

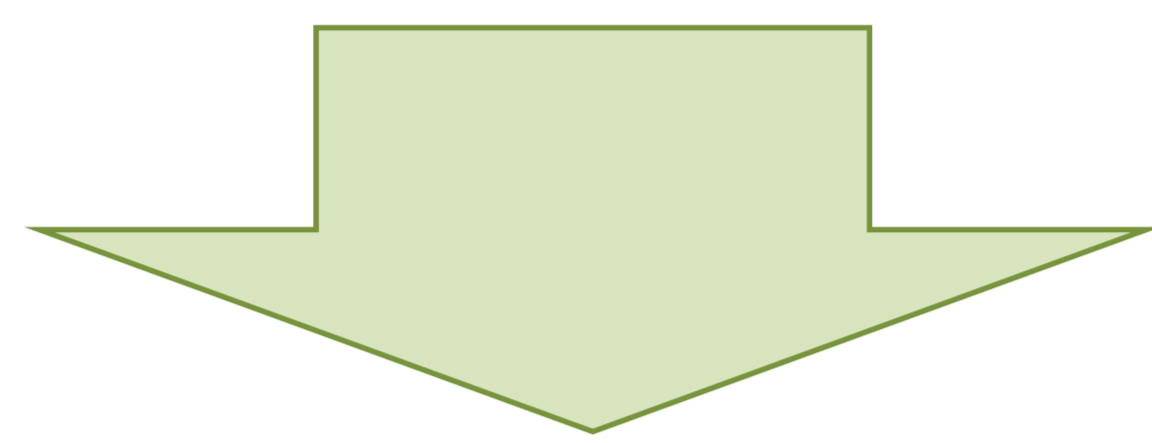
Food Image Recognition with Deep Convolutional Features

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Background+Objective

* **Healthful eating habit is important to avoid obesity and diseases.**
* **If there is a food recommendation system, it is work to keep people in good health.**

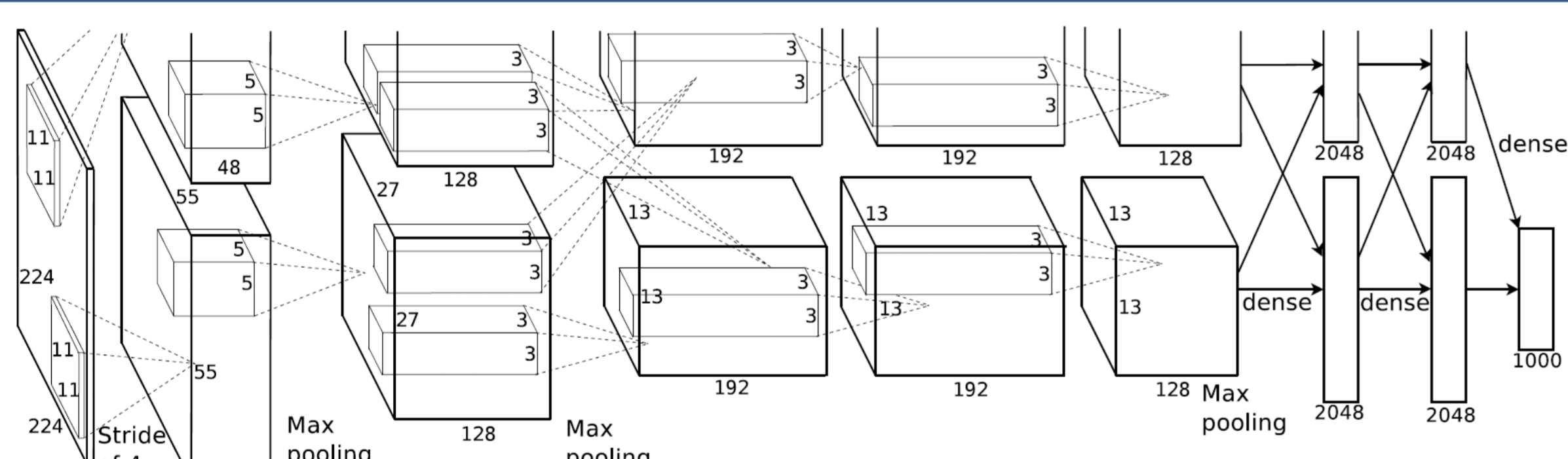


* **A food recognition engine is needed to build a automatic food recommendation system.**

Food recognition: Deep Convolutional Neural Network (DCNN) boosts food recognition.

- **integrating it with conventional hand-crafted image features.**

CNN Feature



Architecture of CNN (quoted from [8])
[8]: Krizhevsky, A et. al.: ImageNet Classification with Deep Convolutional Neural Networks. In NIPS 2012

• **Deep Convolutional Neural Network (DCNN) pre-trained with the ILSVRC2012 1000-class dataset**
• **4096-d DCNN feature:**
L2-normalized output signals from the 6-th layer (one layer before the last layer)

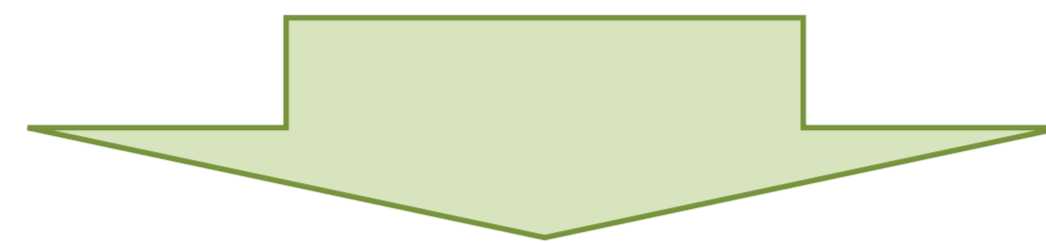
Conclusions

CNN features which are extracted from the pre-trained DCNN into 100 kinds food photo recognition.

In the experimental results, we have obtained **72.26%** classification rate.

Food Image Recognition

Query Image



Features

- **RootHOG FV: gradient** (8 orients, 2x2) Local patch: 16x16 and 24x24
- **Color FV: moment** (1st, 2nd, 2x2) dense sampling every 5 pixel
- **CNN feature**
 - overfeat (<http://cilvr.nyu.edu/doku.php?id=software:overfeat:start>)



Classifiers

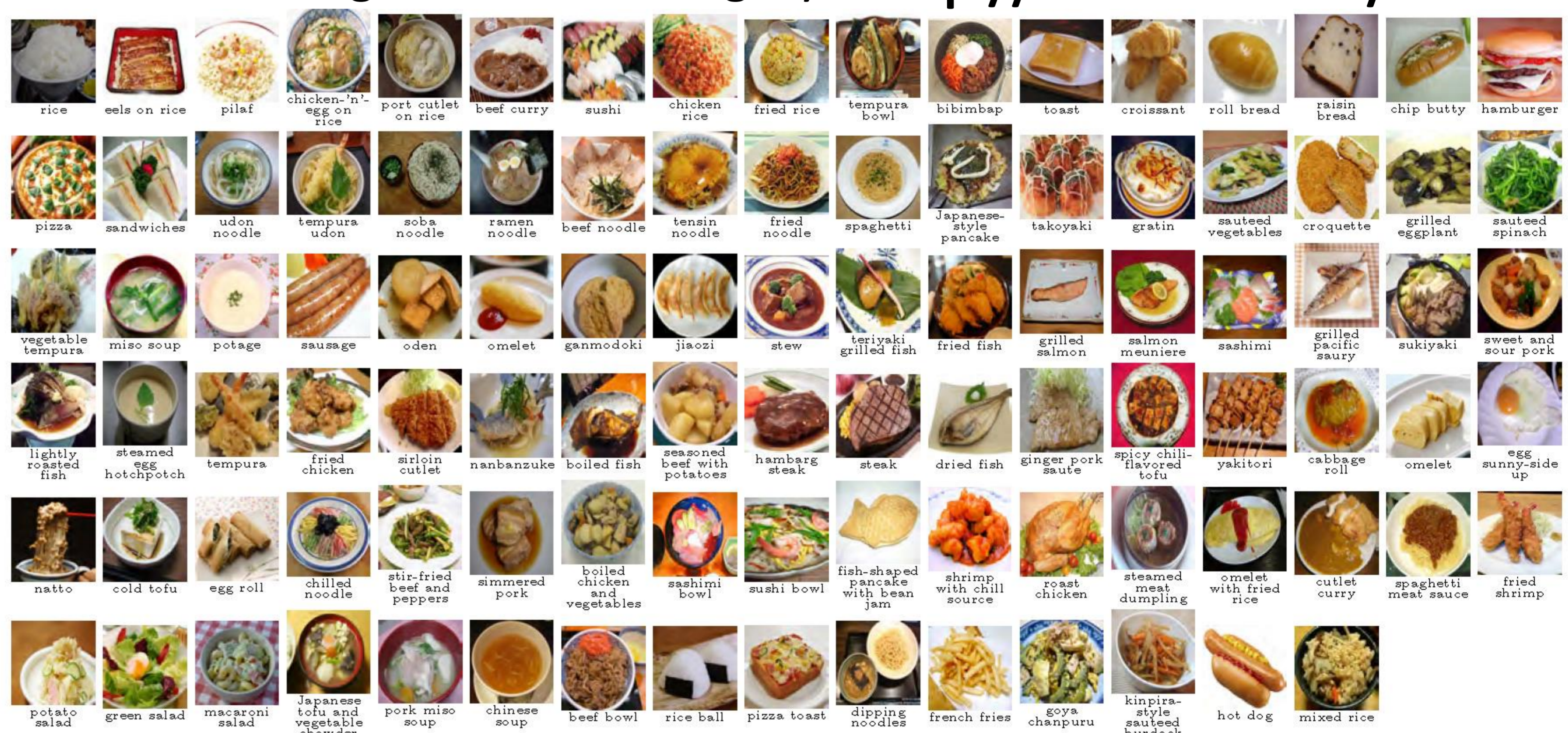
- **Liblinear** (<http://www.csie.ntu.edu.tw/~cjlin/liblinear/>)
- **AROW** (AROWPP: <https://code.google.com/p/arowpp/>)

Food Image Dataset

Food Image Dataset UEC-FOOD100:

100 kinds of food categories with bounding boxes

about 100 images for each category <http://foodcam.mobi/dataset>



Experiments with Food Image Dataset

Evaluation Recognition accuracy (5-cross validation)

