Embeddability and usability testing of deep networks: application to the case of plant recognition

Context

For more than 10 years, we have been developing research on plant recognition on smartphones (ANRs ReVeS and ReVERIES). Recently, we have proposed a prototype, named InterFolia, which allows recognizing a plant among a database of 214 species. This application works on iPhone and is available for free on the App store[1].

The originality of this application is that it does not require an Internet connection, unlike all other applications. Indeed, the processing of images is done locally on the smartphone. More precisely, Interfolia is based on three embedded Deep Learning models and a fusion module. InterFolia is the first prototype that shows the feasibility of embedding three models and getting a query result almost instantly.

Goals of the project

Many networks are available in the literature and would be worth testing in the context of the InterFolia application in terms of their ability to be embedded (memory footprint, inference response time, battery usage, etc.). The following networks could initially be targeted: VGG16/19, squeezeNext, inceptionV3, EfficientNet, MobileNet V2, MobileNetV3 (small, large). Variants of networks that are *a priori* very efficient, but larger, such as ViT-G (transformers) could also be studied.

The objective of this project is to test these networks and to establish a comparison grid between the performances on computers and on mobile terminals. Ultimately, the goal is to define the best networks in terms of usability for embedded systems.

Details

The elements of the project are:

- Definition of the different existing networks and possible variants to be tested;
- Take in hand the models, proposition of variants;
- Training on ImageNet (if necessary), finetuning on the InterFolia database;
- Development of a test bench simulating the use of InterFolia (on computer and on mobile);
- Conducting the tests;
- Generation of comparative tables.

Tools

Use of the LIRIS GitLab, LIRIS-Lyon 2 GPU servers
Python language - PyTorch framework

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[1] https://apps.apple.com/fr/app/interfolia/id1570104475