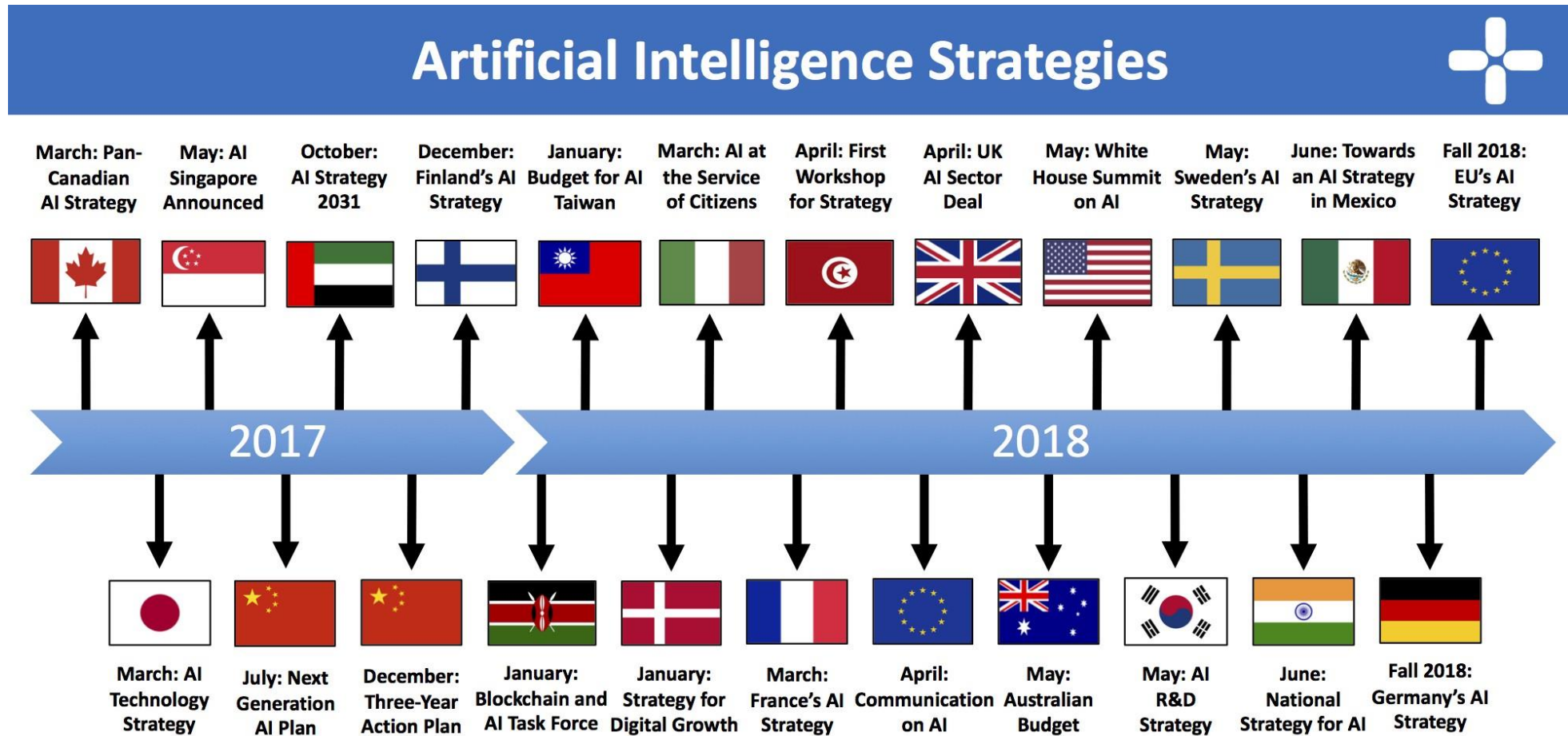


Data Science Research Trends

Yogesh Kulkarni

Government Policies



AI Conference or Pop Concert?



NIPS @NipsConference · 4m
#NIPS2018 The main conference sold out in 11 minutes 38 seconds

3

21

25



(Ref: NIPS Tickets Sell Out in Less Than 12 Minutes - Synced)

History of Deep Learning Ideas

- 1943: Neural networks (Walter Pitts and Warren McCulloch)
- 1957-62: Perceptron (Frank Rosenblatt)
- 1970-86: Backpropagation, RBM, RNN
- 1979-98: CNN, MNIST, LSTM, Bidirectional RNN
- 2006: “Deep Learning”, DBN
- 2009: ImageNet + AlexNet
- 2014: GANs
- 2016-17: AlphaGo, AlphaZero
- 2017: 2017-19: Transformers

In recent past...Imagenet..

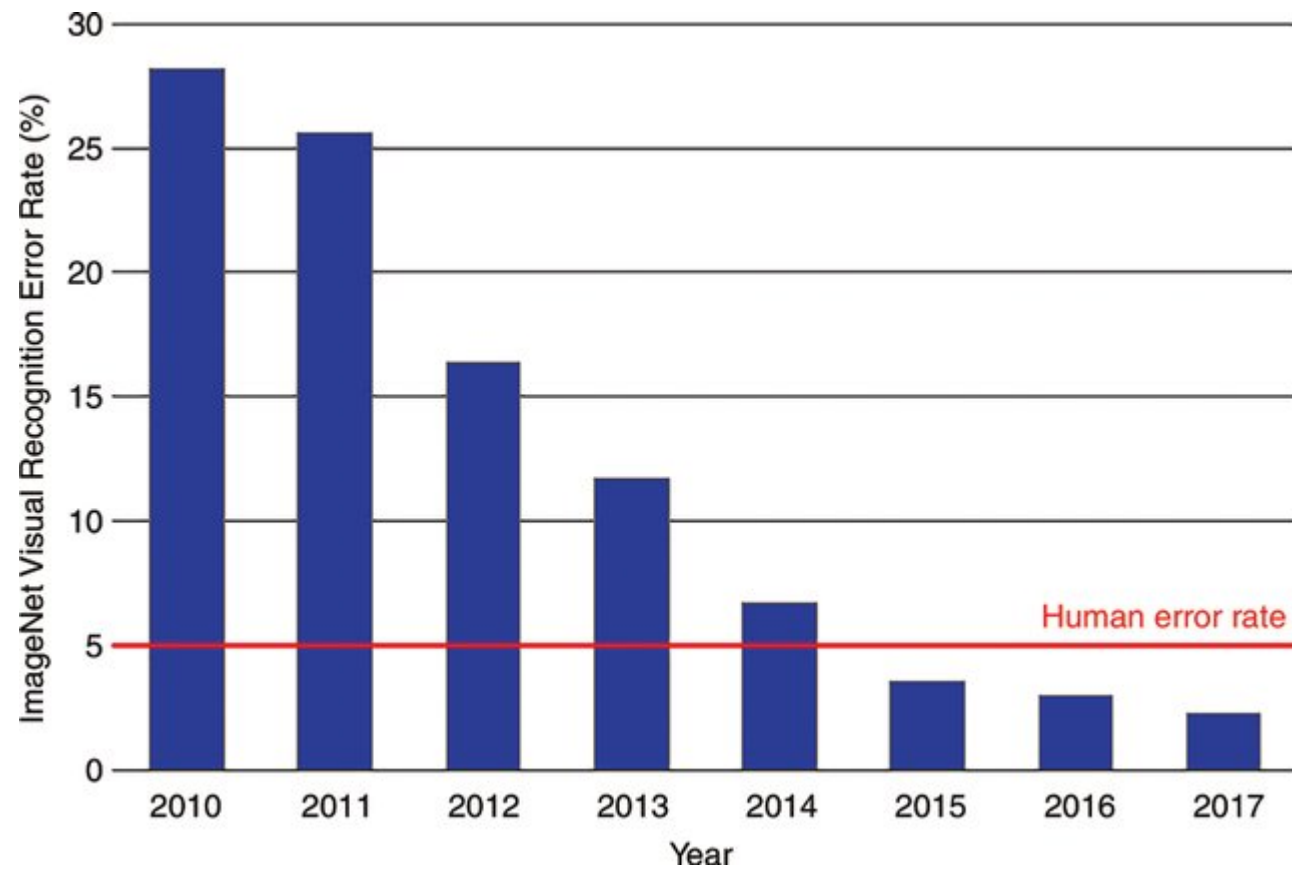


Image Captioning Challenge

A person riding a motorcycle on a dirt road.



Two dogs play in the grass.



A skateboarder does a trick on a ramp.



A dog is jumping to catch a frisbee.



A group of young people playing a game of frisbee.



Two hockey players are fighting over the puck.



A little girl in a pink hat is blowing bubbles.



A refrigerator filled with lots of food and drinks.



A herd of elephants walking across a dry grass field.



A close up of a cat laying on a couch.



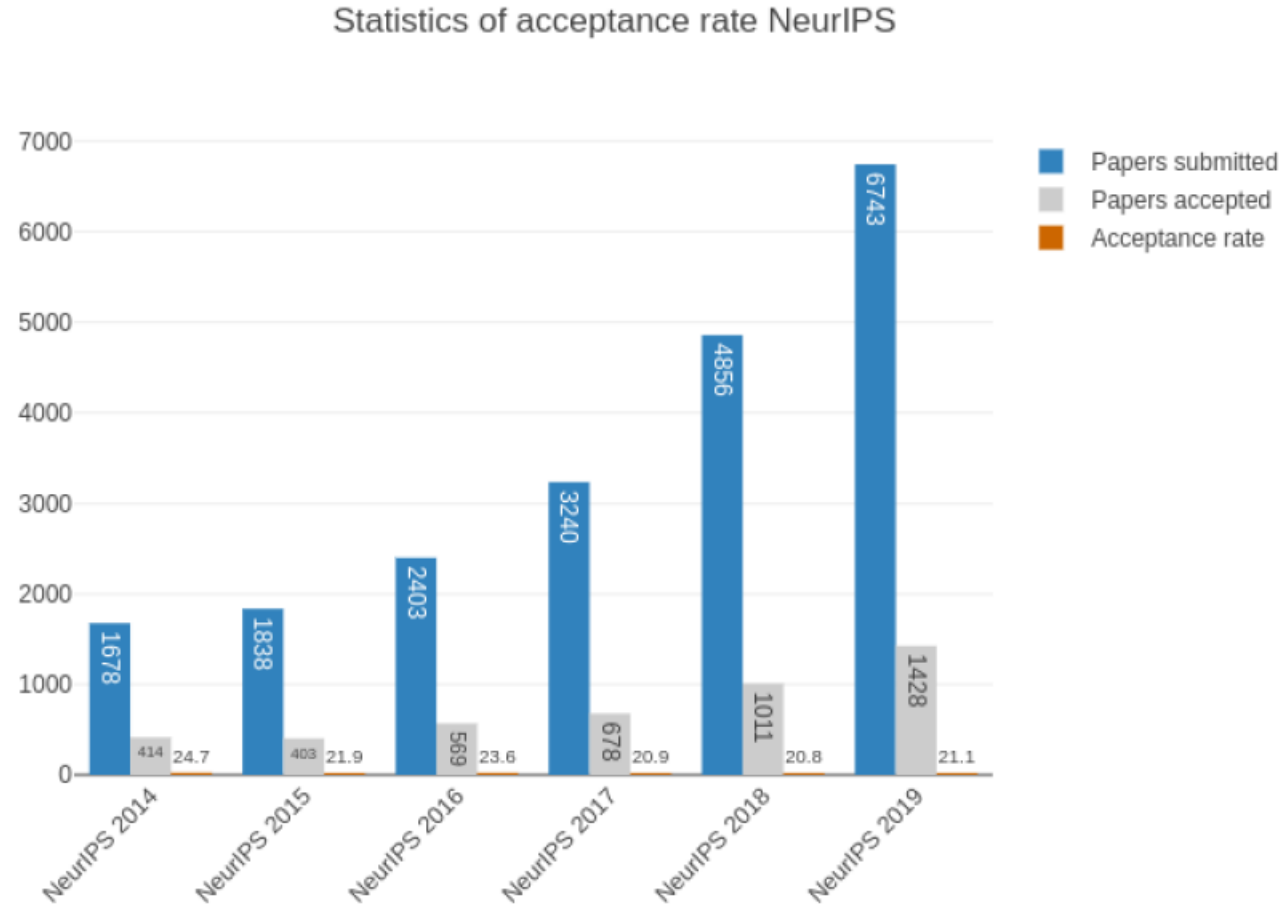
A red motorcycle parked on the side of the road.



A yellow school bus parked in a parking lot.



Research Community is growing



Gartner Predicts

Hype Cycle for Artificial Intelligence, 2020



gartner.com/SmarterWithGartner

On the Rise

- Artificial General Intelligence
- Small Data
- Generative AI
- Responsible AI
- Augmented Intelligence
- AI Governance

At the Peak

- Smart Robots
- Data Labeling and Annotation Services
- Knowledge Graphs
- Edge AI
- AI Cloud Services
- Deep Neural Networks (Deep Learning)
- Natural Language Processing (NLP)

Sliding Into the Trough

- Machine Learning
- Chatbots
- Computer Vision
- Autonomous Vehicles
- Cognitive Computing

Hope for the future

- Active learning and life-long learning
- Multi-modal and multi-task learning
- Open-domain conversation
- Applications: medical, autonomous vehicles
- Algorithmic ethics
- Robotics

On the ground



- Eager execution by default (imperative programming)
- Keras integration + promotion
- Cleanup (API, etc.)
- TensorFlow.js
- TensorFlow Lite
- TensorFlow Serving



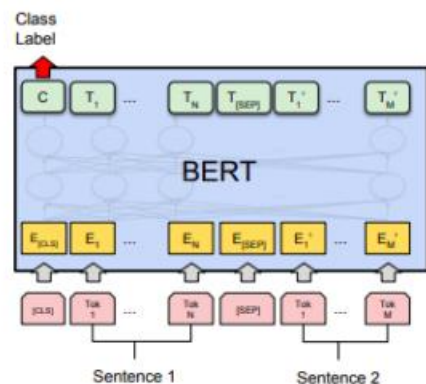
- TorchScript (graph representation)
- Quantization
- PyTorch Mobile (experimental)
- TPU support

Python 2 support ended on Jan 1, 2020.

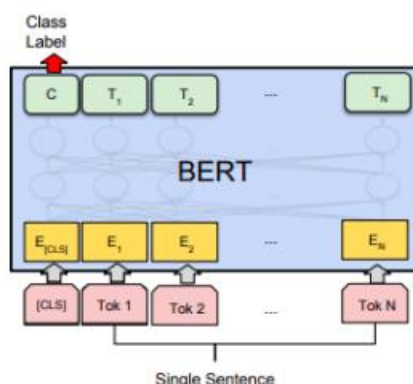
```
>>> print "Goodbye World"
```

NLP

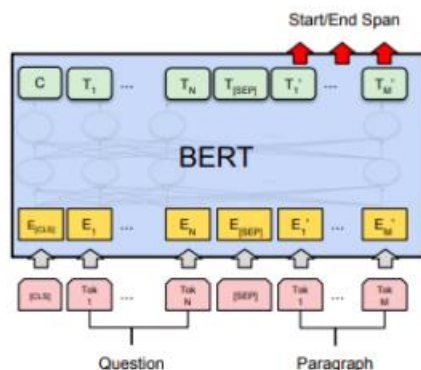
BERT Applications



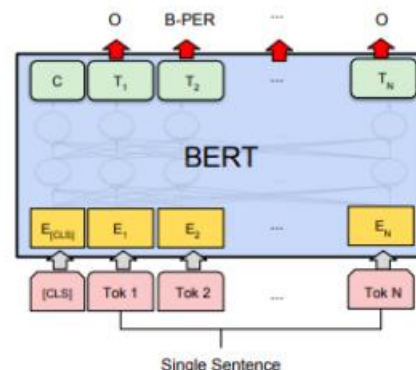
(a) Sentence Pair Classification Tasks:
MNLI, QQP, QNLI, STS-B, MRPC,
RTE, SWAG



(b) Single Sentence Classification Tasks:
SST-2, CoLA



(c) Question Answering Tasks:
SQuAD v1.1



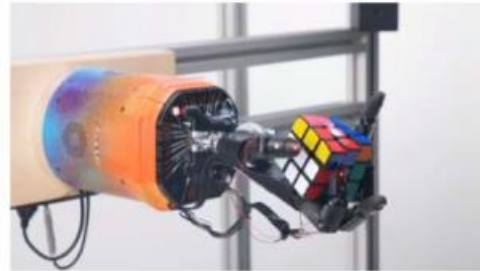
(d) Single Sentence Tagging Tasks:
CoNLL-2003 NER

Now you can use BERT:

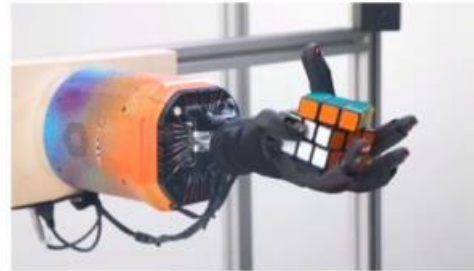
- Create contextualized word embeddings (like ELMo)
- Sentence classification
- Sentence pair classification
- Sentence pair similarity
- Multiple choice
- Sentence tagging
- Question answering

Reinforcement Learning

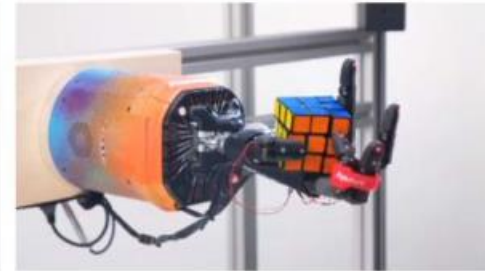
OpenAI Rubik's Cube Manipulation



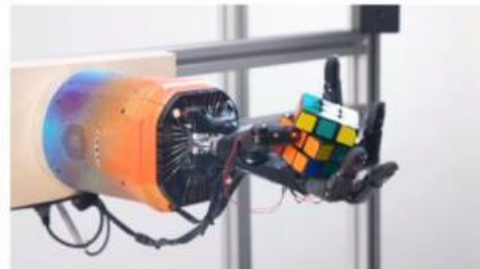
Unperturbed (for reference)



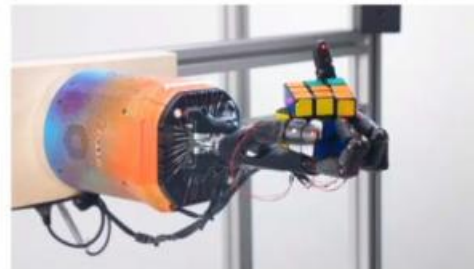
Rubber glove



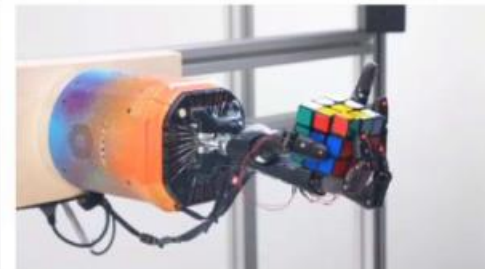
Tied fingers



Blanket occlusion and perturbation



Plush giraffe perturbation



Pen perturbation

Autonomous Cars

Level 2



Human is Responsible

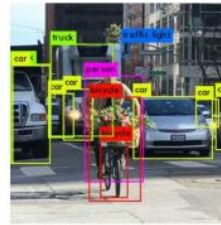
Level 4



Machine is Responsible

Multi-Task Learning

Task 1:
Object Detection



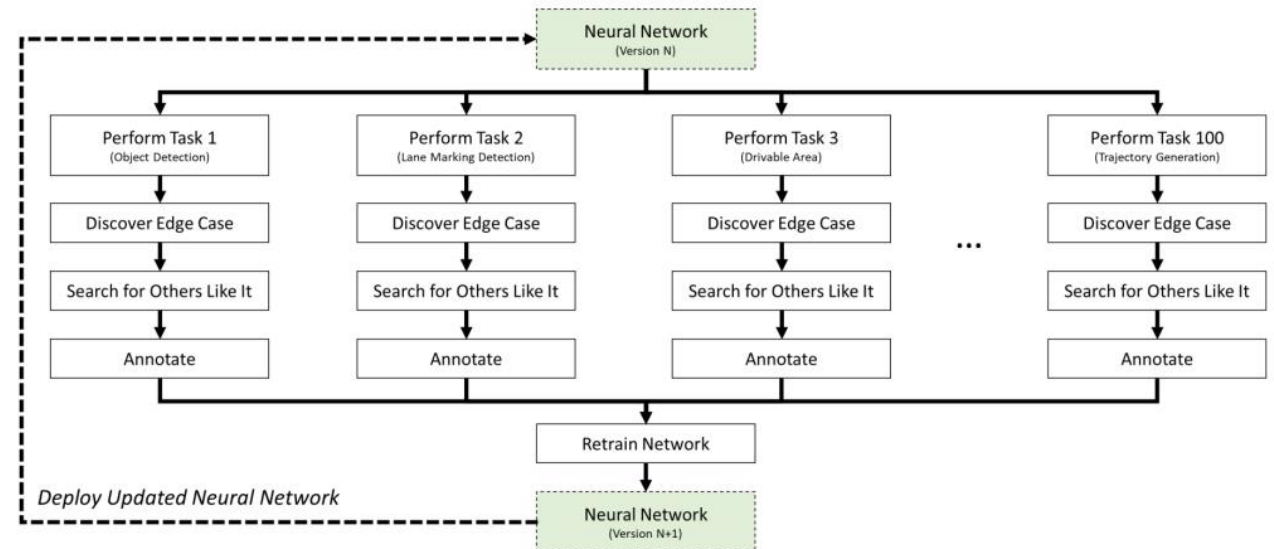
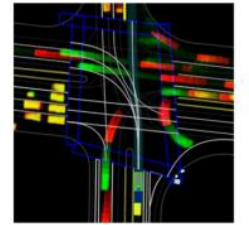
Task 2:
Lane Markings



Task 3:
Drivable Area



Task 100:
Trajectory Generation



Where to look?

- Papers with Code:
 - State of the Art, domain wise
 - Trending, Latest, Top rated ,
 - Look for stars
 - Get code!!
- Two Minute Papers Youtube

References

- Pieter Abbeel: Recent Advances and Trends in Artificial Intelligence | Keynote | ODSC East 2019
- Deep Learning: State of the Art (2020) – Lex Fridman, MIT