Topic 3: Deep learning for image analysis – application to dengue fever risky sites monitoring

Description:

The objective of this project is to build a flexible and real-time monitoring system using Android mobile devices for monitoring risky sites for dengue transmission.

Risky sites for dengue transmission are places (mostly in urban areas) that are susceptible to make breeding sites. In particular, the presence of temporary open still water (in ponds, empty box, pots of flowers, etc.) favours mosquitoes breeding. For instance, pagodas and construction sites (for building houses, roads, bridges) have open still water and are therefore considered as risky sites.

In the case of construction sites, another factor increases the risk of dengue fever transmission: the presence of temporary workers from the countryside. Indeed, workers who come from the countryside are more susceptible to be infected by dengue fever than people who live in urban areas. That is because people who live in urban areas are more bitten by *Aedes* mosquitoes and are more likely to be immunized to dengue fever than people from the countryside. So, in this study, we are especially interested in monitoring construction sites, and the presence of temporary workers on those sites (clothes hanging, etc.).

Information about interest sites (like construction sites, pagodas, etc.) is gathered using photos along with descriptive voice and text data. The goal of this internship is to implement deep learning algorithms (from an existing library/framework) to perform automatic recognition of five site types : construction site, pagoda, rubbish, lake/pond, park.

Deep Learning is a new area of Machine Learning research, which has been introduced with the objective of moving Machine Learning closer to one of its original goals: artificial Intelligence. Recent results have shown very important performance improvements over more traditional methods on very complex real problems.

Figure 1 : a few samples of site types, (a) pond, (b) pagoda, (c) (d) construction sites, (e) rubbish.

Expected outcomes:

- Study, test, choice and implement a deep learning library/framework
- Build an images database and a ground truth
- User and technical documentations

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Pre-requisites:

- Motivations in research and innovation
- Good skills in programming
- Knowledge in Android development and computer vision

References:

- Zhong, S. H., Liu, Y., & Liu, Y. (2011, November). Bilinear deep learning for image classification. In Proceedings of the 19th ACM international conference on Multimedia (pp. 343-352). ACM.
- Donahue, J., Jia, Y., Vinyals, O., Hoffman, J., Zhang, N., Tzeng, E., & Darrell, T. (2013). Decaf: A deep convolutional activation feature for generic visual recognition. arXiv preprint arXiv:1310.1531.
- Welcome to deep learning : http://deeplearning.net/
- Caffe, a deep learning framework : http://caffe.berkeleyvision.org/
- https://en.wikipedia.org/wiki/Deep_learning