Large-Scale Initiatives at CMU

Simon Initiative
&
Yahoo! InMind
Carnegie Mellon University

The Simon Initiative
CMU’s distinctive ecosystem
The Future of Personalization

1. Learning about the world
2. Learning about the user
3. Making inferences on the basis of learned input / inferring user behavior
4. Creating compelling personalized experiences for user based on inferences
5. Making those compelling experiences accessible anytime anywhere
The Opportunity; Yahoo!

• Draw together state-of-the-art results across CMU to
• Build next-next-generation intelligent mobile assistant
  – demonstrate and test it on 100s or 1000s of opt-in users
• Study fundamental research issues in vivo
• Sensor-effector agents, interacting routinely with people, learning continuously

• Nobody can do this better than CMU
What about Siri, Google Now, and Cortana?

• Leapfrog Siri, Google Now by designing prototype system for 2020-2025
  – assume lots of computation available per phone
  – assume instrumented environment?
  – assume accurate, high coverage background knowledge and perception

• Develop very different functionality
  – long-term assistance instead of immediate information query
    (eg. help me organize this conference)
  – based on ability to perceive everything, read everything
  – including novel instrumented infrastructure
  – including ability for users to teach the assistant new tasks
  – <your idea here>
The Yahoo! InMind Project

• Build a working InMind agent, fielded to opt-in users
  – give away 1000 phones
  – early 2015: first prototype based on Yahoo! News variant
  – May 2015: first implementation of more general architecture

• Integrate world-class CMU research into InMind
  – invite all relevant research, fund those we can (10 + 5)
  – $100k/year projects, overhead free, including PhD student designated Yahoo! Fellow
  – Each project must contribute working software that works with others
  – 2 projects of each yearly batch may be pursued as research agreements

• Yahoo! support includes
  – software infrastructure to host our opt-in software worldwide
  – data feeds for Yahoo! News, Finance, Sports, Weather, etc.
  – collaborations with their top experts
  – $10M over five years
Learning about the world: NELL Reading the Web

**Problem:** Learn to read the web

**Approach:** Never ending learning, 24x7, since 2010

**Results so far:** knowledge base of 70M beliefs, reading skills still improving

**Next steps:** Personal reading assistant, including news, emails, calendar, …

fragment of NELL’s 70M beliefs automatically read from the web

Tom Mitchell

- Knowledge about the World -

Carnegie Mellon University
NEIL: Never Ending Image Learner

Running 24 hours a day, 7 days a week

Build Visual Models

Learn Common-Sense Relationships

- Wheel is a part of Car
- Eye is a part of Baby
- Helicopter is found in Airfield
- Zebra is found in Savanna
- Trading Floor are Crowded
- Wheels have round shape

Running since July 2013 on 200-core Cluster

- Analyzed 6 million images
- Labeled 700K images
- 2500 Concepts
- 3000 Relationships

Abhinav Gupta

- Knowledge about the World -

Carnegie Mellon University
Making Inferences: Reasoning at scale over millions of beliefs

**Problem:** Automatic reasoning over large knowledge graphs

**Approach:** Discover and apply 1000’s of rules, based on random walks

**Results so far:** effective and routinely used over NELL’s 70M beliefs

**Next steps:** Reason over combined knowledge about user and external world

Random Walk Inference over NELL’s knowledge suggests “Pittsburgh” is probably “Located In” the country “U.S.”

William Cohen

Carnegie Mellon University
Learn user news preferences

Trade off:
1) Show articles user will like
2) Show articles to discover what else user will like

1) Use learned model of user
2) Use uncertainty about learned model to decide which next article to show

Emma Brunskill
Hi, I’m on vacation in LA and was hoping to find a good place for lunch tomorrow.

Which part of LA are you in?

Westwood, over by UCLA

I would try Pizzacotto

How far away is it?

It’s across 405 on San Vincente

I believe you can walk there.

Facts about Joe:
- Allergic to shellfish
- Often chooses Italian food
- Enjoys walking places

contextual memory
Chorus
deploying for data-driven automation

Automatic:
- Response Suggestions
- Real-Time Training
- Context Identification
- Memory Curation

Walter Lasecki, Alan Ritter, Kenneth Huang, Tom Mitchell, and Jeffrey Bigham

Jeff Bigham

- Compelling Experiences -> Learn about User
Persistent
Ubiquitous
Anytime
Anywhere
Assistance

- Compelling Experiences Anytime Anywhere -

Justine Cassell

Carnegie Mellon University
Computational Intimacy

- Compelling Experiences Anytime Anywhere -

Chris Harrison

Carnegie Mellon University
Info Bulb screws into traditional light fixture and allows illuminated surfaces to be touch sensitive with dynamic graphics (rectified to the world’s geometry appropriately). Voice, gestures and object detection are supported and intertwined into the user experience.

Zensors

Creating interfaces in the world, where and when we need them

Chris Harrison & Robert Xiao

Carnegie Mellon University