Analytics Vidhya | DATAHACK SUMMIT

Workshop

# NLP using Generative AI

# Module 3

## Speaker
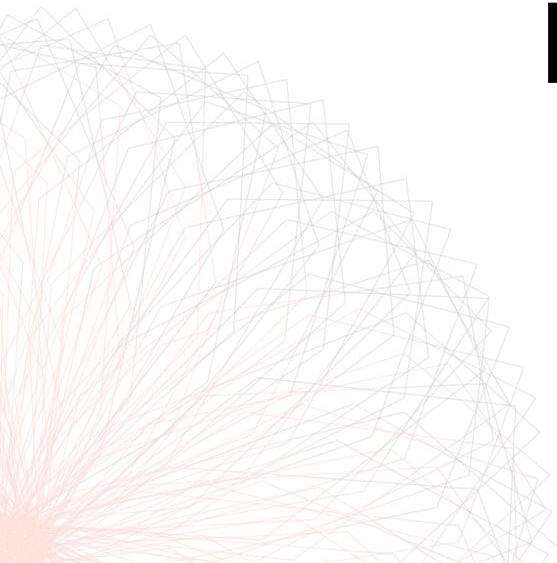
Amar Lalwani

Building a startup (stealth mode)
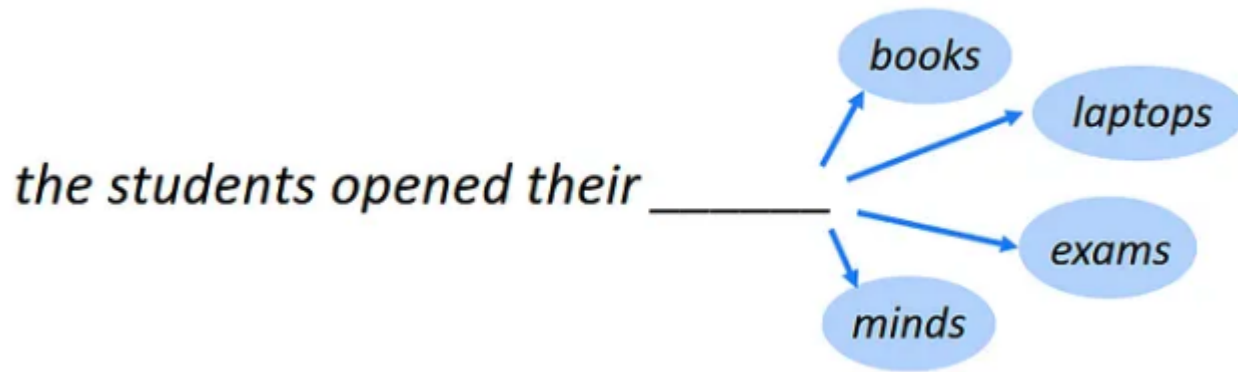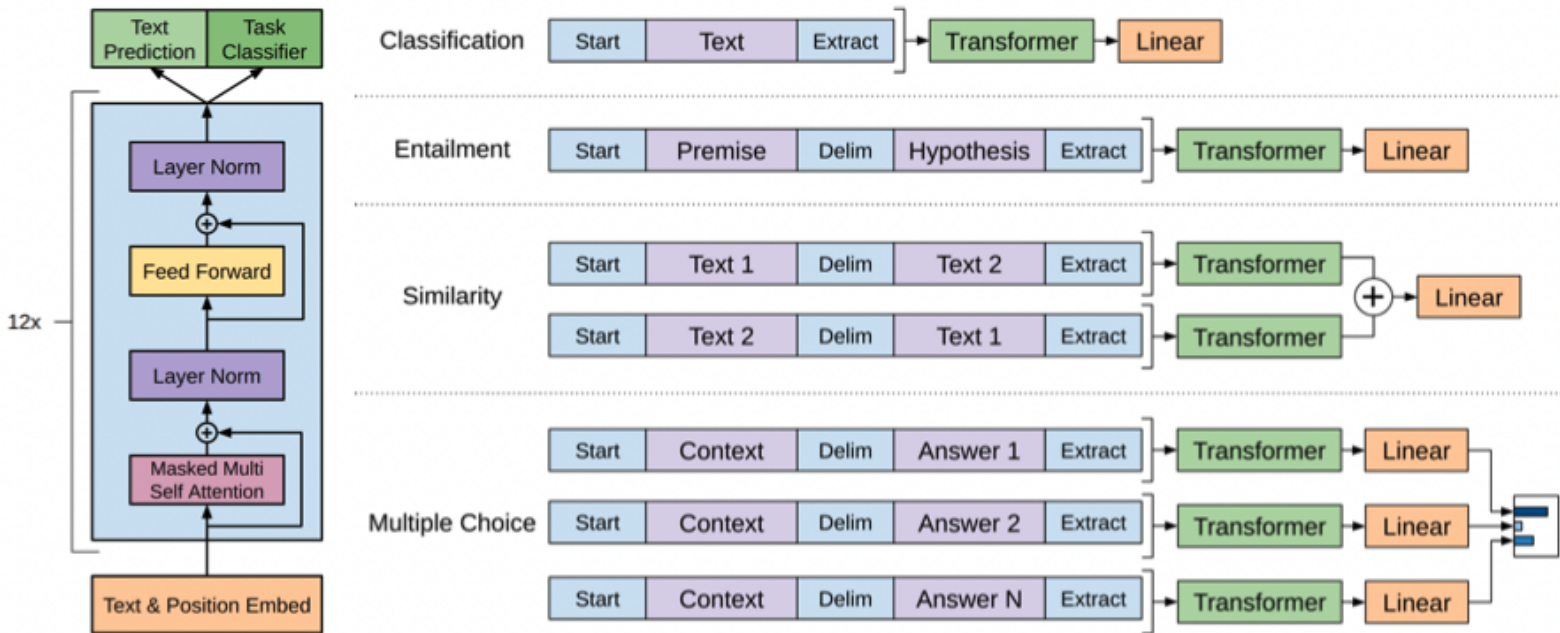Ex - Head of AI and R&D, funtoot

Sophisticated Next Word Predictors

## Improving Language Understanding by Generative Pre-Training

- followed by (task-agnostic) Discriminative Fine-Tuning

# GPT-2: Unsupervised Multitask Learner

- Pre-training transformer language models
- Task specific fine-tuning
  - Eliminating need of task specific architectures
- Limitation: while architecture is task-agnostic, still task specific datasets and fine-tuning needed

➔ For each task, large high quality dataset needed. May not be possible always
➔ Out of distribution generalization decays with
  ◆ Expressiveness of the model
  ◆ Narrowness of the training distribution
➔ Humans to do not require large training datasets to learn most natural language tasks
  ◆ Brief directive in natural language or at-most a tiny number of demonstrations is enough
  ◆ This allows humans to seemingly mix together or switch between various tasks and skills

https://d4mucfpksywv.cloudfront.net/better-language-models/
language_models_are_unsupervised_multitask_learners.pdf

# GPT-3: Few-shot Learner

**The three settings we explore for in-context learning**

**Zero-shot**

The model predicts the answer given only a natural language description of the task. No gradient updates are performed.

```
1   Translate English to French:        ← task description
2   cheese =>                            ← prompt
```

**One-shot**

In addition to the task description, the model sees a single example of the task. No gradient updates are performed.

```
1   Translate English to French:        ← task description
2   sea otter => loutre de mer          ← example
3   cheese =>                           ← prompt
```
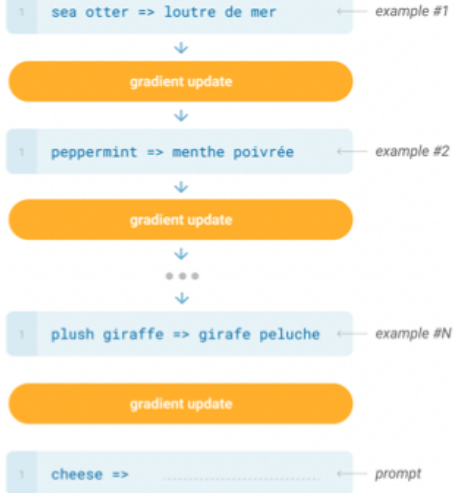
**Few-shot**

In addition to the task description, the model sees a few examples of the task. No gradient updates are performed.

```
1   Translate English to French:        ← task description
2   sea otter => loutre de mer          
3   peppermint => menthe poivrée        ← examples
4   plush girafe => girafe peluche      
5   cheese =>                           ← prompt
```
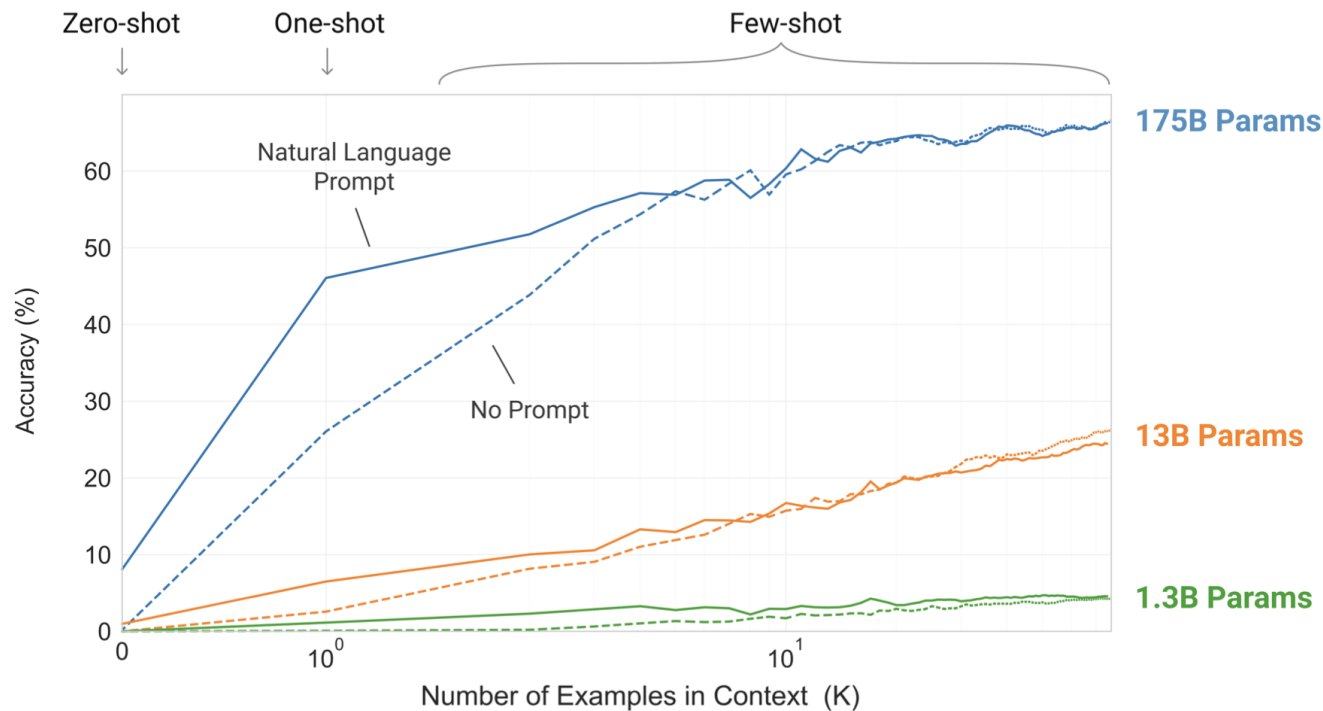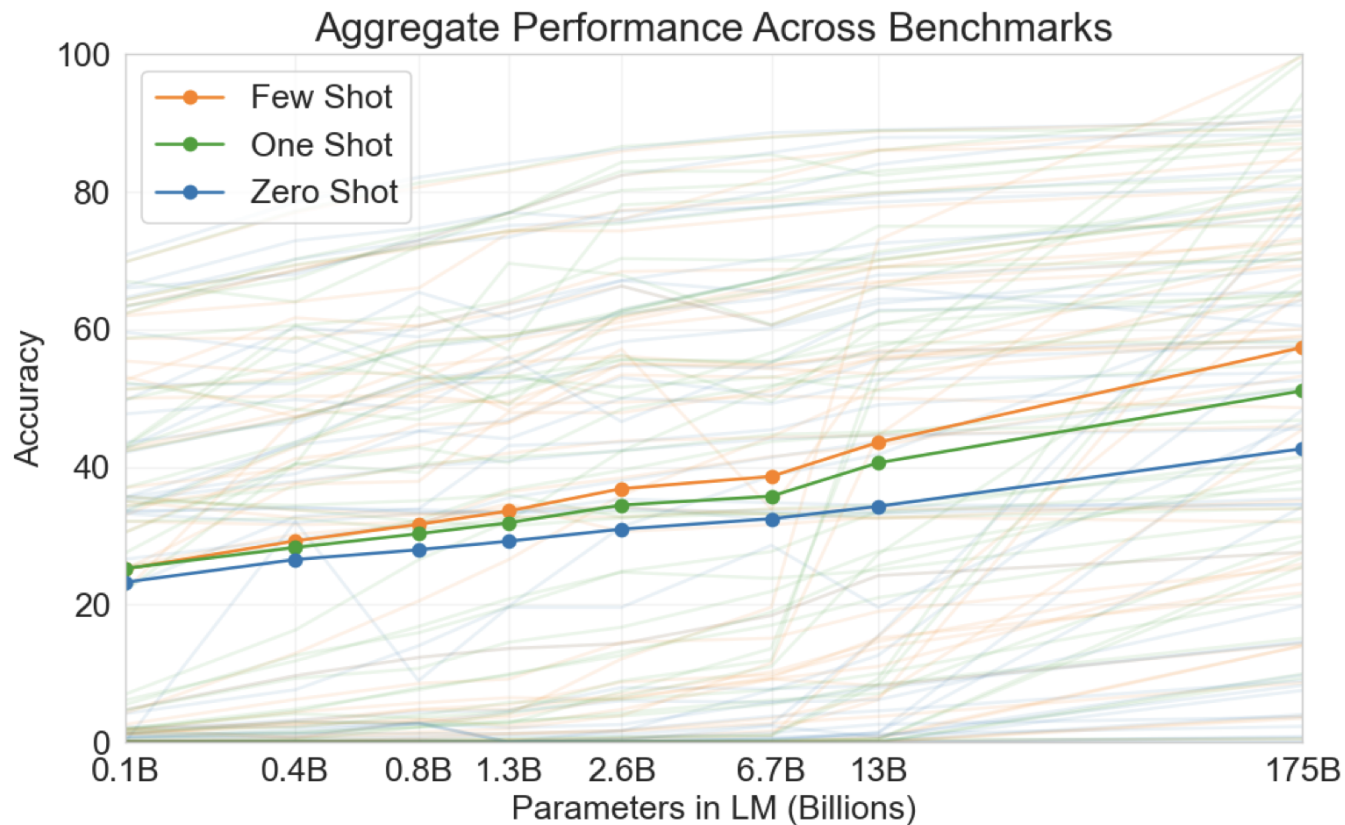
**Traditional fine-tuning (not used for GPT-3)**

**Fine-tuning**

The model is trained via repeated gradient updates using a large corpus of example tasks.
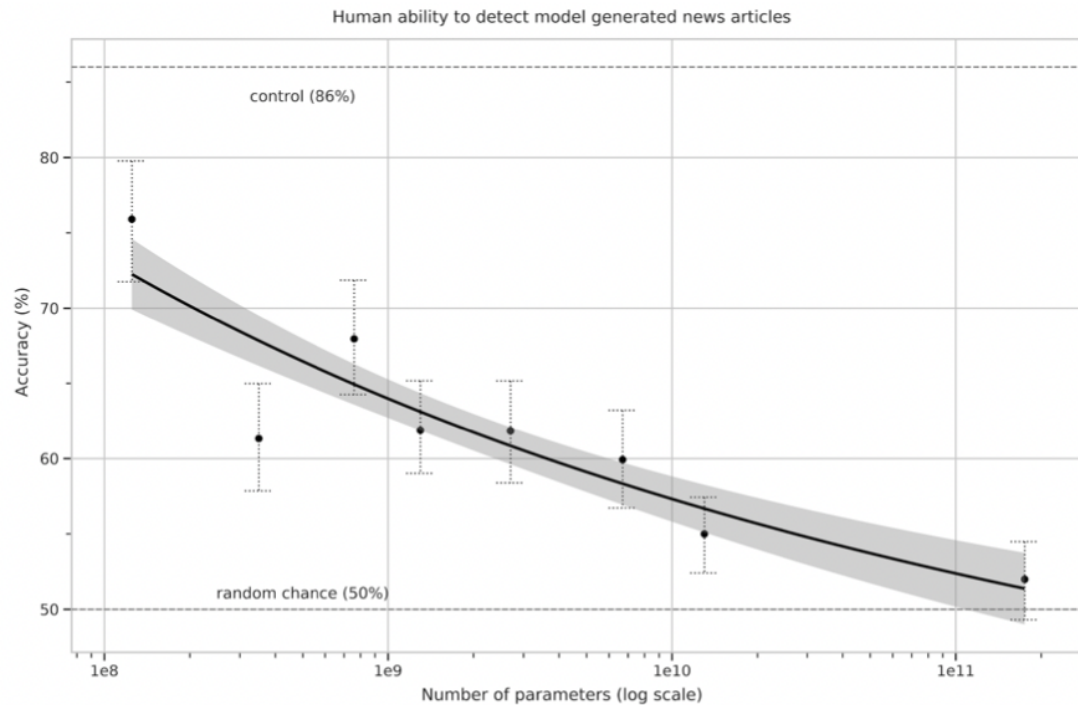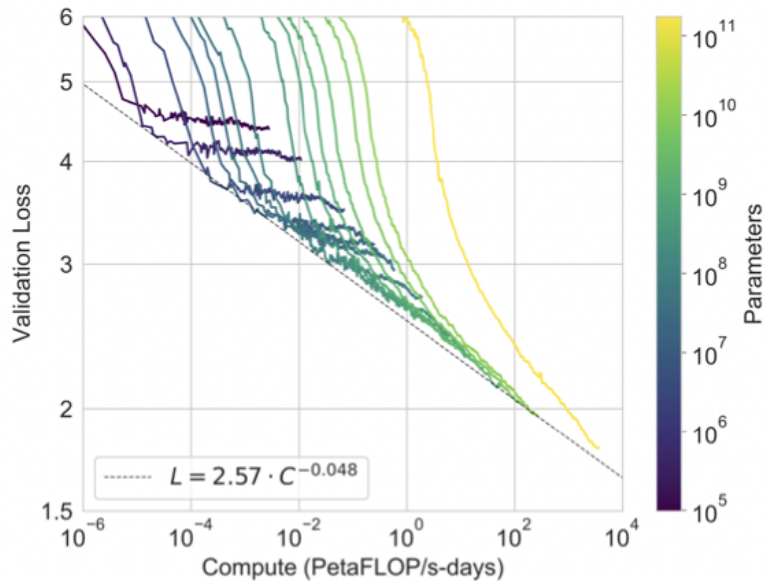
```
1   sea otter => loutre de mer          ← example #1
                    ↓
              gradient update
                    ↓
1   peppermint => menthe poivrée        ← example #2
                    ↓
              gradient update
                    ↓
                  • • •
                    ↓
1   plush giraffe => girafe peluche     ← example #N

              gradient update

1   cheese =>                           ← prompt
```

# GPT-3 In-context learning: remove random symbols from a word

Aggregate Performance Across Benchmarks

# Performance: Power Law



$L = 2.57 \cdot C^{-0.048}$



Human ability to detect model generated news articles