE
- **Publication:** *Wilds: A Benchmark of in-the-Wild Distribution Shifts*. READ MORE
- **Publication:** *Pre-trained Language Models in Biomedical Domain: A Systematic Survey*. READ MORE

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