Low-Power Computer Vision Competition

Motivation
Many applications need light-weight and energy-efficient solutions for computer vision.

Competitions encourage focused efforts and assess technologies consistently. Competitions drive innovations.

Space X Prize DARPA Driverless Vehicle

Low-Power Image Recognition

IEEE Low-Power Image Recognition Challenge (LPIRC) was held in 2015-2019 at Computer Vision and Pattern Recognition (CVPR), Design Automation Conference (DAC), and International Conference on Computer Vision (ICCV).

The challenge used ImageNet as training data: 200 categories of objects, such as airplane, bird, apple, banana, basketball, bee, bicycle, bus, car, chair, dog, drum, hammer, laptop, orange, ...

Score = Accuracy (mAP) / Energy
An object is correctly recognized if the category is correct, the bounding box overlaps with the correct answer more than 50%, and not a duplicate detection. Accuracy is measured by the mean average precision (mAP). Energy is measured by Watt-Hour.

Score Improvements from 2015 to 2018

<table>
<thead>
<tr>
<th>Year</th>
<th>mAP</th>
<th>WH</th>
<th>Score</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>0.02971</td>
<td>1.634</td>
<td>0.0182</td>
<td>1.0</td>
</tr>
<tr>
<td>2016</td>
<td>0.03469</td>
<td>0.789</td>
<td>0.0440</td>
<td>2.4</td>
</tr>
<tr>
<td>2017</td>
<td>0.24838</td>
<td>2.082</td>
<td>0.1193</td>
<td>6.6</td>
</tr>
<tr>
<td>2018</td>
<td>0.18310</td>
<td>0.412</td>
<td>0.4446</td>
<td>24.5</td>
</tr>
</tbody>
</table>

Online Submissions since 2018
To promote participation, year 2018 had online submissions using TensorFlow and Caffe2. Year 2019 has TensorFlow and FPGA.

TensorFlow Solutions 2018-2019
Contestants submit models for a common TensorFlow machine. Evaluations considered execution time and accuracy.

Forty teams submitted more than 300 solutions.

ImageNet Classification

COCO Object Detection

Winners
• 2015: Tsinghua University / Huawei
• 2016: Chinese Academy of Science
• 2017: Seoul National University
• 2018: Qualcomm, Seoul National University, ETRI/KPST, Expasoft, Amazon
• 2019: Amazon, Alibaba, Xidian University
* Multiple tracks since 2018

Additional Information
• www.lpcv.ai
• IEEE Journal on Emerging and Selected Topics in Circuits and Systems June 2019

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