ABOUT ME

• Kaggle Grandmaster since 2019, competing since 2016

• Work on web information extraction at Scrapinghub

• Member of Open Data Science Community [ods.ai]

• Enjoy working on unusual (for me) challenges

• Like if high solution quality can be achieved
MY MOTIVATION

• I never worked on character recognition
• Great organisation of the competition
• Dataset is clean and looks beautiful
• I love Japan!
SOLUTION: TWO STAGES

- Stage 1: detect characters
- Stage 2: classify characters
STAGE 1: DETECT CHARACTERS

- **Input:** image
- **Output:** boxes around all characters
STAGE I: DETECT CHARACTERS

- **Input:** image

- **Output:** boxes around all characters
DETECTION CHALLENGES

- False detection: annotations, characters in images, unknown characters.
- Characters consisting of multiple parts: sometimes incorrectly broken into multiple boxes.
- Still, detection quality is high: 0.992 assuming perfect classification.
STAGE 2: CLASSIFY CHARACTERS

• Input: image and boxes from stage 1
• Output: classes for all boxes
STAGE 2: CLASSIFY CHARACTERS

- Input: image and boxes from stage 1
- Output: character classes for all boxes
CLASSIFICATION CHALLENGES AND SOLUTIONS

• Context is important: process all characters at once.

• Large number of classes (more than 4k): use large models, regularisation, data augmentation, careful tuning.

• Detection errors: allow the model to reject false detections.

• High variability between different books: use test adaptation.
RESULTS

- Simple baseline: 0.838
- Tuning baseline: 0.922
- Using bigger model: 0.934
- Adapting to test set: 0.945
- Mixing models from 5 folds: 0.950
LESSONS LEARNED

• Dataset is very clean and rich
• Classification is harder than detection
• Modern computer vision methods work very well here
• Hard to analyse errors without domain knowledge
• Two stages were not required (see 1st place)
THANK YOU!

• Thank you dear organising team, it was a great success
• Thank you Kaggle and all who participated
• Thank you CODH for inviting me
• Thank you everyone for attention