## DRP-AI PROCESSING TIME

<table>
<thead>
<tr>
<th>No.</th>
<th>Model structure</th>
<th>Processing time [msec]</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RZ/V2L</td>
<td>RZ/V2M</td>
</tr>
</tbody>
</table>
| 1   | resnet18        | 23.9   | 15.2   | 15.2   | Pre-trained model: **Torchvision 0.15.1 ResNet**
|     |                 |         |         |         | [https://pytorch.org/hub/pytorch_vision_resnet/](https://pytorch.org/hub/pytorch_vision_resnet/)
| 2   | resnet34        | 39.7   | 25.0   | 24.9   | References: ResNet **Deep residual learning for image recognition**
| 3   | resnet50        | 59.5   | 35.4   | 35.3   | |
| 4   | MobileNetV1     | 22.8   | 15.2   | 15.2   | Pre-trained model: **TensorFlow 2.12.0 MobileNetV1 1.0 224**
| 5   | mobilenet_v2    | 27.9   | 19.2   | 19.0   | Pre-trained model: **Torchvision 0.15.1 MobileNet V2**
|     |                 |         |         |         | [https://pytorch.org/hub/pytorch_vision_mobilenet_v2/](https://pytorch.org/hub/pytorch_vision_mobilenet_v2/)
| 6   | YOLOv3          | 251.4  | 143.9  | 143.5  | Pre-trained model: **Darknet YOLOv3/Tiny YOLOv3** (COCO)
| 7   | Tiny YOLOv3     | 32.8   | 22.8   | 22.8   | References: YOLOv3 **YOLOv3: An Incremental Improvement**
| 8   | YOLOv2          | 117.1  | 73.1   | 72.9   | Pre-trained model: **Darknet YOLOv2/Tiny YOLOv2** (VOC)
| 9   | Tiny YOLOv2     | 38.2   | 26.1   | 26.0   | References: YOLOv2 **YOLO9000: Better, Faster, Stronger**
| 10  | HRNet           | 102.2  | 60.0   | 59.8   | Pre-trained model: **MMPose HRNet** (COCO)
|     |                 |         |         |         | References: HRNet **Deep High-Resolution Representation Learning for Human Pose Estimation**
| 11  | DeepLabV3       | 623.5  | 324.0  | 322.7  | Pre-trained model: **Torchvision 0.15.1 DeepLabV3**
|     |                 |         |         |         | [https://pytorch.org/hub/pytorch_vision_deeplabv3_resnet101/](https://pytorch.org/hub/pytorch_vision_deeplabv3_resnet101/)
|     |                 |         |         |         | References: DeepLabV3 **Rethinking Atrous Convolution for Semantic Image Segmentation**

This processing time includes pre-processing and post-processing by DRP-AI. CPU pre-processing and post-processing time is not included.

*See page 4 for detail of DRP-AI processing.*
## DRP-AI PROCESSING TIME MEASUREMENT CONDITIONS

DRP-AI processing time is measured under following conditions:

<table>
<thead>
<tr>
<th>Board</th>
<th>Items</th>
<th>File name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>DRP-AI Translator</td>
<td>DRP-AI_Translator-v1.82-Linux-x86_64-Install</td>
</tr>
<tr>
<td>RZ/V2L</td>
<td>RZ/V2L DRP-AI Support PKG *</td>
<td>r11an0549ej0740-rzv2l-drpai-sp.zip</td>
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<td></td>
<td>RZ/V2MA Linux PKG</td>
<td>RTK0EF0045Z0024AZJ-v3.0.4.zip</td>
</tr>
</tbody>
</table>

* Time measurement: C++ `timespec_get()` function
DETAIL OF DRP-AI PROCESSING (RESNET)

DRP-AI processing includes pre-processing and post-processing as follows.

resnet18/34/50

<Pre-processing>

- **Resize**: Input image size (640x480 BGR) to HWC tensor size (224x224x3).
- **Cast to fp16**: Cast to fp16 from int8 for DRP-AI processing.
- **Normalize**: Normalized using 'mean' and 'std'.

<Post-processing>

- **Softmax**: For 1000 classes. Included cast to fp32.

CPU processing

Sort
Labeling
DETAIL OF DRP-AI PROCESSING (MOBILENETV1)

DRP-AI processing includes pre-processing and post-processing as follows.

**MobileNetV1**

**<Pre-processing>**
- **Resize**: Input image size (640x480 BGR) to HWC tensor size (224x224x3).
- **Cast to fp16**: Cast to fp16 from int8 for DRP-AI processing.
- **Normalize**: Normalized using 'mean' and 'std'.

**<Post-processing>**
- **Softmax**: For 1001 classes. Included cast to fp32.

**CPU processing**
DETAIL OF DRP-AI PROCESSING (MOBILENETV2)

DRP-AI processing includes pre-processing and post-processing as follows.

**mobilenet_v2**

### Pre-processing
- **Resize**: Input image size (640x480 BGR) to HWC tensor size (224x224x3).
- **Cast to fp16**: Cast to fp16 from int8 for DRP-AI processing.
- **Normalize**: Normalized using 'mean' and 'std'.

### Post-processing
- **Softmax**: For 1000 classes. Included cast to fp32.

CPU processing
DETAIL OF DRP-AI PROCESSING (YOLO)

DRP-AI processing includes pre-processing and post-processing as follows.

YOLOv3/YOLOv2/Tiny YOLOv3/Tiny YOLOv2

<Pre-processing>
- **Resize**: Input image size (640x480 BGR) to HWC tensor size (416x416x3).
- **Cast to fp16**: Cast to fp16 from int8 for DRP-AI processing.
- **Normalize**: Normalized using 'mean' and 'std'.

<Post-processing>
- **Transpose**: HWC to CHW.
- **Cast to fp32**

**CPU processing**

<table>
<thead>
<tr>
<th>Model</th>
<th>HWC</th>
<th>CHW</th>
</tr>
</thead>
<tbody>
<tr>
<td>YOLOv3</td>
<td>[13, 13, 255]</td>
<td>[255, 13, 13]</td>
</tr>
<tr>
<td></td>
<td>[26, 26, 255]</td>
<td>[255, 26, 26]</td>
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<tr>
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<td>[52, 52, 255]</td>
<td>[255, 52, 52]</td>
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<tr>
<td>YOLOv2</td>
<td>[13, 13, 125]</td>
<td>[125, 13, 13]</td>
</tr>
<tr>
<td>Tiny YOLOv3</td>
<td>[13, 13, 255]</td>
<td>[255, 13, 13]</td>
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<tr>
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<td>[26, 26, 255]</td>
<td>[255, 26, 26]</td>
</tr>
<tr>
<td>Tiny YOLOv2</td>
<td>[13, 13, 125]</td>
<td>[125, 13, 13]</td>
</tr>
</tbody>
</table>

**Darknet YOLO Transpose Shape**
DETAIL OF DRP-AI PROCESSING (HRNET)

DRP-AI processing includes pre-processing and post-processing as follows.

HRNet

<Pre-processing>
Crop : Input image size (640x480 BGR) to portrait image size (270x480 BGR).
Resize : Image size (270x480 BGR) to HWC tensor size (192x256x3).
Cast to fp16 : Cast to fp16 from int8 for DRP-AI processing.
Normalize: Normalized using 'mean' and 'std'.

<Post-processing>
Transpose : HWC (64x48x17) to CHW (17x64x48).
Cast to fp32

CPU processing
**DETAIL OF DRP-AI PROCESSING (DEEPLABV3)**

DRP-AI processing includes pre-processing and post-processing as follows.

**DeepLabV3**

<table>
<thead>
<tr>
<th>Resize</th>
<th>Cast to FP16</th>
<th>Normalize</th>
<th>Inference (DeepLabV3)</th>
<th>Argmax</th>
</tr>
</thead>
</table>

**<Pre-processing>**
- **Resize**: Input image size (640x480 BGR) to HWC tensor size (234x416x3).
- **Cast to fp16**: Cast to fp16 from int8 for DRP-AI processing.
- **Normalize**: Normalized using 'mean' and 'std'.

**<Post-processing>**
- **Argmax**: HWC (234x416x21) to HWC (234x416x1). Includes cast to uint8.