Parallel Programming Contest2019

Cuda Section

A simple CNN: LeNet

Get lenet_cuda.tar and transfer to comparc{01,02}.

HLS Section is introduced in the next lesson.

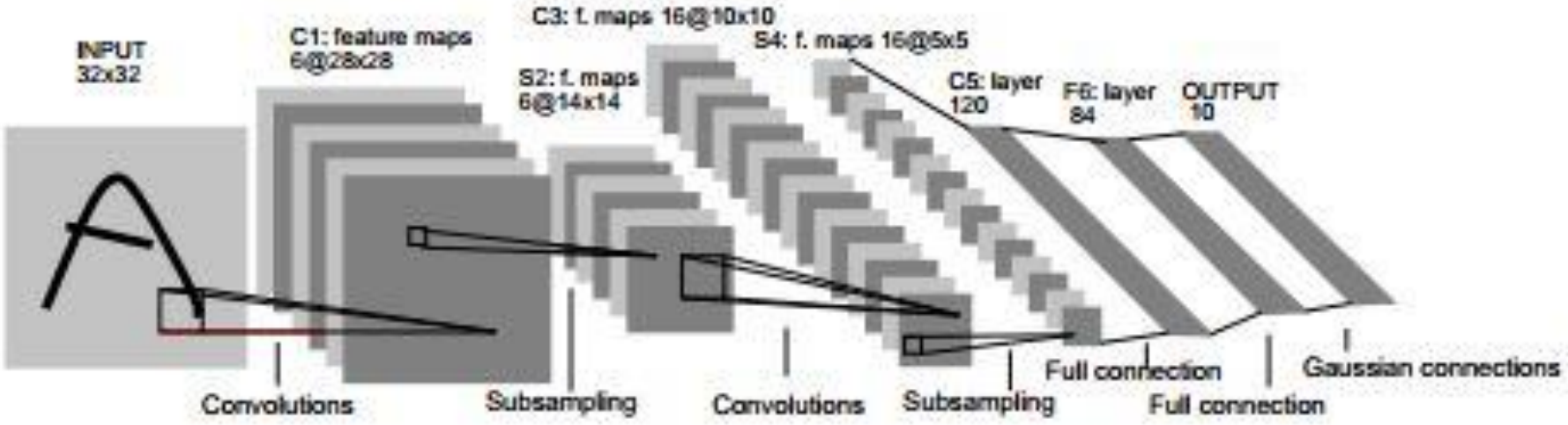


Fig. 1. Architecture of LeNet-5, a Convolutional Neural Network, here for digits recognition. Each plane is a feature map, i.e. a set of units whose weights are constrained to be identical.

Yan LeCun http://yann.lecun.com/exdb/publis/pdf/lecun-99.pdf

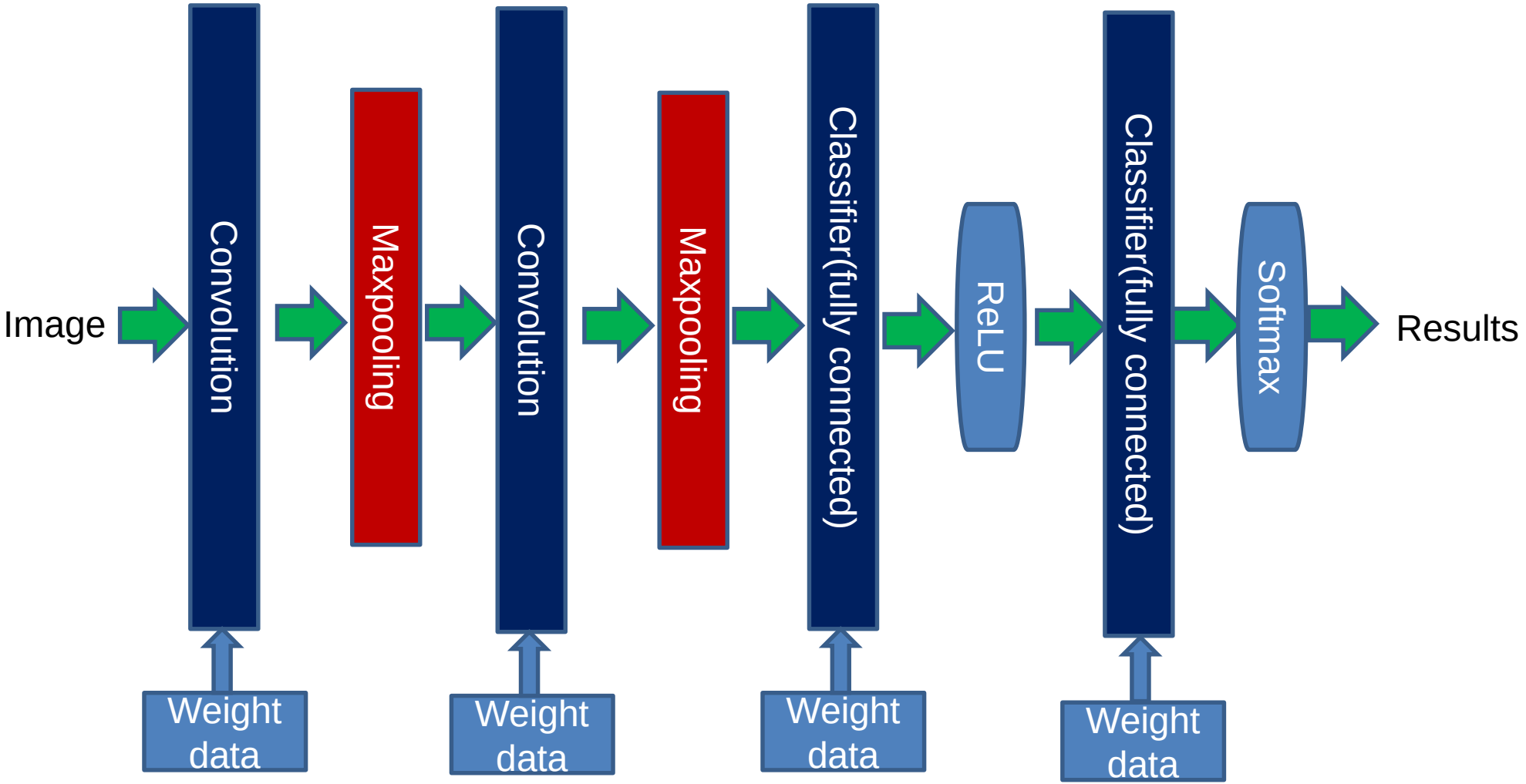


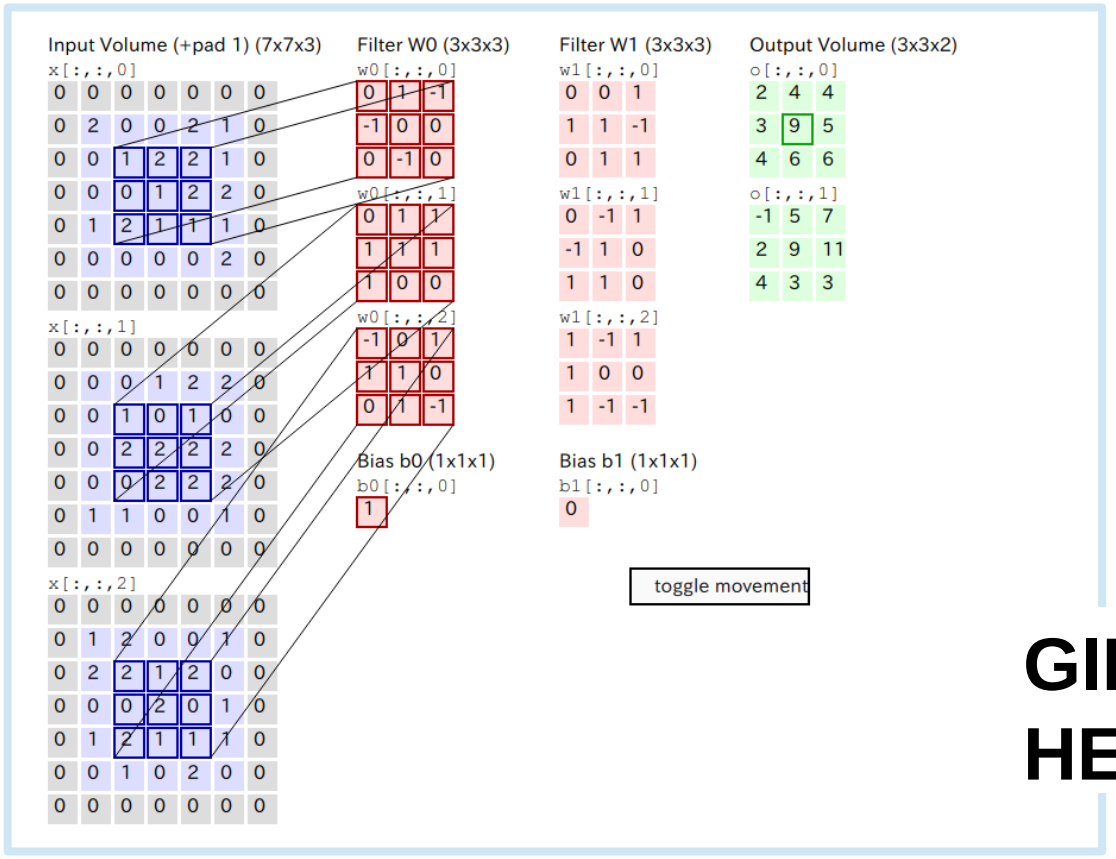
Image
Convolution
Maxpooling
Convolution
Maxpooling
Classifier(fully connected)
ReLU
Classifier(fully connected)
Softmax
Results
Weight data
Weight data
Weight data
Weight data

Layers

Read weight data (Common for every input image)
while (1) { // for each image data

Read image data
convolution
maxpooling
convolution
maxpooling
classifier
relu
classifier
softmax }

Convolution (in Deep Learning)

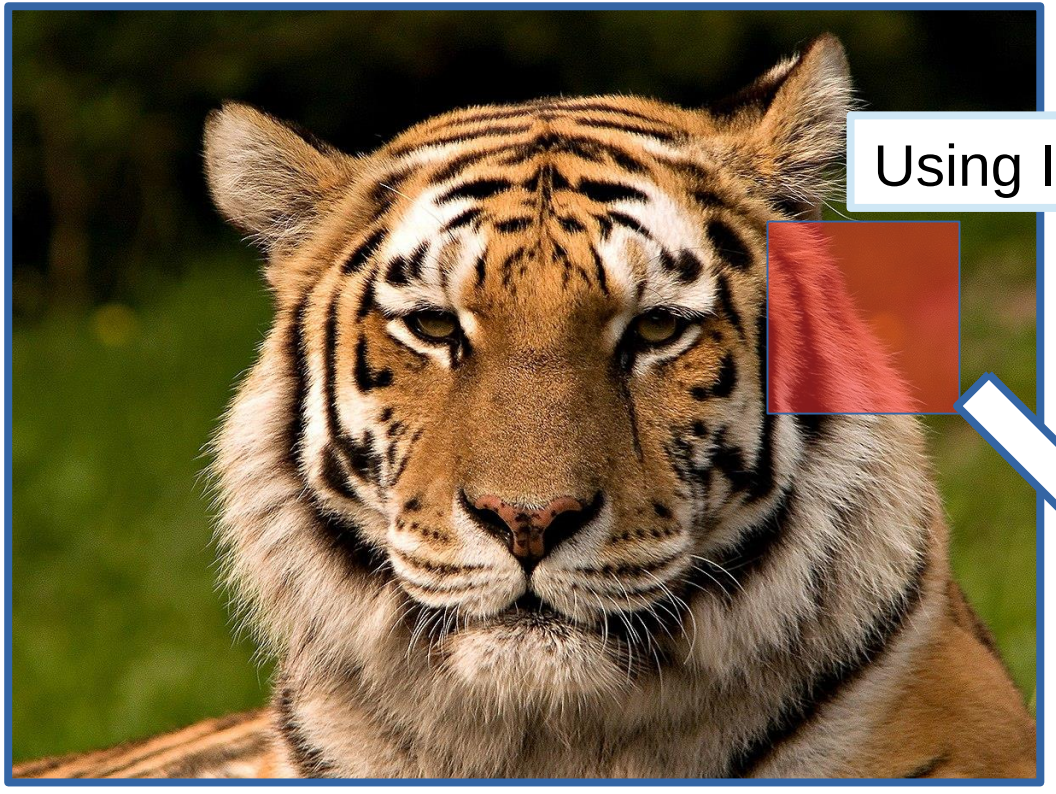


GIF Animation HERE!

http://cs231n.github.io/convolutional-networks/#MathJax-Element-42-Frame

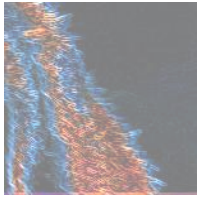
Purpose of Convolution

(in Image Processing)



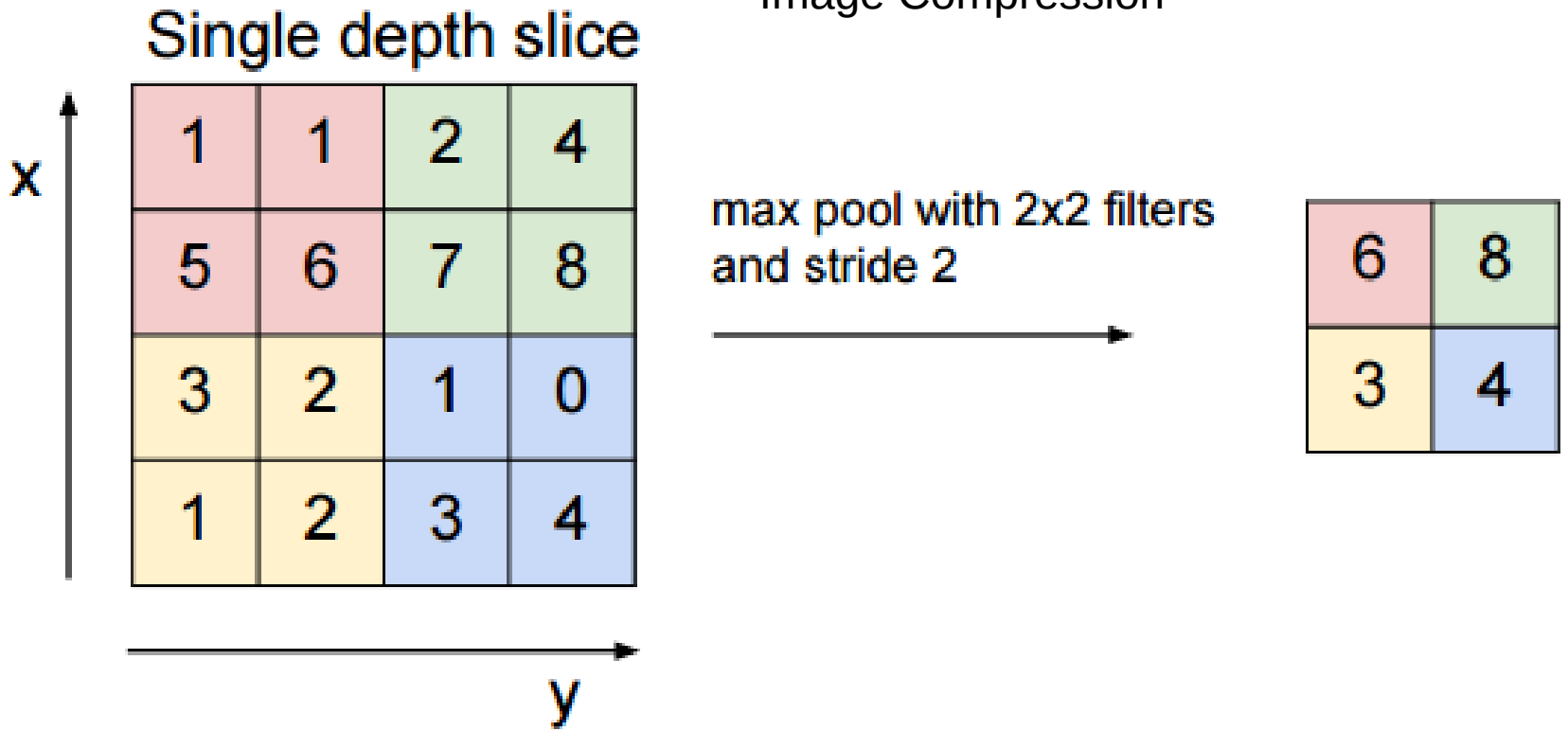
Using Image Locality

e.g. Edge Detection



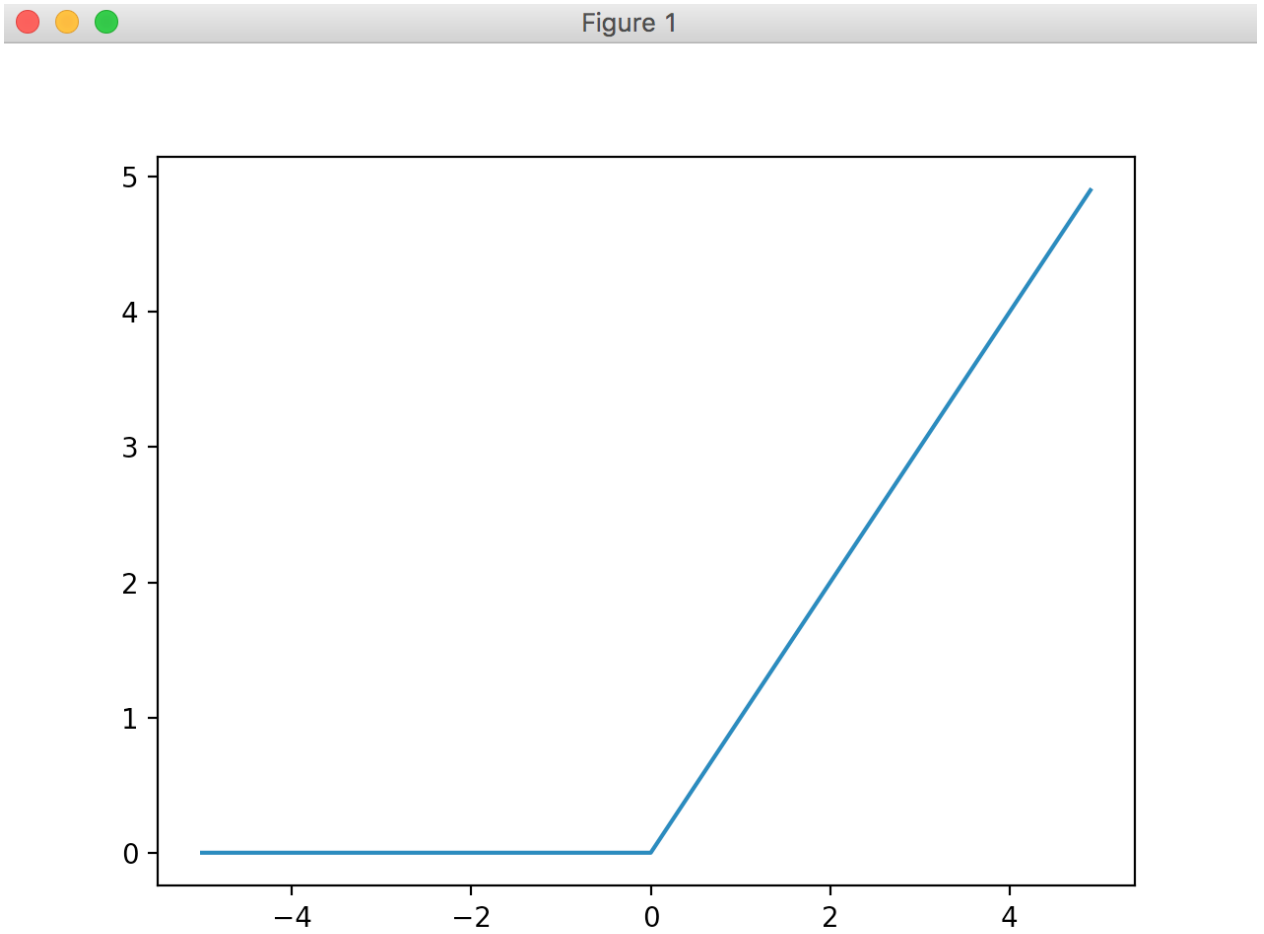
Maxpooling

Image Compression



http://cs231n.stanford.edu/slides/winter1516_lecture7.pdf

ReLU function (Activation Function)



Programming contest

- Accelerate this calculation with GPU!
  - We can use lots of cells to calculate each pixel.
- There are a lot of acceleration techniques.
  - See https://media.nips.cc/Conferences/2015/tutorialslides/Dally-NIPS-Tutorial-2015.pdf

For debugging

You can use:

CUDA_SAFE_CALL macro

for debugging.

- CUDA_SAFE_CALL(Cuda function);
- This is included in the delivered code.

Report

- Leave your design in “lenet” directory in your home directory.
- Send the mail to hunga4125@gmail.com with a report and your account number.
- The result must be the same as the current version.
- The deadline is 8/2 24:00. Never delayed.
- The ranking will appear on the web site.
- If you have any question, mail to yasuaki@am.ics.keio.ac.jp.