Research Summary

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- Director, NTU IoX Center, featuring global research collaboration among MOST/Taiwan. NTU, Intel, Delta, and local industry.
- Professor, Computer Science and Information Engineering/Graduate Institute of Networking and Multimedia at National Taiwan University.
- President of Taiwanese Association for Artificial Intelligence (2013-2014)
- Her research interests include artificial intelligence, internet of things, crowdsourcing, intelligent agents, intelligent data analysis, commonsense knowledge, and context-aware computing.
Research Topics

• Common Sense Knowledge Base
  • knowledge mining
  • machine learning
  • crowdsourcing

• Smart Internet of Things
  • activity recognition
  • context-aware computing

• Social Robots for Elder Care
  • affective computing
  • human-robot co-learning
State-of-the-art Commonsense Knowledge Bases

ConceptNet

WordNet

- Space
  - In general
  - Dimensions
  - Form
  - Motion
- Hyponymy
- Synonymy
- Size
  - Reduction, deflation, shrinkage, curtailment, condensation...
- Space
  - Distance
  - Interval
  - Contiguity
ConceptNet

Knowledge about 台北101

Similar concepts:

- 台北101 是一種 地標。
- 台北101 是一種 大樓。
- 台北101 是一種 建築物。
- 台北101 是一種 藝術。
- 你可以在 台北市信義區 找到 台北101。
- 你可以在 台北 找到 台北101。
- 在 台北101，你會 吃飯。
- 在 台北101，你會 看煙火。
- 在 台北101，你會 照相。
- 在 台北101，你會 盒倉。
- 在 台北101，你會 跳命。
Crowdsourcing Common Sense Knowledge

• GWAP + Knowledge Mining
  – Precision
  – Sustainability
  – Resource-bounded
  – Real-time
Q. When cooking, which appliance do you use?: ____

New assertions are generated.

Q. When cooking, which appliance do you use?: ____

a virtual pet on the web

microwave
electric pot
oven
...

crowds

iAgents@NTU
Effectiveness of Knowledge Collection


### General concept

<table>
<thead>
<tr>
<th>Concept</th>
<th># of sentences</th>
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<tr>
<td>运動 sport</td>
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<tr>
<td>食物 food</td>
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### Specific concept

<table>
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<td>籃球 basketball</td>
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</tr>
<tr>
<td>紅蘿蔔 carrot</td>
<td>142</td>
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</table>

Only 2/3 new assertions!!!
Common Sense Knowledge for Language Learning
• **VoiceTranscriber** is a mobile crowd-powered system for summarizing stories from recorded voices that relies on the human abilities of discrimination and expression.

PicMemory:
Enriching Intergenerational Family Interaction and Memory Collection

• PicMemory, an interactive mobile application for enriching the family interaction and collaboratively collecting family stories among family members.
Enhancing Diversity and Coverage of Crowd-Generated Feedback through Social Interaction

This work suggests that collaborating with other people could generate greater diversity and coverage of feedbacks for facilitating paper revision.

Group Collaboration Strategies

**Individual Work**
- Simple and easy to scale

**Sequential Work**
- Existing feedbacks enable **learning** from others

**Simultaneous Work**
- Social awareness guides **to avoid duplication conflicts**
Activity Recognition

- Location tracking
- Activities of daily living
- Concurrent chatting activity recognition
- Social engagement
Chatting Activity Recognition

Audio Stream

Audio Stream

Audio Stream

Audio Stream

Reasoning

Concurrent Chatting Activity Recognition

[Lian & Hsu, IJCAI-09]
Probabilistic Learning

• Use FCRFs probabilistic model to conduct inference and learning from the patterns of multiple concurrent chatting activities.
Environment Sensing
Results: Irrelevant Appliance Detection

- Appliance and activity in the experiment are highly related.
- Irrelevant appliance could be easily detected.

<table>
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<tr>
<th>appliance</th>
<th>laptop</th>
<th>electric fan</th>
<th>dehumidifier</th>
<th>refrigerator</th>
<th>air conditioner</th>
<th>exhaust fan</th>
<th>hit</th>
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<th>precision (%)</th>
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<td>100</td>
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</tbody>
</table>

false alarm miss hit precision (%) recall (%)
Abnormal Activity Pattern

[Graphs showing topic proportions and entropy zero order for a specific date (2014-12-18).]

[Images of a classroom setting with people engaged in activities.]
CrowdButton

- A situated micro-volunteering system allowing passersby to report the activity status of a room by clicking a button for improving common space utilization

ACB Conceptual Framework

- Enhance interpretation of perceived signals
  - Be more sensitive of risky situations or provide future prevention or handling suggestions.

- Make imperceptible to perceptible

- Connect far-field signals to near-field
Human Augmentation APIs
Social Robots for Elder Care
Thank you!

Q & A