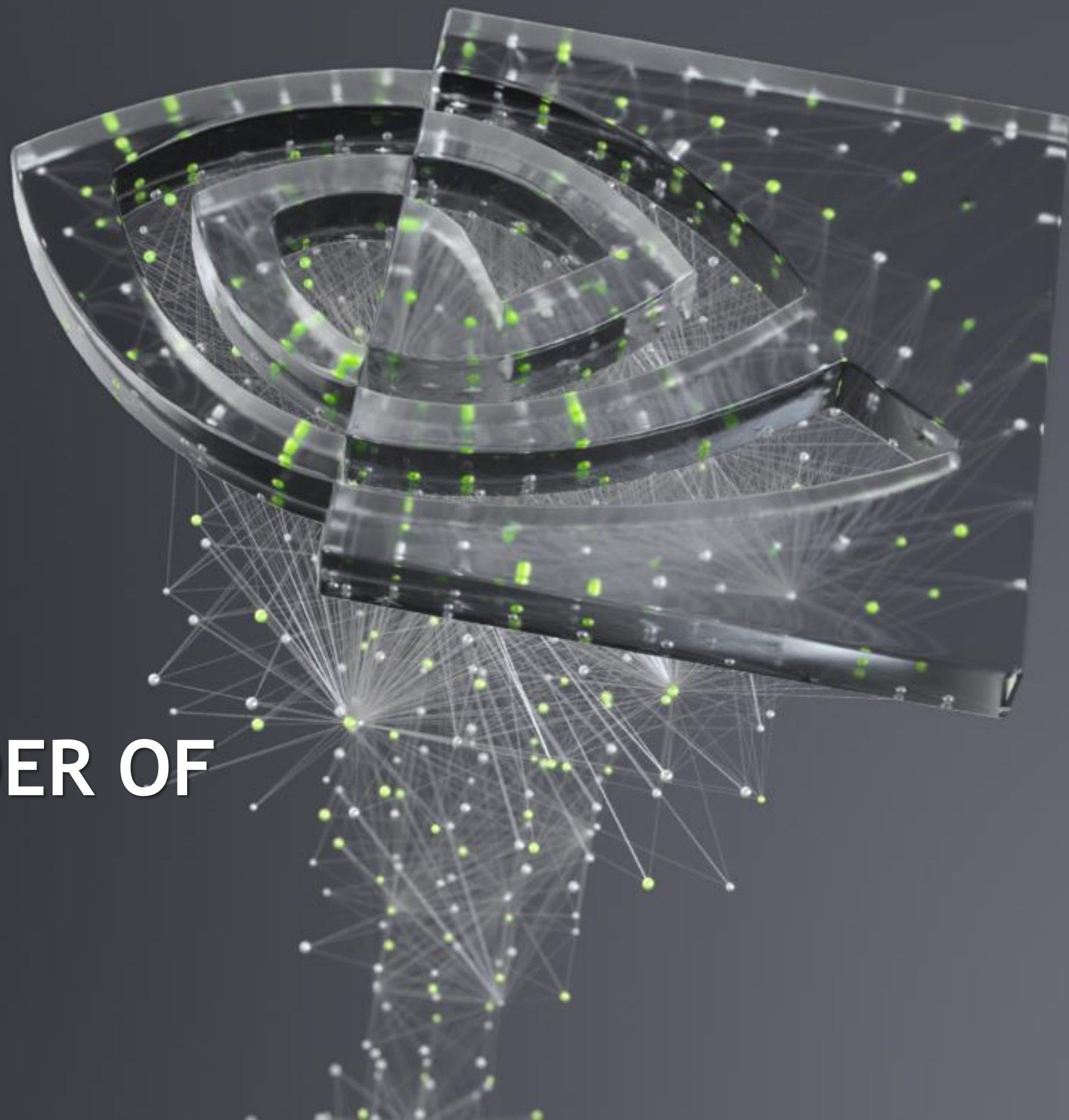




# ADVANCING THE TRADER OF TOMORROW WITH AI

John Ashley, January 2021





Augmented and Artificial Intelligence

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Information Superiority

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Language is Hard



## Augmented and Artificial Intelligence

**“ANY SUFFICIENTLY ADVANCED TECHNOLOGY  
IS INDISTINGUISHABLE FROM MAGIC.”**

**- ARTHUR C. CLARKE**

# IMAGINE...

(briefly)

What would you pay...

...to get the news 10 minutes ahead of your competitors?

... to get all the news when your competitors only get 80%?

... for a team of people to filter your incoming data to flag the good vs. the bad?

...and prioritize the interesting over the non-interesting?

**This is not science fiction.**



# AI FOR TRADING

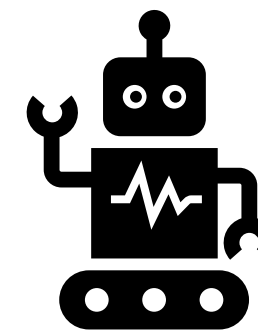
## Selected Use Cases



### Augmented Intelligence for Discretionary Traders

#### NLP

- Text Prioritization
- Text Summarization
- Named Entity Recognition & Knowledge Graphs



### Artificial Intelligence for Algo Traders

#### Algo Development

- Time Series via RNN / Temporal CNN
- Synthetic Data / VAE & GAN (backtesting)

Sentiment Analysis - News, Social Media, Regulatory Filings

“alt data”

Optimal execution (Reinforcement Learning)

Deep Learning for Pricing and Risk



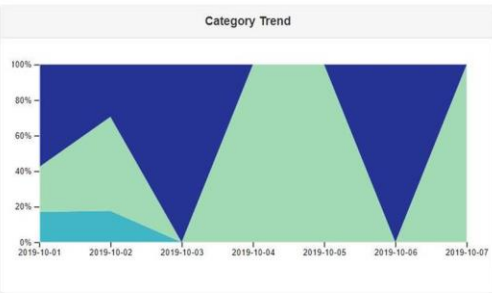
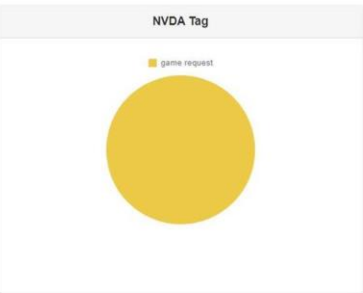
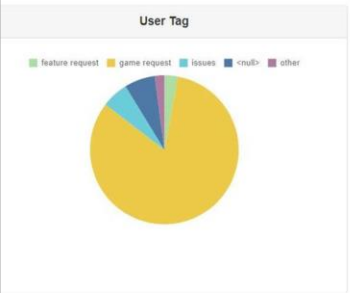
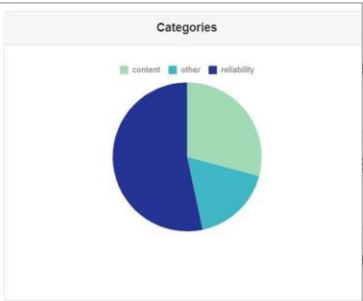
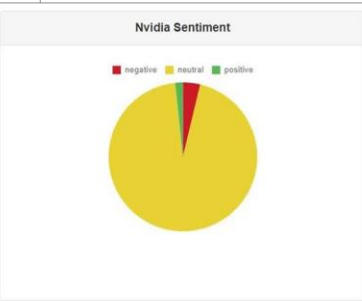
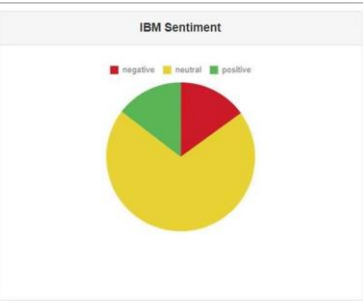
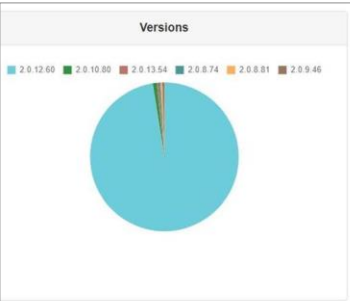
## Information Superiority

“THE MORE YOU LEARN, THE  
MORE YOU EARN.”  
- WARREN BUFFET

# SENTIMENT: UNDERSTAND GEFORCE NOW USERS

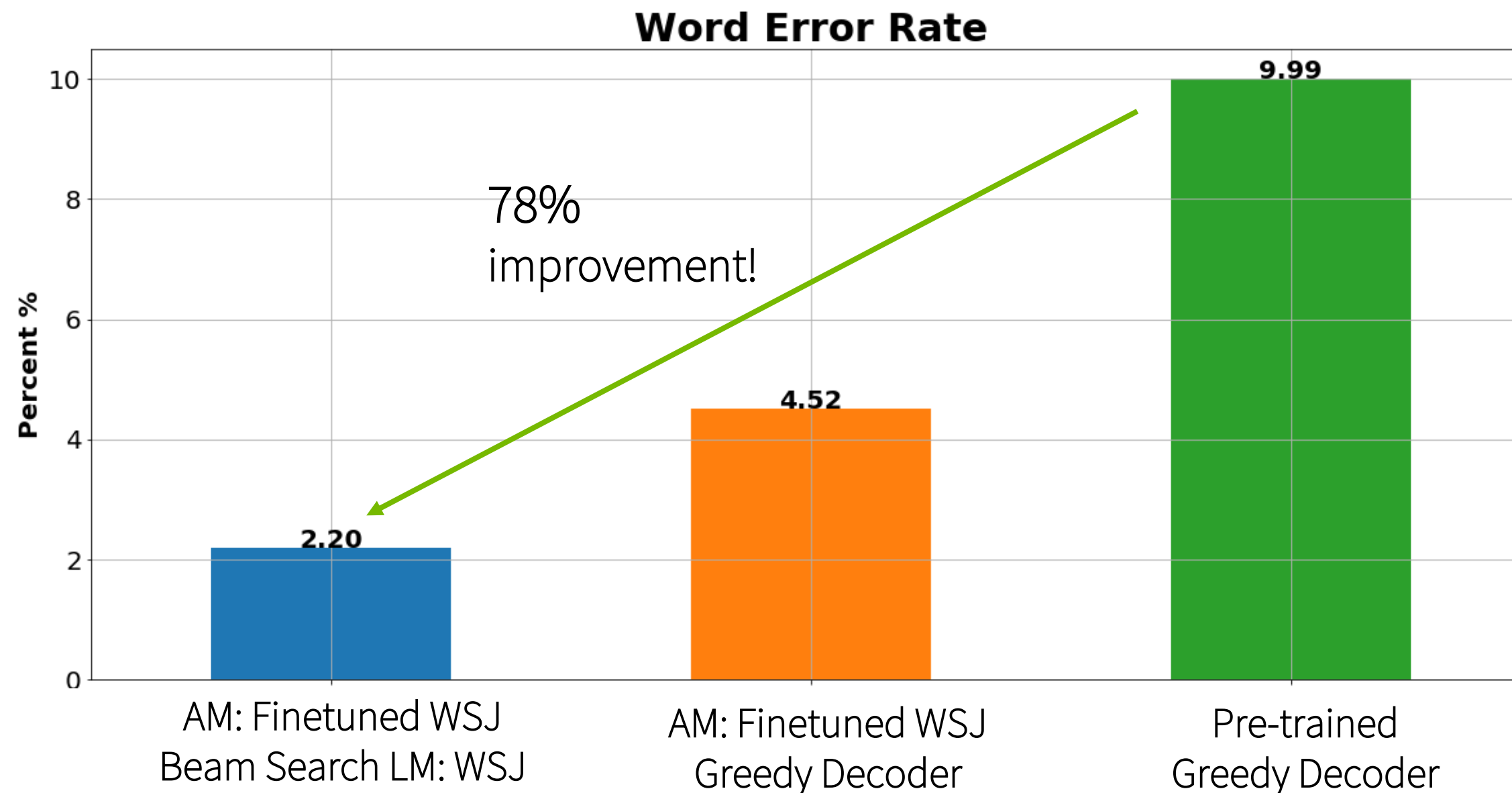
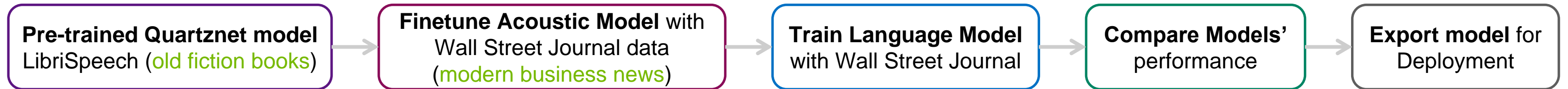
Thousands of gamer comments every day

User ID	Device ID	Version	Qos	System Tags	Feedback	Customer Satisfaction	User Tag	NVDA Tag	Category	Sentiment	NVDA Sentiment	Response D
		<input type="text" value="..."/>			<input type="text" value="search answer..."/>							
182530...	d3a495...	2.0.12.60	link	windows,release	Good afternoon. Please add a game <b>Destiny 2</b>	NA	Game Request	Game Request	content ▾	positive	neutral	10/08/2019 02:20:20
229639...	1f1e19...	2.0.13.54	link	mac,release	Can you add <b>destiny 2</b> . I really want it because my friend is scared of all the scary stuff and we could play together	★★★★★	Game Request	Game Request	content ▾	negative	neutral	10/07/2019 20:04:44
245313...	b96b3c...	2.0.12.60	link	windows,release	Please add <b>Destiny 2</b>	NA	Game Request	Game Request	content ▾	neutral	neutral	10/07/2019 06:44:37
245484...	cfb756...	2.0.12.60	link	windows,release	<b>Destiny 2</b>	NA	Game Request	Game Request	content ▾	neutral	neutral	10/06/2019 13:10:58
207885...	037d51...	2.0.12.60	link	windows,release	<b>Destiny 2</b> steam based	★★★★★	<null>	Game Request	reliability ▾	neutral	neutral	10/06/2019 01:23:38
245399...	030067...	2.0.12.60	link	windows,release	<b>Destiny 2</b>	★★★★★	Game Request	Game Request	content ▾	neutral	neutral	10/05/2019 13:33:06
228028...	afeafd...	2.0.12.60	link	windows,release	<b>Destiny 2</b>	NA	Game Request	Game Request	content ▾	neutral	neutral	10/05/2019 09:38:22
				release	<b>Destiny 2</b>	★★★★★	Game Request	Game Request	content ▾	neutral	neutral	10/04/2019 19:42:21
				se	<b>destiny 2</b> (steam)	NA	Game Request	Game Request	reliability ▾	neutral	neutral	10/03/2019 08:35:25
				release	<b>Destiny 2</b> plz	★★★★★	Game Request	Game Request	content ▾	neutral	neutral	10/02/2019 17:02:04
				release	<b>Destiny 2</b> on Steam	★★★★★	Game Request	Game Request	reliability ▾	neutral	neutral	10/02/2019 15:57:07
				release	add plz <b>Destiny 2</b> and other games.	★	Game Request	Game Request	content ▾	neutral	neutral	10/02/2019 15:50:05
				release	please put the <b>destiny 2</b> again	★★★★★	Game	Game	other ▾	neutral	neutral	10/02/2019 15:50:05



# HOW TO BUILD YOUR OWN DOMAIN SPECIFIC ASR MODELS

[https://ngc.nvidia.com/catalog/containers/nvidia:nemo\\_asr\\_app\\_img](https://ngc.nvidia.com/catalog/containers/nvidia:nemo_asr_app_img)







## Language is Hard

“SIMPLIFY, THEN ADD LIGHTNESS.”  
– COLIN CHAPMAN

# LANGUAGE UNDERSTANDING IMPROVEMENT

Reaching human level

## GLUE Aggregate Score

Detect grammatical errors

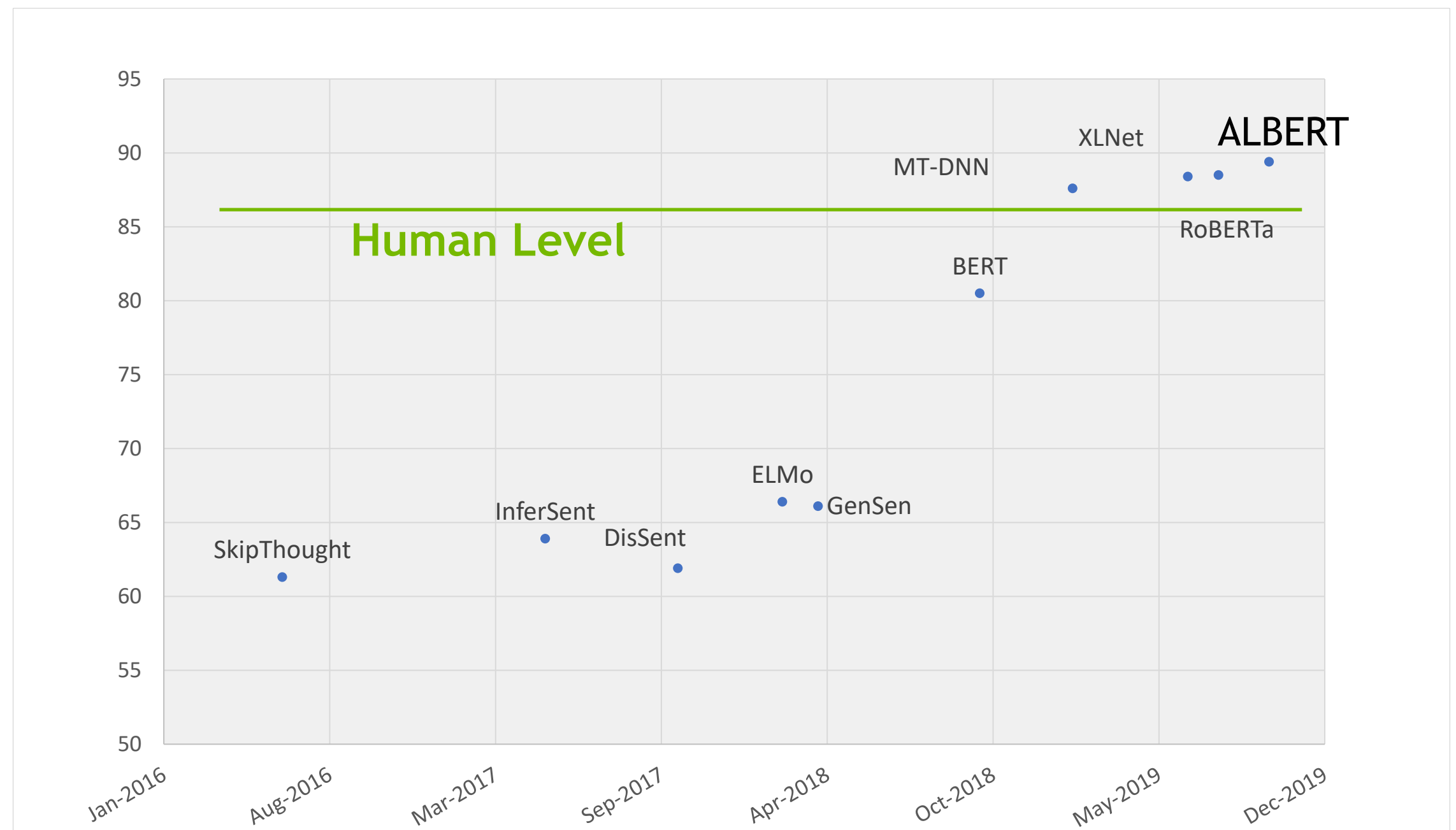
Predict if movie review is positive or negative

Decide if an abstract correctly summarizes an article

Sentence-level Semantic equivalence

Basic reading comprehension

Pronoun disambiguation



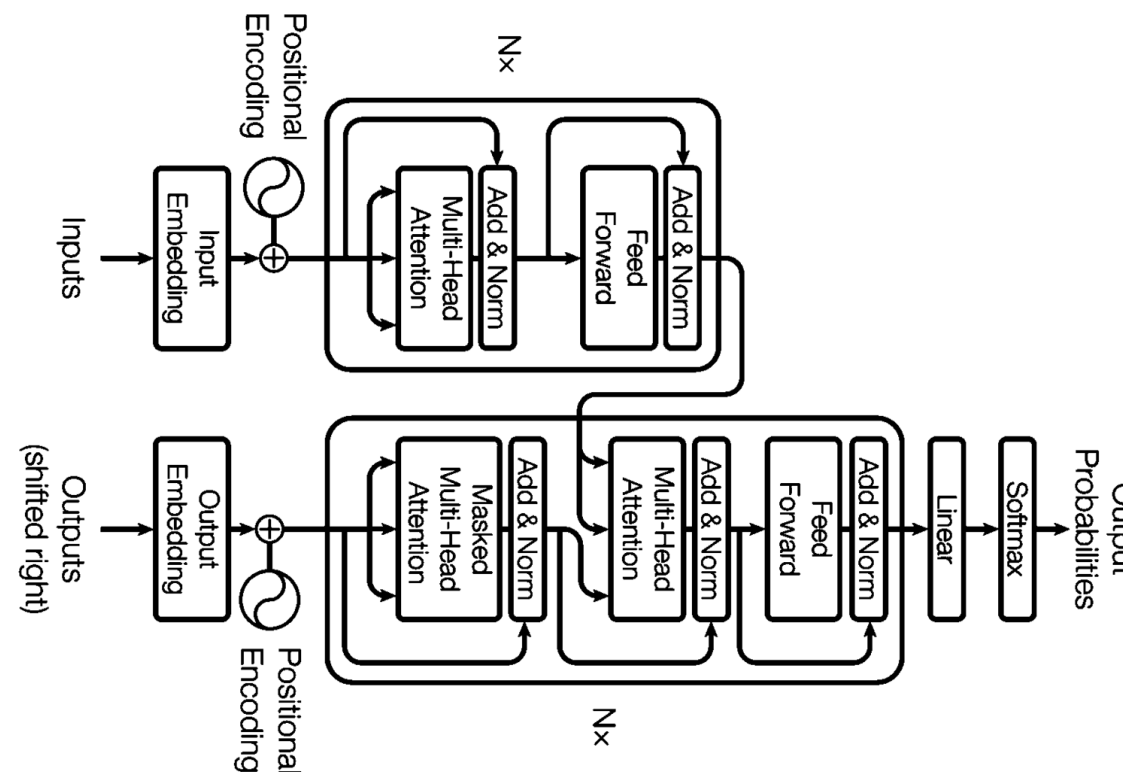
# NATURAL LANGUAGE UNDERSTANDING

## BERT universal language model

**Input: Two sentences with 15% of words masked out**

1 = “Initially he supported himself and his [REDACTED] by farming on a plot [REDACTED] family land.”

2 = “[REDACTED] in turn attracted the attention of [REDACTED] St. [REDACTED] *Post-Dispatch*, which sent a reporter to Murray to [REDACTED] review Stubblefield's wireless [REDACTED].”



**Output 1: Reconstruct missing words**

family, of  
this, the, Louis, personally,  
telephone

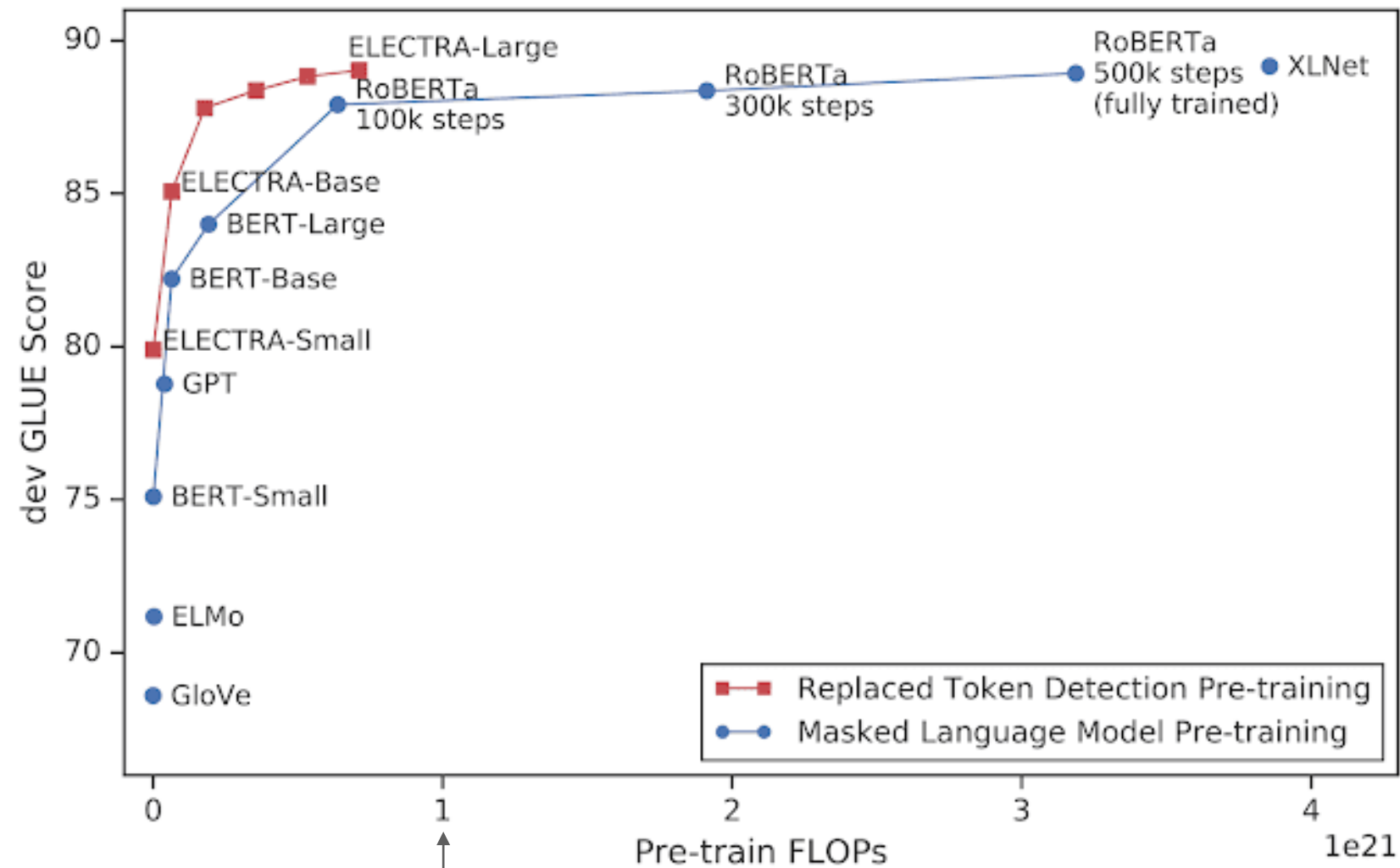
**Output 2: Is two the next sentence after one?**

NOT\_NEXT\_SENTENCE

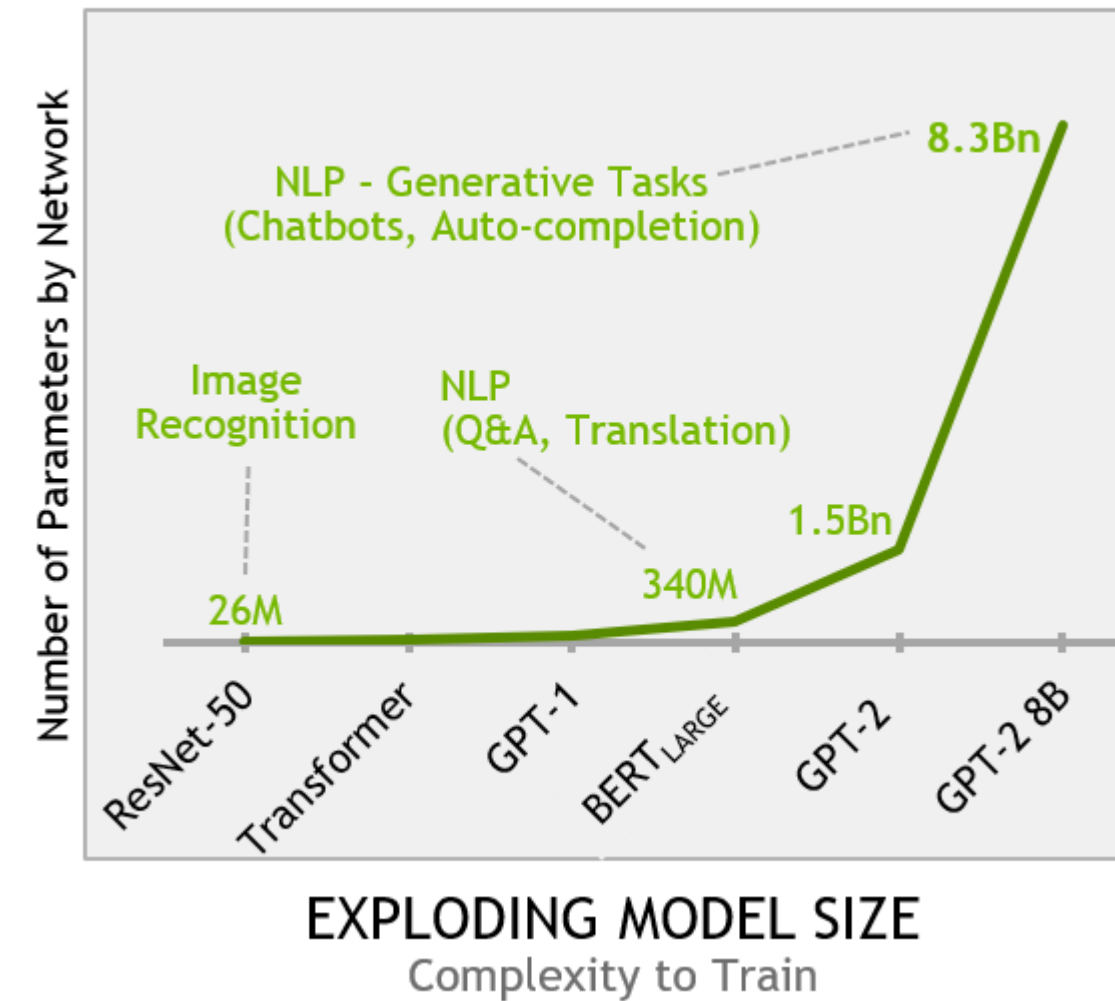
<https://arxiv.org/abs/1810.04805>

# NLP MODELS ARE LARGE

The Training and Inference cost is high



1 Zettaflop = 1,000 Exaflops





# DL FRAMEWORKS

TensorFlow, PyTorch, etc.

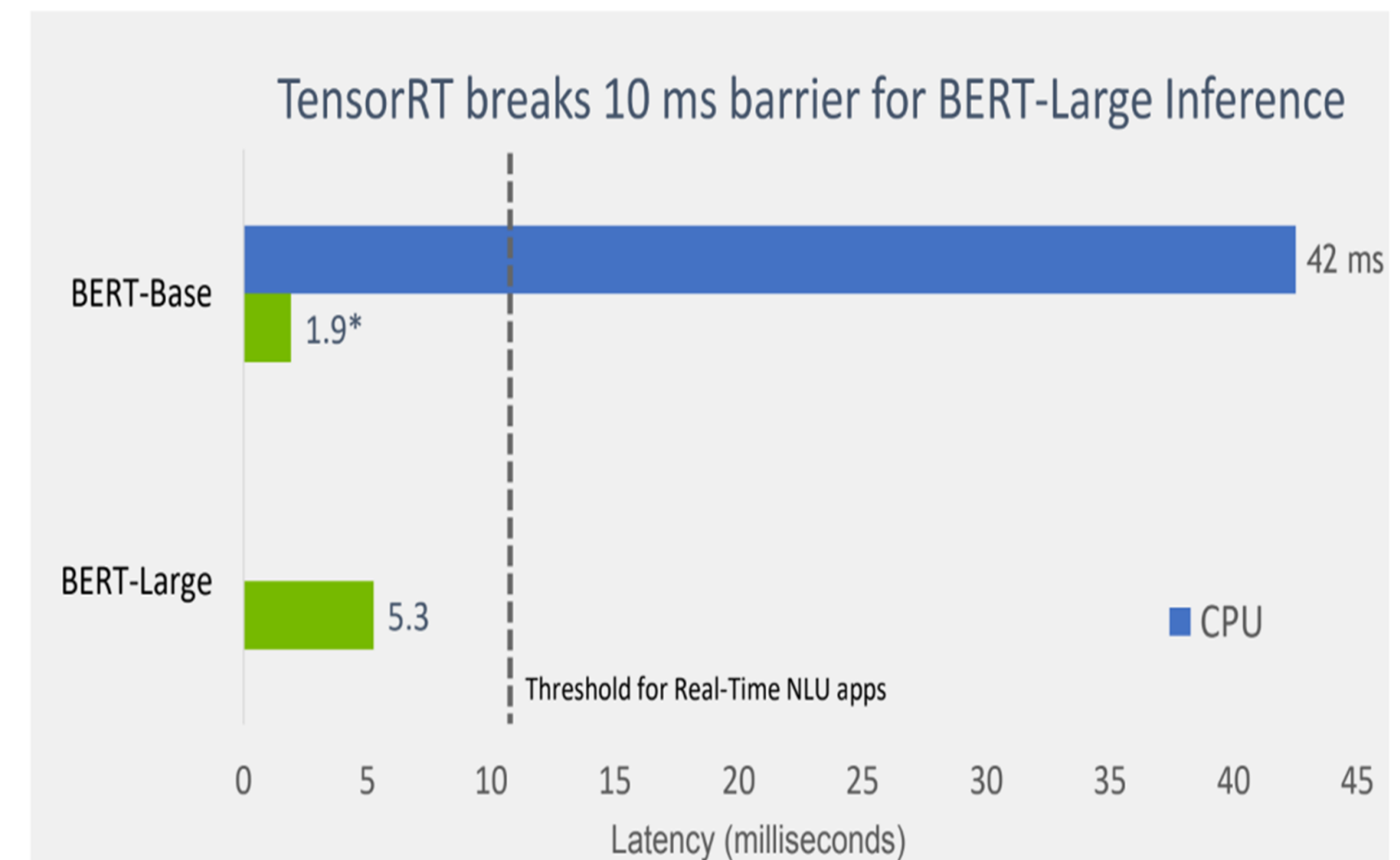
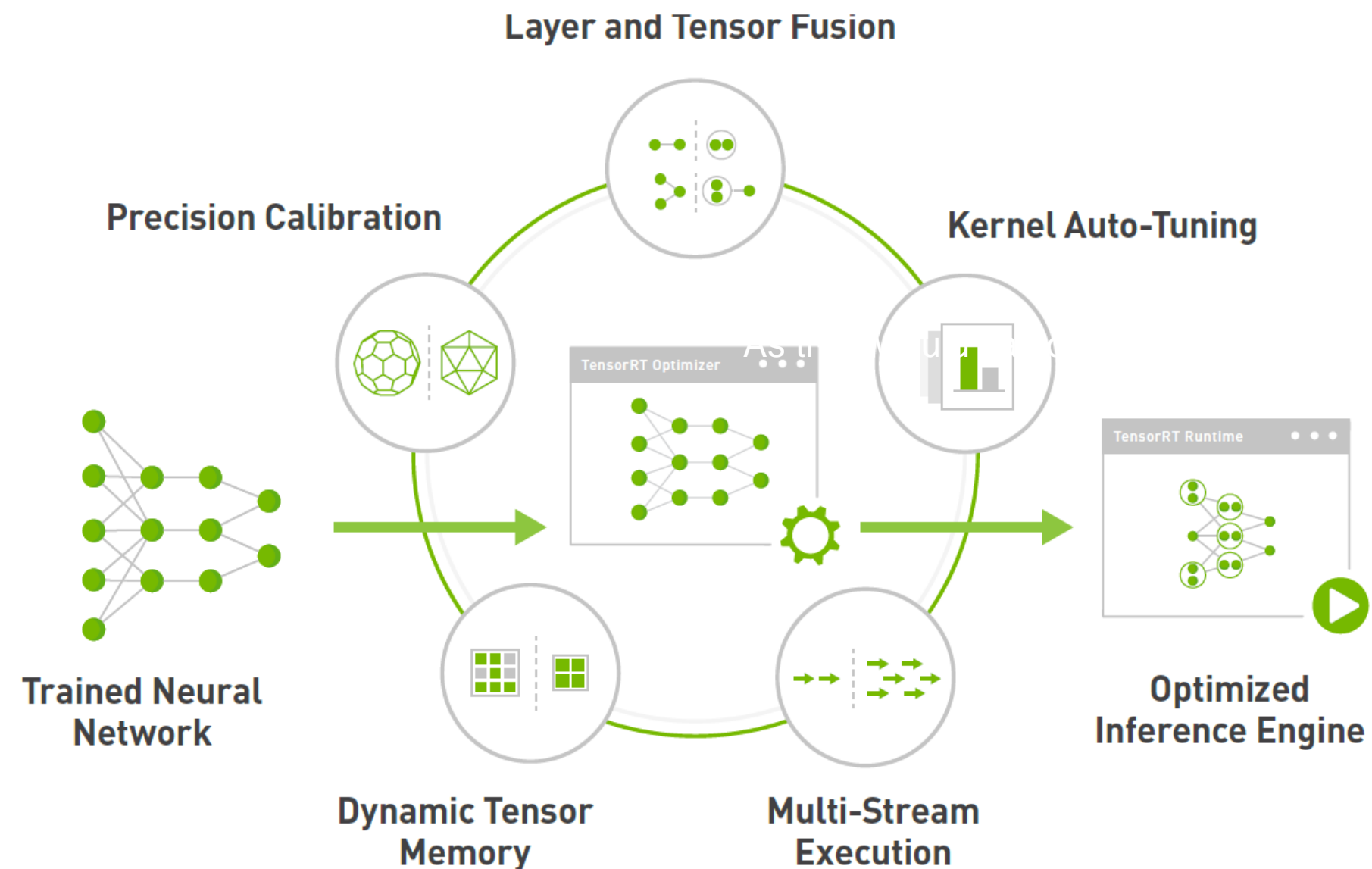
- System to move, manipulate, debug, monitor, and **perform operations on general tensors**.
- Must be able to handle **multiple / general operations**, back-prop, and stochastic methods.
- Underlying framework code **object-y** and **designed for feature growth / rapid development**.
- We can and do still accelerate this with GPUs, but

**THESE THINGS ADD COMPLEXITY AND WEIGHT, SLOWING DOWN RUNTIME INFERENCE.**

- We can speed this up by applying Colin Chapman's principles.

# SIMPLIFICATION AND THE ADDITION OF LIGHTNESS.

Via TensorRT\*



\* In our tests, OpenVINO Release 2019 R2 did not execute BERT-Large and exited with an error

[BERT Sample Code in TensorRT Repo](#)

[Jupyter Python Notebook](#)

[Blog: Real-Time Natural Language Understanding with BERT Using TensorRT](#)

\*As they would say on the BBC, other solutions may be available

Available at <https://developer.nvidia.com/tensorrt>



CLOSING

# CLOSING THOUGHTS

## Recap

Unless you want to fight the physics at the bleeding edge of trading, **you need to be working smarter.**

We can use AI to **augment our discretionary traders** and incorporate **AI** into our trading algorithms.

**NLP methods have advanced** via Bert class models, and we can optimize them to run in the millisecond realm.



# CLOSING THOUGHTS

## Conclusion

Unless you want to fight the physics at the bleeding edge of trading, you need to be working smarter.

We can use AI to augment our discretionary traders and incorporate AI into our trading algorithms.

NLP methods have advanced via Bert class models, and we can optimize them to run in the millisecond realm.

**Your competition will have augmented traders and AI trading algorithms.**

**Failure to compete in this space will have the expected results.**



QUESTIONS?  
[FINANCE@NVIDIA.COM](mailto:FINANCE@NVIDIA.COM)

# MEET SOME FINBERTS

Not an exhaustive list

Bottom line - it's not terribly difficult to start building your own.

With a human in the loop approach to slowly correcting / building additional training data, it is straightforward (almost easy) to get a custom model that is deeply relevant to the things you care about. And that improves over time.

- Prosus -- <https://github.com/ProsusAI/finBERT>
  - <https://medium.com/prosus-ai-tech-blog/finbert-financial-sentiment-analysis-with-bert-b277a3607101>
- Psnonis -- <https://github.com/psnonis/finbert>
- Araci -- <https://arxiv.org/abs/1908.10063>
- Yang, Uy, Huang -- <https://arxiv.org/abs/2006.08097> and <https://github.com/yya518/FinBERT>
- Liu, Huang, Huang, Li, Zhao -- <https://www.ijcai.org/Proceedings/2020/0622.pdf>
- Abhijeet Kumar -- <https://pypi.org/project/finbert-embedding/>