Contribution to Knowledge Search in Video Content

Author: Francisco Javier Rodríguez González
Thesis Advisors: Cristina López Bravo, Enrique Costa Montenegro
Ph.D. Program: Information and Communications Technology of the University of Vigo

Motivation

DATA in 2017

Positronic Brain
- 100 PB
- 60 TOPS

Nvidia Xavier
- 30 TOPS
- 20 watts

Google TPU
- 45 TFLOPS

Human Brain
- 1 PB
- 100B neuron
- 1000 conn/neuron
- TEPS 30X faster
- "36800 TOPS"
- 20 watts

Work life data sources:
1. Meetings, notes, audio.
2. Email
3. Study: videos, papers, documentation

V
V
V

Machine Learning
extracts knowledge from data

Brain Augmentation
Cool!

- **HUMAN MEMORY SYSTEM**

Human Memory: The Processing of Information. Loftus & Loftus E. ISBN: 0-89859-135-X

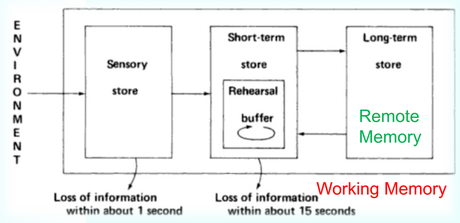
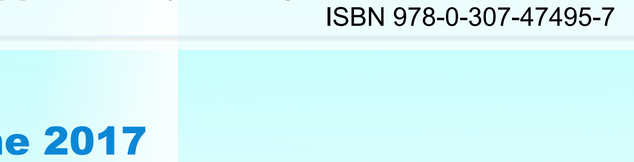


Figure: Two-Store Memory model *Atkinson & Shiffrin, 1968*

MOOC Learning How to Learn: Powerful mental tools to help you master tough subjects

Brain modes: Focused and Diffuse



FACTS#2
- Malleable, un-reliable
- Associations to remember
- Memories are composite
- Recording: Slow process of repetition and retrieval

Thesis Objectives

Define a software Architecture that is able to **assist in Knowledge recording and retrieval**, searching in previously studied content: video, audio, image, text, etc, creating associations and becoming "The Memory augmentation" to control the fast paced digital world as a source of information

OBJECTIVES

- Web Scale, multitenant, micro-services
- Leverage Cloud, Open Source [Apache license]
- Multimodal learning
  - ✧ OCR, voice transcripts, sentiment
  - ✧ Image, scene recognition
- **Simple** user interface

USE CASES

Cool Search
AWS growth
in Keynote

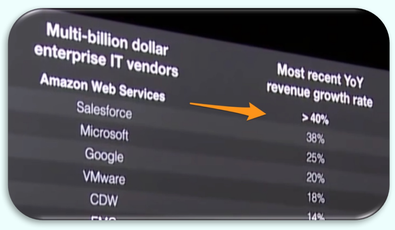


Figure Source: AWS re:Invent 2014 Day 1 Keynote with Andy Jassy

Cool Search: Nobel prize in Kindle Book
Cool Search: Summary of meeting Friday PM
Cool Search: GCP 2016 Keynote issue

Research Plan

1. Study ML State of the Art (SOTA) ✓
   - I. Academic research perspective ✓
   - II. Start-ups perspective ✓
2. Study Text summarization ✓
   - I. Abstractive, extractive ✓
3. Study Cloud APIs ✓
4. Build a Storm Sandbox ✓
   - I. Cloud ingest optimization(RT) ✓
   - II. Scalability, HA experiments ✓
5. Re-define Architecture ✓
   - I. Definition: Knowledge Assistant ✓
   - II. Simplify:+ Open Source + Cloud ✓
   - III. Metadata/associations ✓
   - IV. System output and search interface ✓
   - V. Develop functional prototype ✗

Results and Discussions

TRAINING

TechIgnite Cybersecurity and ML
Data Science: Data to Insights
AWS Summit SF. Alexa sessions
Lots of brain research [cognition, memory, nutrition]

CLOUD LAYER 1.0

Number 1 project in GitHub
GOOD DECISION

Google Cloud Platform TensorFlow

Speech API: transcribing

```
cool@cool-VirtualBox:~/python-docs-samples/speech/cloud-client$ python transcribe.py ~/Downloads/How\ we\ can\ find\ ourselves\ in\ data\ _\ Giorgia\ Lupi.raw
Transcript: she came to us with a lot of data but ultimately she wanted to tell one of the most Humane stories possible she is someone taking stuff she has been the first Italian woman astronaut and she contacted us before being lunch on a six-month-long expedition to the International Space Station
cool@cool-VirtualBox:~/python-docs-samples/speech/cloud-client$
```

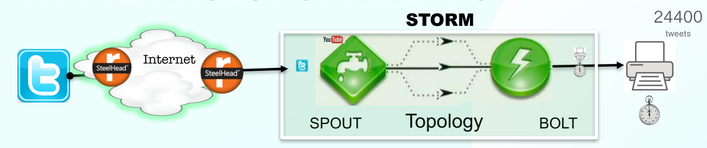
Sequence to Sequence: training [mode=train], summarizing [mode=decode]

```
cool@cool-VirtualBox:~/Desktop/textsum$ python3 seq2seq_attention.py --mode=train --article_key=article --abstract_key=abstract --data_path=data/data --vocab_path=data/vocab --log_root=log_root --train_dir=log_root/train
WARNING:tensorflow:<tensorflow.contrib.rnn.python.ops.core_rnn_cell_impl.LSTMCell object at 0x7f11771e0c88>: Using a concatenated state is slower and will soon be deprecated.  Use state_is_tuple=True.
WARNING:tensorflow:<tensorflow.contrib.rnn.python.ops.core_rnn_cell_impl.LSTMCell object at 0x7f11771e0cc0>: Using a concatenated state is slower and will soon be deprecated.  Use state_is_tuple=True.
```

Article: gulf newspapers voiced skepticism Thursday over whether newly re - elected us president bill Clinton could help revive the troubled middle east peace process but saw a glimmer of hope
Human: gulf skeptical about whether Clinton will revive peace process
Machine: gulf press skeptical over Clinton's prospects for peace process

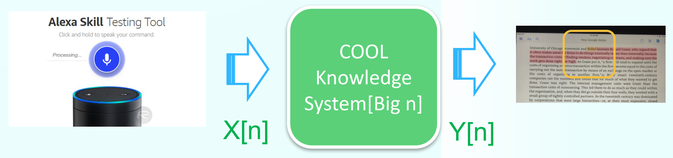
How to improve?: Professor *Andrew NG:*
1. Get more data [to do]
2. Add layers to NN
3. Improve the system [to do] → *SalesForce Research breakthrough [6]*

TWITTER INGEST OPTIMIZATION



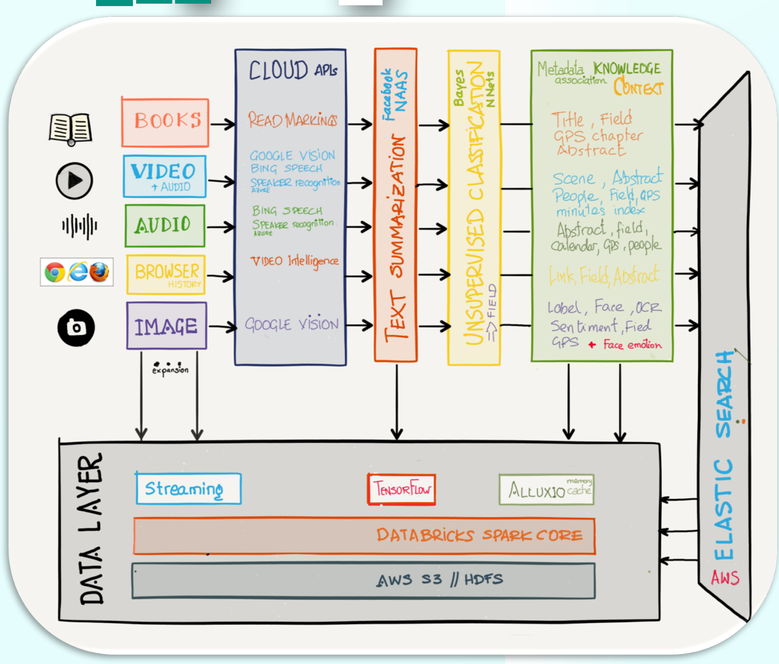
- Additional this year Anycast-Unicast comparison

USER INTERFACE EXPERIMENTATION



ARCHITECTURE re-definition Take3: Cloud APIs

EMOTION API API: VISION, SPEECH, VIDEO INTELLIGENCE



Next Year Planning

- Finish twitter ingest optimization
- Improve performance of Summarization
- Experiment with Google Home
- Clustering knowledge. Metadata fine tune

Last Year Planning
- ✗ Finish paper twitter ingest optimization
- ✓ Continue studying ML, TensorFlow
  End of SOTA research:= Implementation
  - ✓ 1) Cloud intelligence layer
  - ✓ 2) Text summarization
  - ✗ 3) Sparse FT for Clustering

References

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[2] Self comes to Mind. *Damasio.* ISBN 978-0-307-47495-7
[3] The memory Advantage, *Crook, Ph.D.* ISBN 978-0-307-47495-7
[4] A multi-modal parcellation of human cerebral cortex DOI: 10.1038/nature18933
[5] Text summarization with TensorFlow. Google Research. Github repository: [Link]
[6] A Deep Reinforced Model for Abstractive Summarization Paulus, Xiong, Socher. May 2017. arXiv:1705.04304v2