SMART TOURISM
Value-added Applications with Deep Learning

TRAVEL & TOURISM'S DIRECT CONTRIBUTION TO GDP		2016 (US$bn)
2	China	275.2
12	Australia	36.9
13	Thailand	36.7
16	Philippines	25.0
	World Average	**19.1**
22	Indonesia	17.0
29	Malaysia	14.0
32	Singapore	12.4
	Southeast Asia Average	12.0
37	New Zealand	9.5
38	Vietnam	9.3
72	Cambodia	2.4

Somnuk Phon-Amnuaisuk, Minh-Son Dao, CIE, Universiti Teknologi Brunei

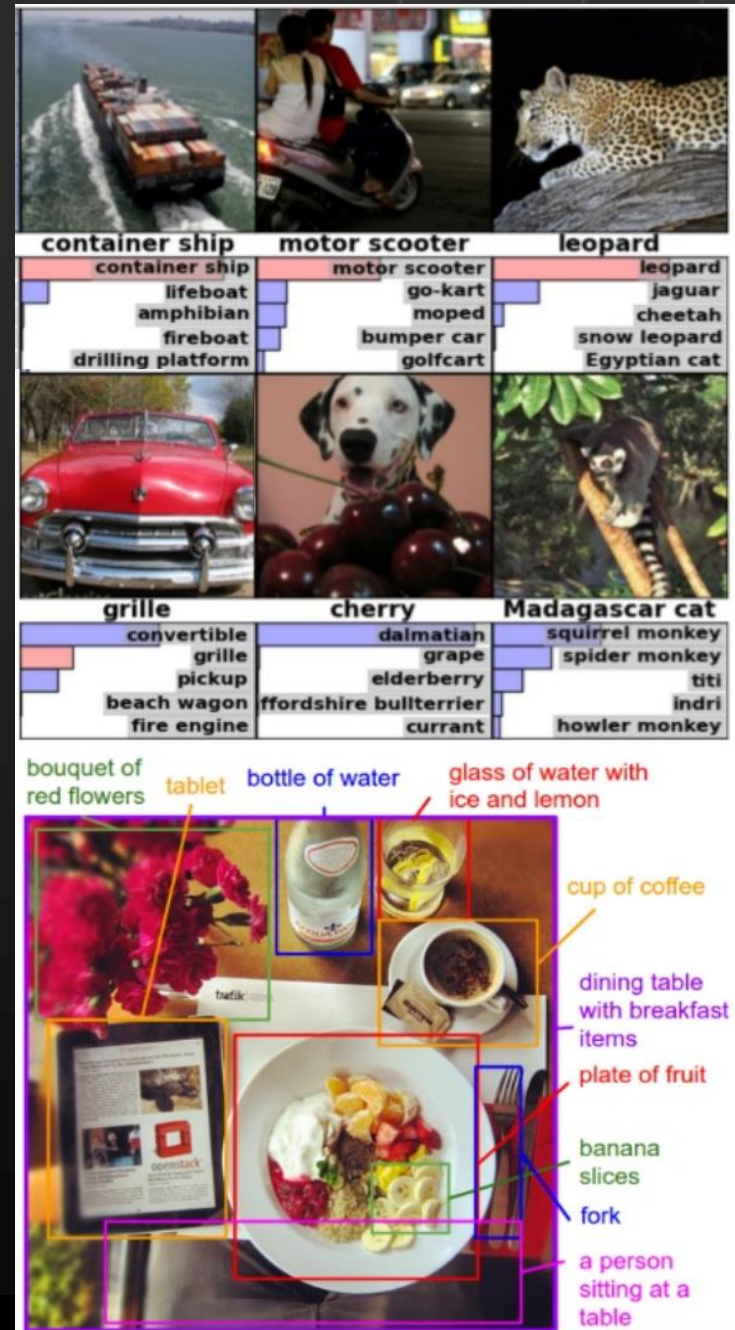# Smart TOURISM
Value-added Applications with Deep Learning

- After the establishment of the AEC (ASEAN Economic Community), travelling has become easy for people living in this region. One of the main concerns when travelling is the safety and well-being. Hence, it is useful to explore various value-added applications for safety and well being in the tourism industry.

- In this presentation, we highlight the recent advances in computer vision and deep learning. We then suggest potential value-added applications for:
  - the safety and surveillance applications, and
  - the tourist travel assistant applications.

- Here, we are interested in leveraging recent advances in deep learning to augment machine vision & scene understanding capacity.

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Shifting of Tourism Services

○ Prior 1990s

  ○ Telephone, Fax, Mail

  ○ Flight booking

○ 1990s – 2010s

  ○ Internet, Web-based technology

  ○ Online info, Map, Online booking

○ Post 2010s

  ○ AI, IOT, Big data, Deep learning technology – text, speech, vision

  ○ Real-time recommendation, Smart services

src: ImageNet

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Safety & Surveillance Applications

- Ensure visitors safety and well-being by augmenting the existing surveillance system with deep learning technology

- DL → Better performance

  - Better detection, recognition & tracking

  - Better semantic labelling

  - Better quality downstream applications

- For example

  - Abandoned luggage

  - Fighting, street crime

  - Behaviors monitoring/analysis

src: Internet

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Tourist Travel Assistant Applications

- Enhance visitor experience with computer vision enabled applications. For example

- Text translation
  - Street sign translations, Local text translations

- Augmented reality
  - Augment the scene with virtual objects e.g., view virtual objects through camera

src: Internet

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What is the typical ingredient of computational process for the applications mentioned earlier?

Object detection → Object recognition → Tracking → Activities analysis → Knowledge base

What can traditional machine vision offer?

○ A solution based on handcrafted feature approach

○ Variation of appearance, Occlusion, Transformation

○ Pixels, shape, contour, texture, SIFT, HOG, etc

What can Deep Learning contribute?

○ Expansion of memory, expansion of computing power

○ Ability to learn hierarchical features, end-to-end learning
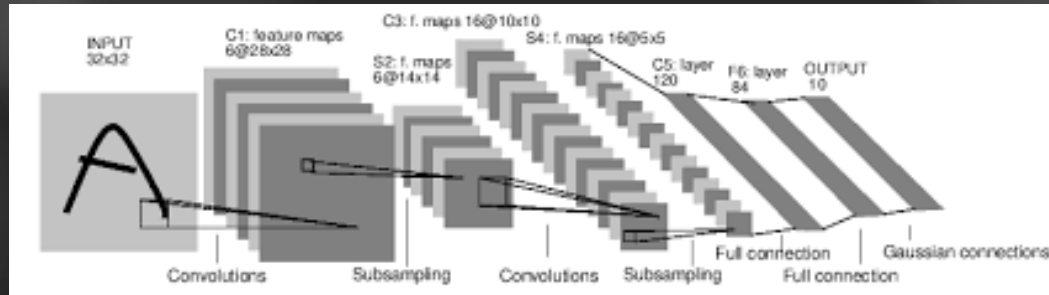
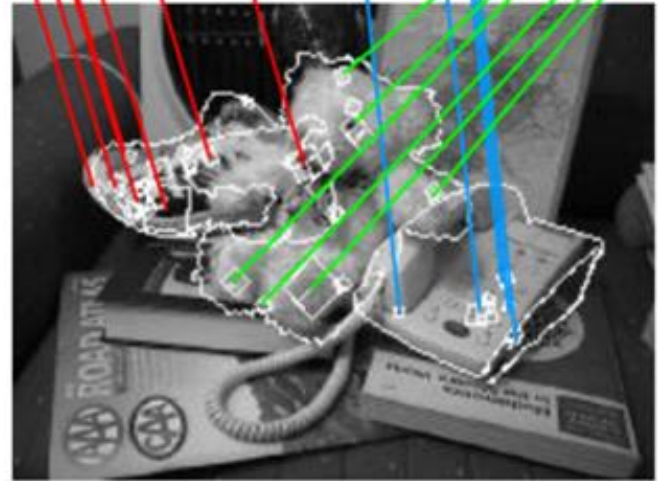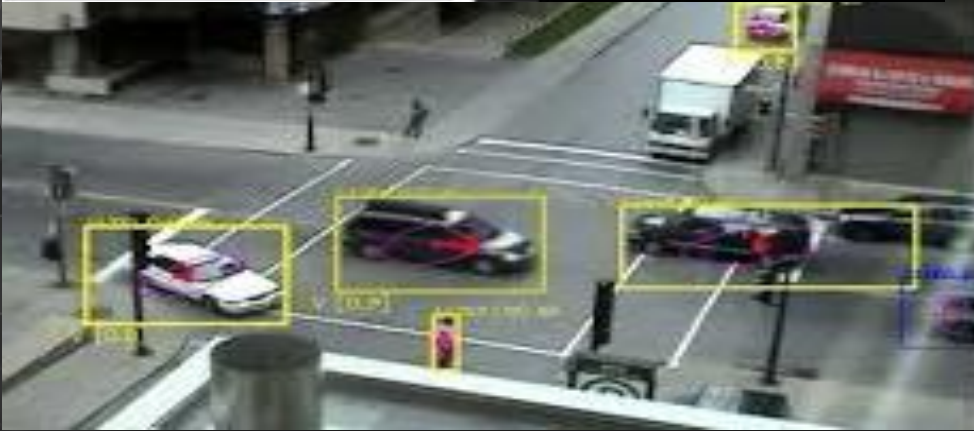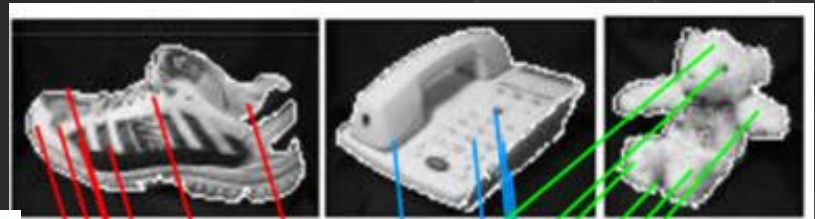**Deep Learning ➔ Value-added applications**

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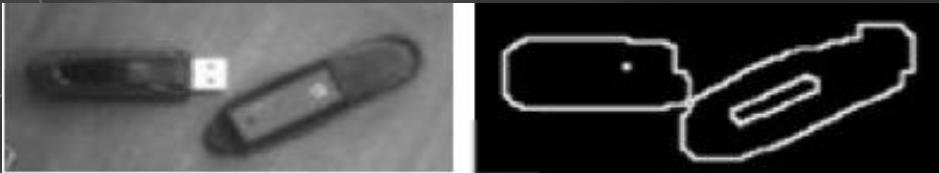
O AlexNet

O VGGnet

O GoogleNet
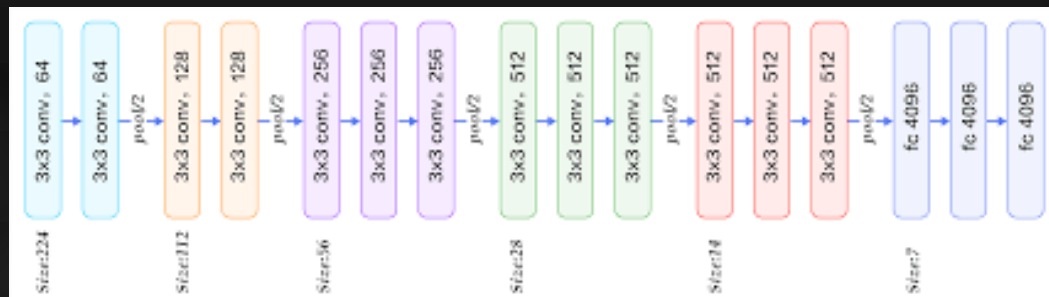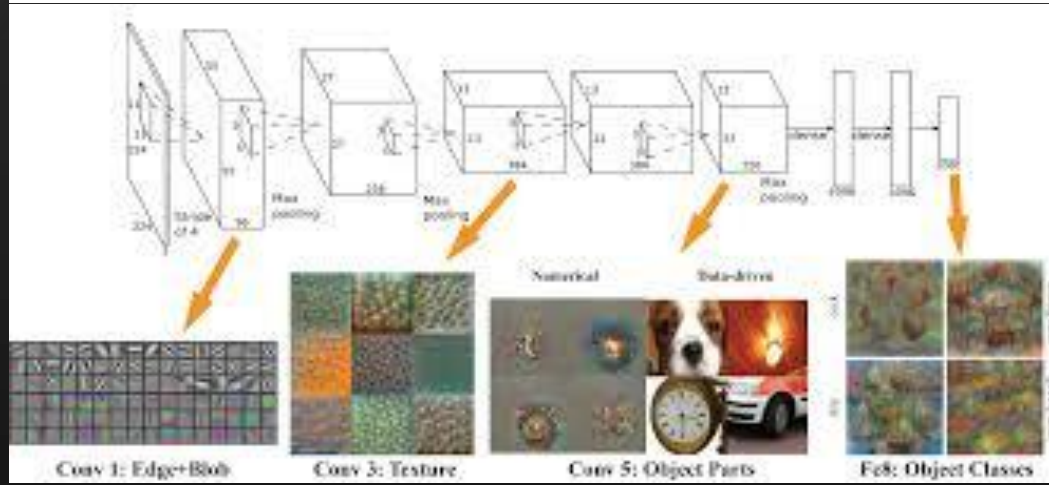
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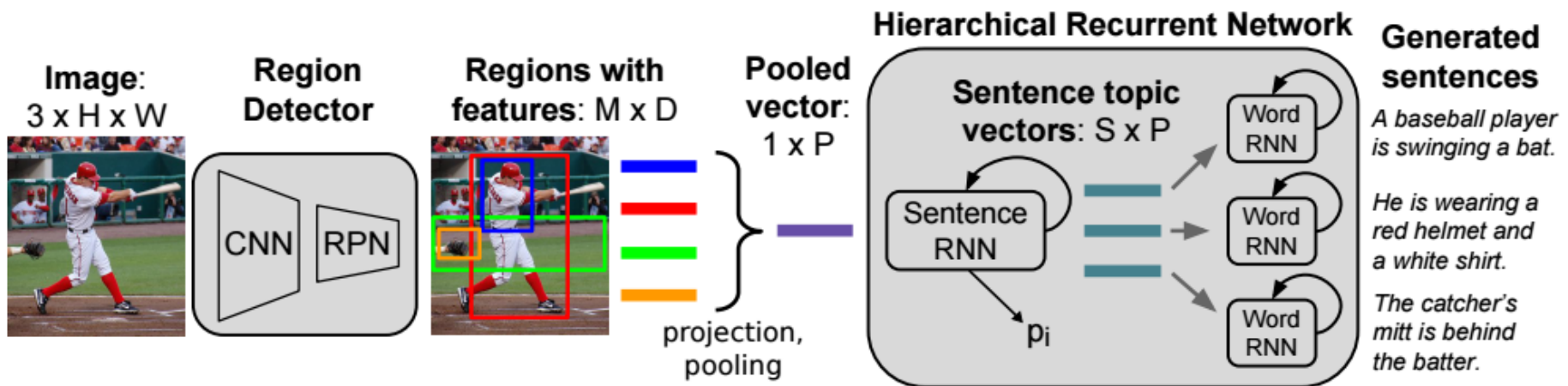## Recent Advances using Deep Learning

- Object detection, recognition, Language translation

- 2D Pose estimation, 3D model generation

- Appropriate semantics can be hierarchically labelled to objects and actions

- Plan analysis, Behaviors analysis

- Ability to learn from semantic labels

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Example Applications: Augmenting CCTV with DL

CCTV can be augmented with DL technology. This provides persistent real time surveillance, with ability to perform semantic labelling, analysis, content search and intelligent queries.

A Hierarchical Approach for Generating Descriptive Image Paragraphs. J. Krause, J. Johnson, R. Krishna, F.F, Li
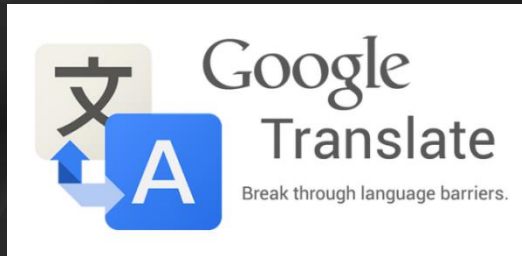
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Example Applications:

Language Translation, Augmented Reality, Virtual Reality

○ Language translation

○ Transmedia story telling, augment historical building in a real scene, information in the scene

src: dnatatravel.com

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SUMMARY

○ **Look for partners who are interested in this direction**

○ **Leverage on Deep learning Technology**

○ **Create value-added application in the area(s) below**

   ○ **Safety & Surveillance Applications**

     ○ Image captioning, Video describing

     ○ 2D pose estimation from video sequence

     ○ Behaviors analysis

   ○ **Tourist Travel Assistant Applications**

     ○ Text translation

     ○ Augmented reality

Q & A

Thank you for your attentions

Pls contact: span.amnuaisuk@gmail.com