Understanding Text on Images with AI at Scale

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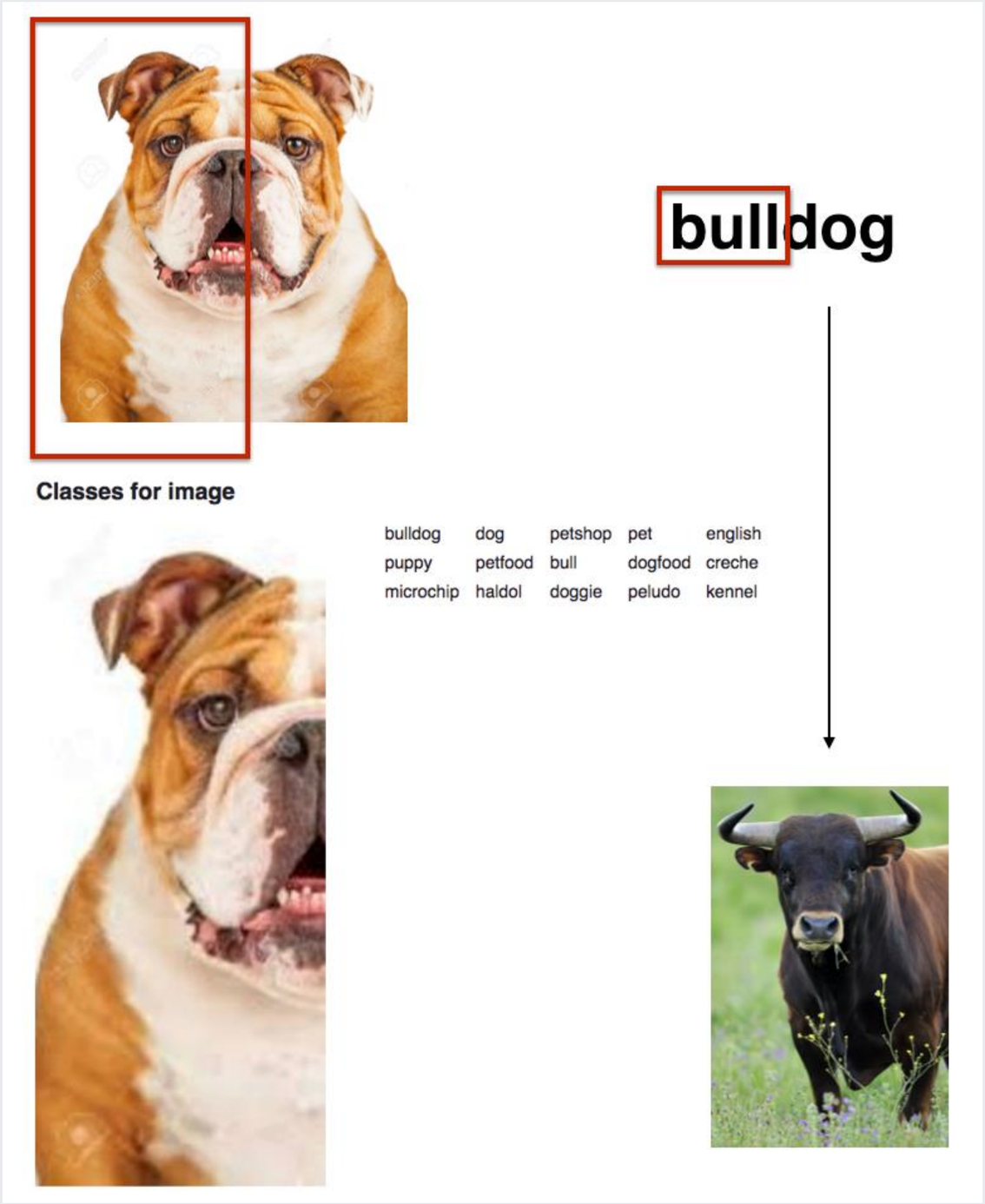
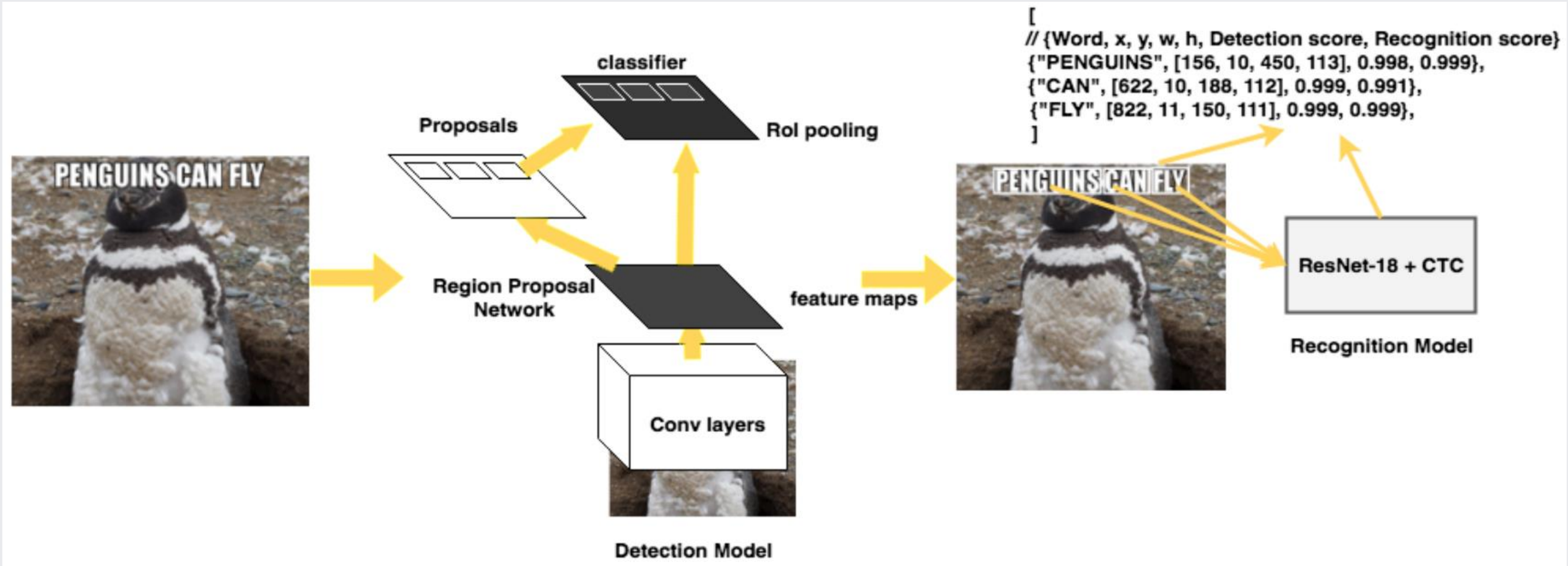
PINGUINO FELIZ TE ESPERA
PINGUINO FELIZ TE ESPERA
EN MAGDALENA EN 2018
EN MAGDALENA EN 2018
VIENES?
VIENES?

Challenges

- Sizes, fonts, orientations
- Languages
- Scale
- Efficiency



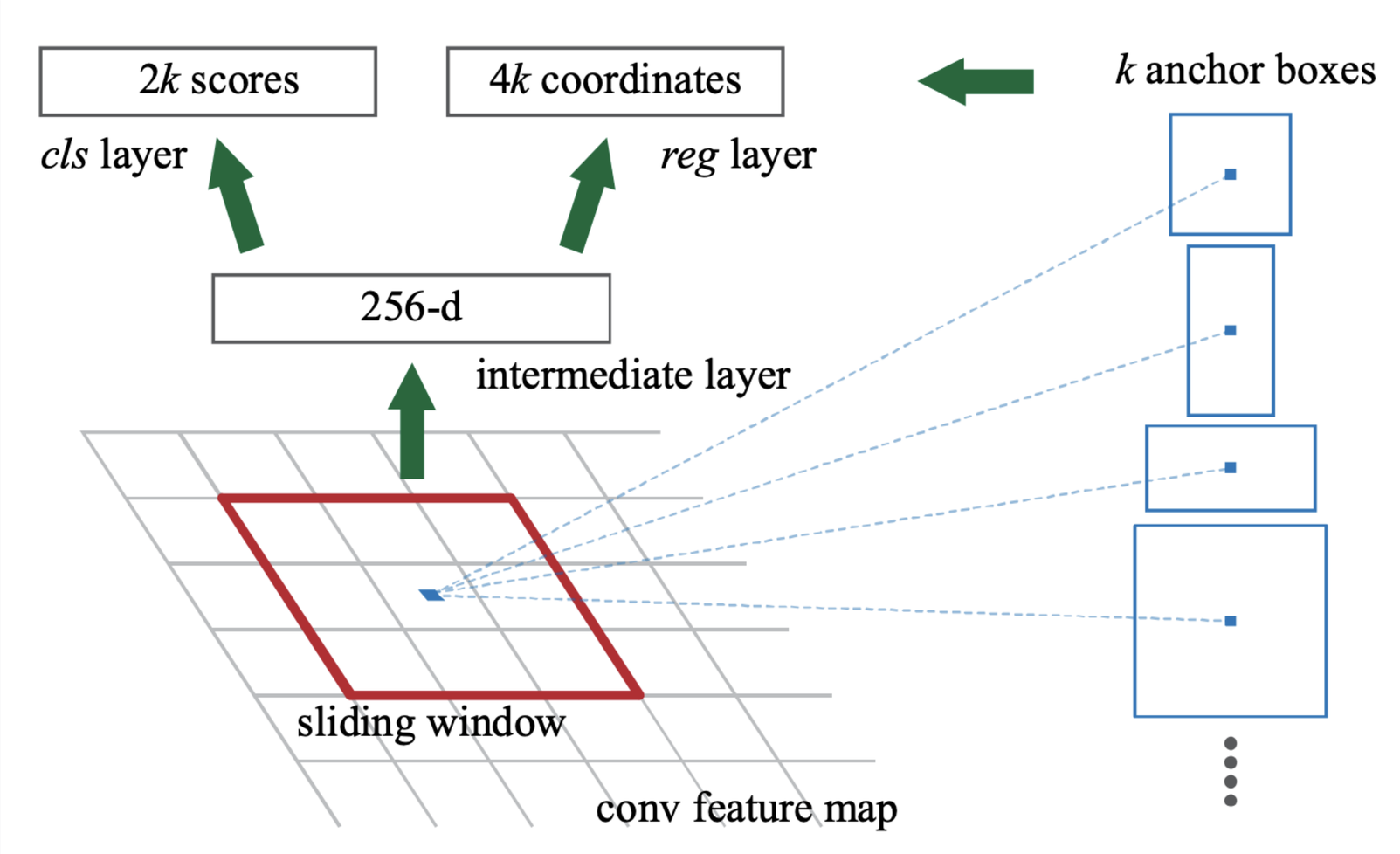
Architecture

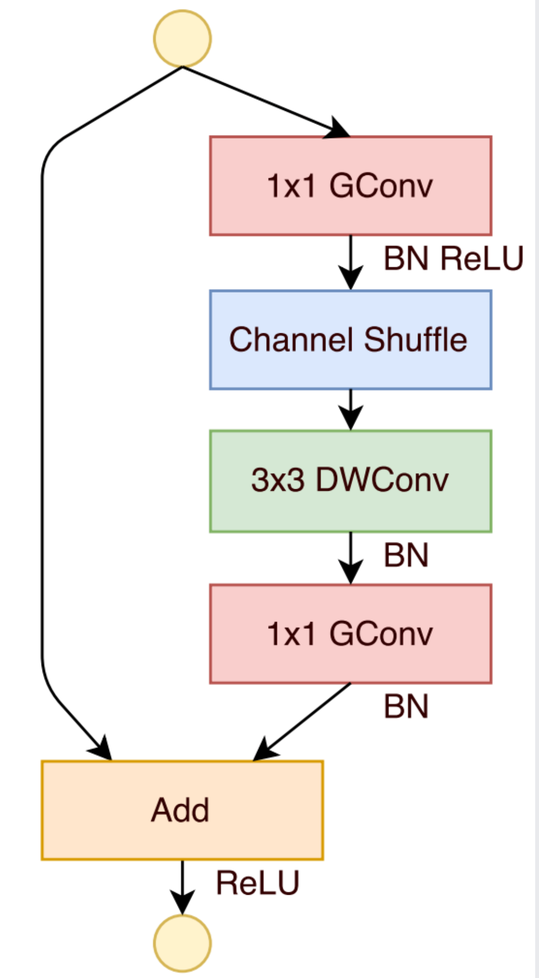


Large scale system for text detection and recognition in images, KDD 2018,

Viswanath Sivakumar, Albert Gordo, Fedor Borisyuk

Text Detection

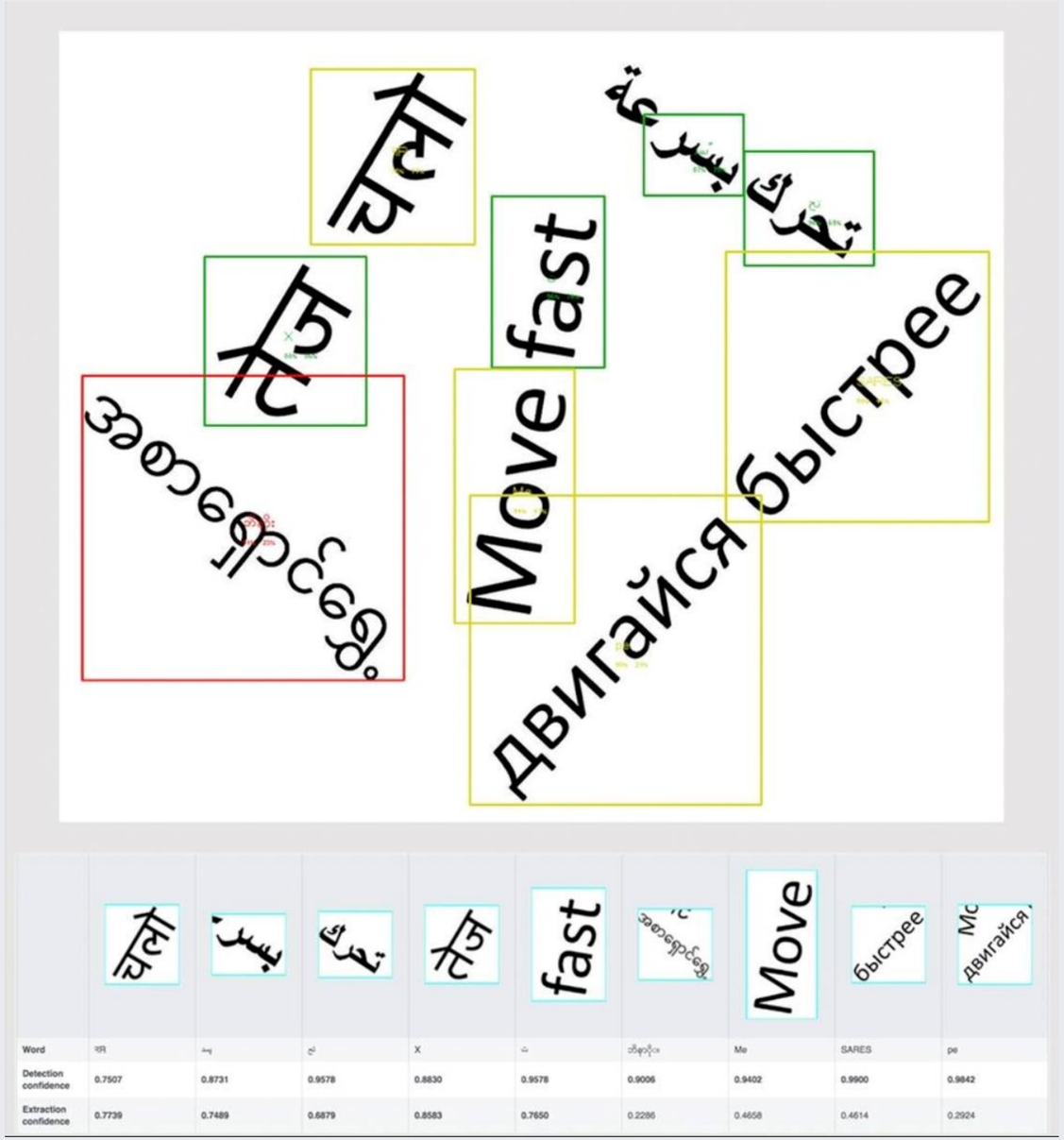




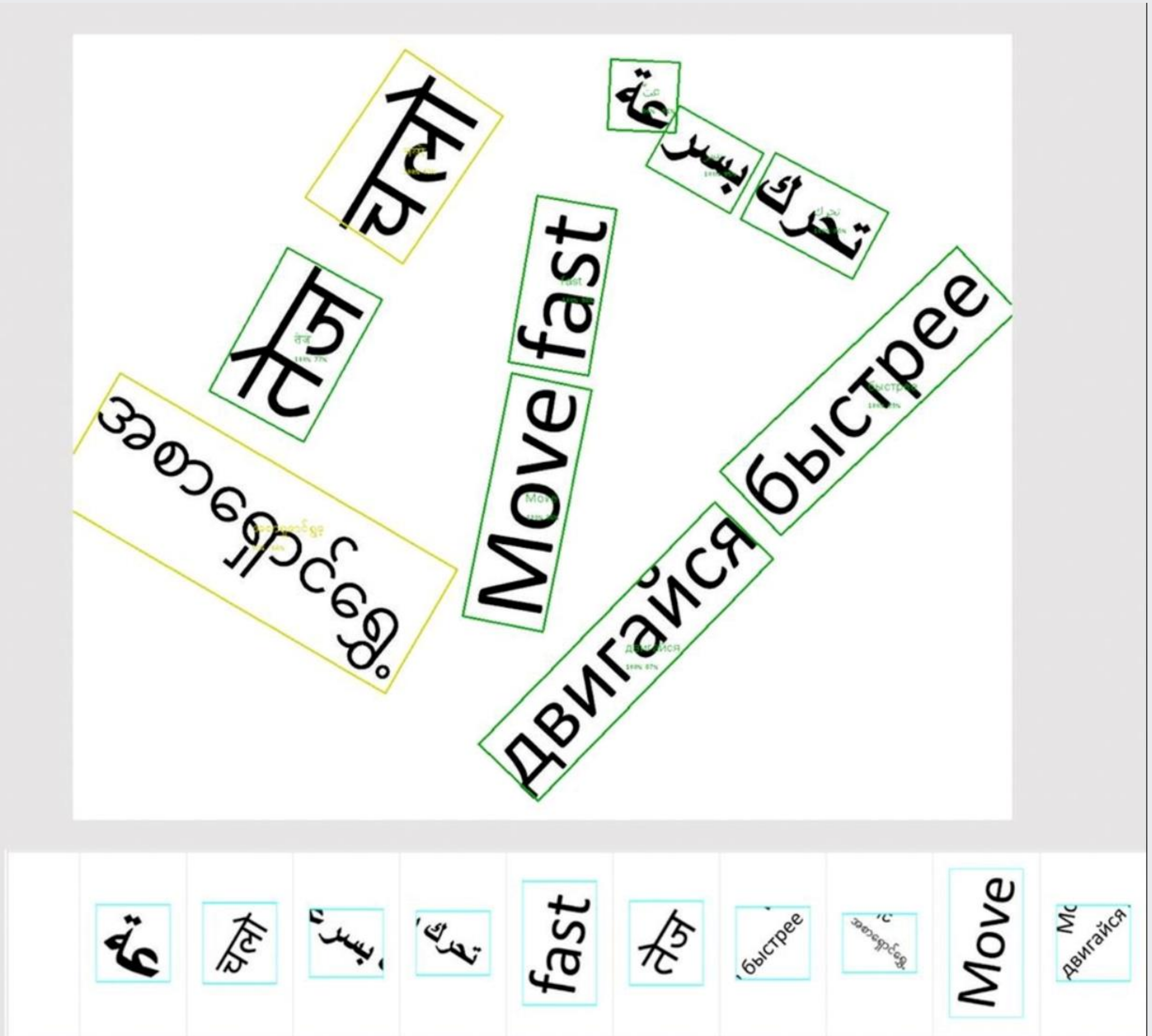
Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks, Ren et al.

ShuffleNet: An Extremely Efficient Convolutional Neural Network for Mobile Devices, Zhang et al.

Orientations



Orientations



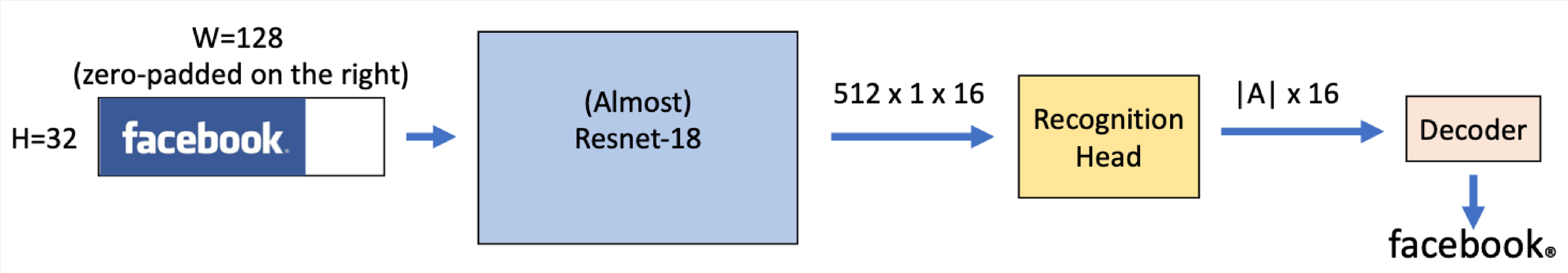
Word	عة	चलो	بسر	تحرك	fast	तेज	быстрее	[illegible]	Move	двигайся
Detection confidence	0.8376	0.9996	0.9984	0.9993	0.9993	0.9996	0.9986	0.9252	0.9991	0.9969
Extraction confidence	0.8149	0.4253	0.9545	0.8841	0.9837	0.7687	0.8888	0.6619	0.9828	0.8702

Improving Rotated Text Detection with Rotation Region Proposal Networks,

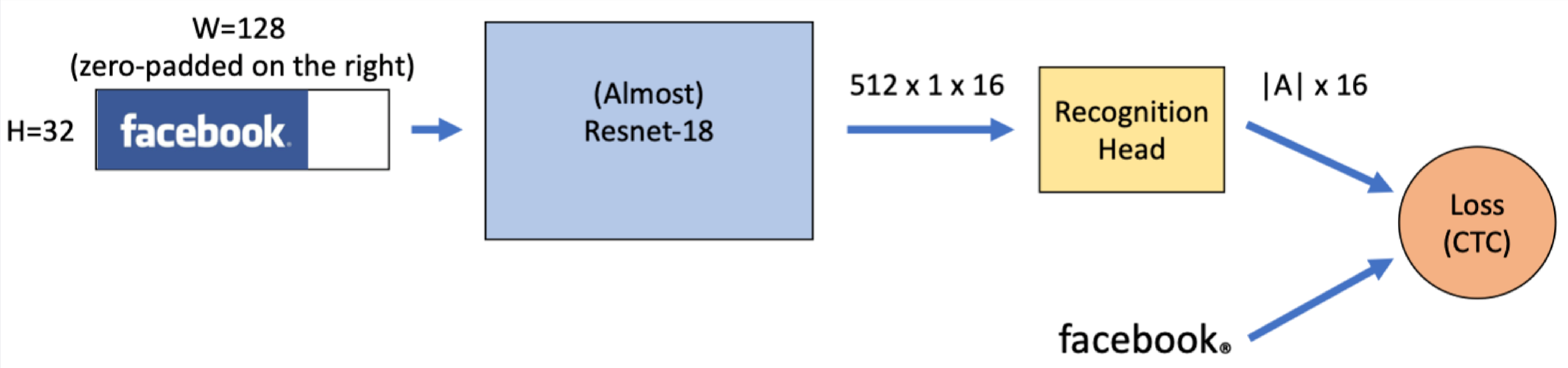
Text Recognition

Text Recognition

Text Recognition

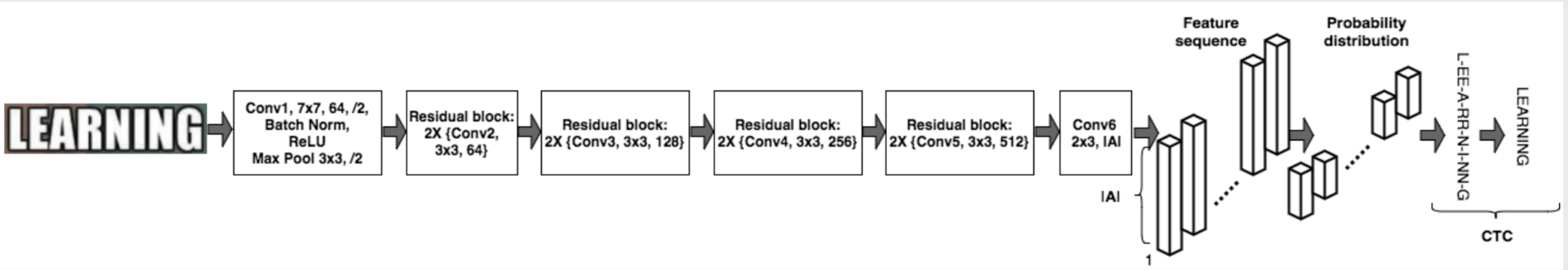


Text Recognition

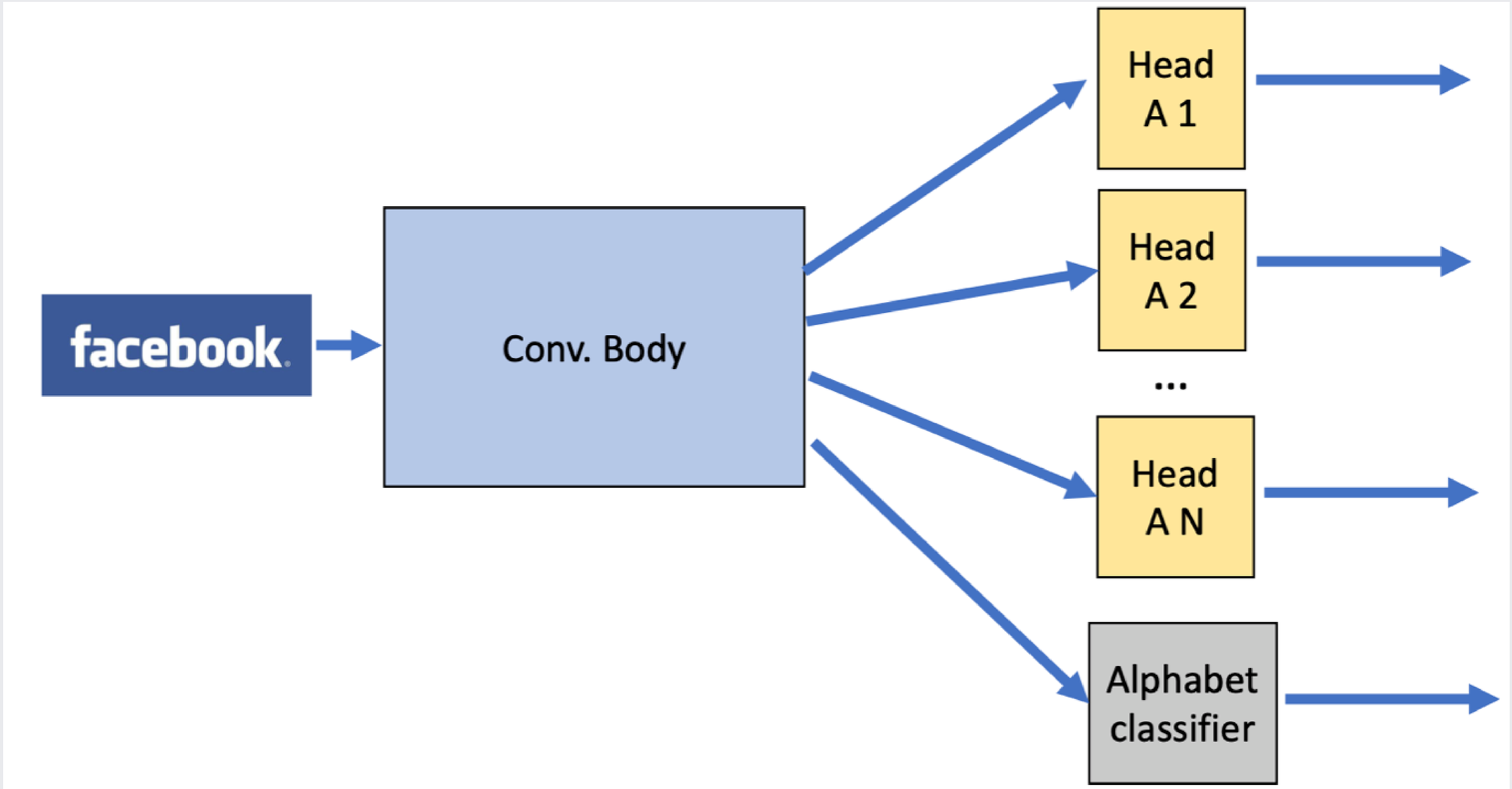


Connectionist temporal classification: Labelling unsegmented sequence data with recurrent neural networks, Graves et al.

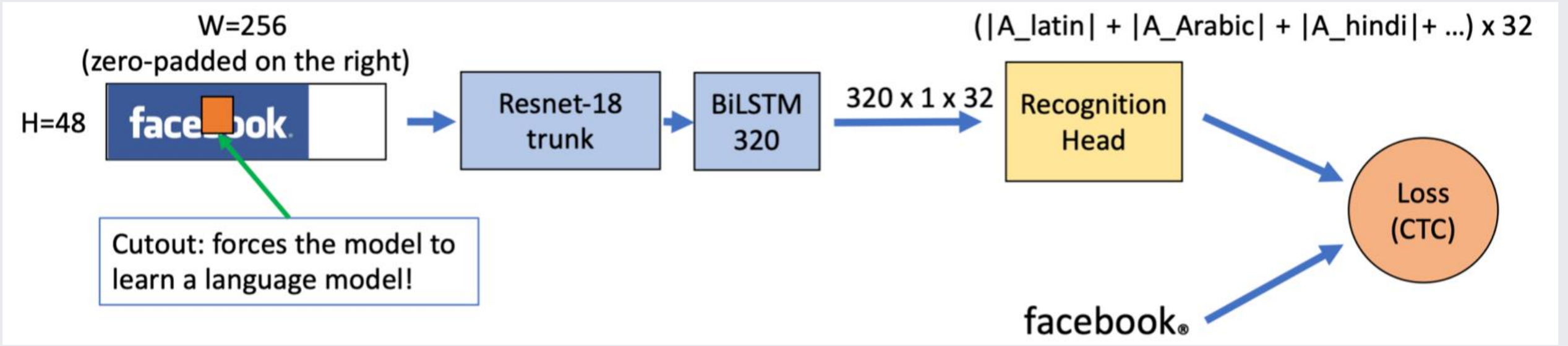
Text Recognition



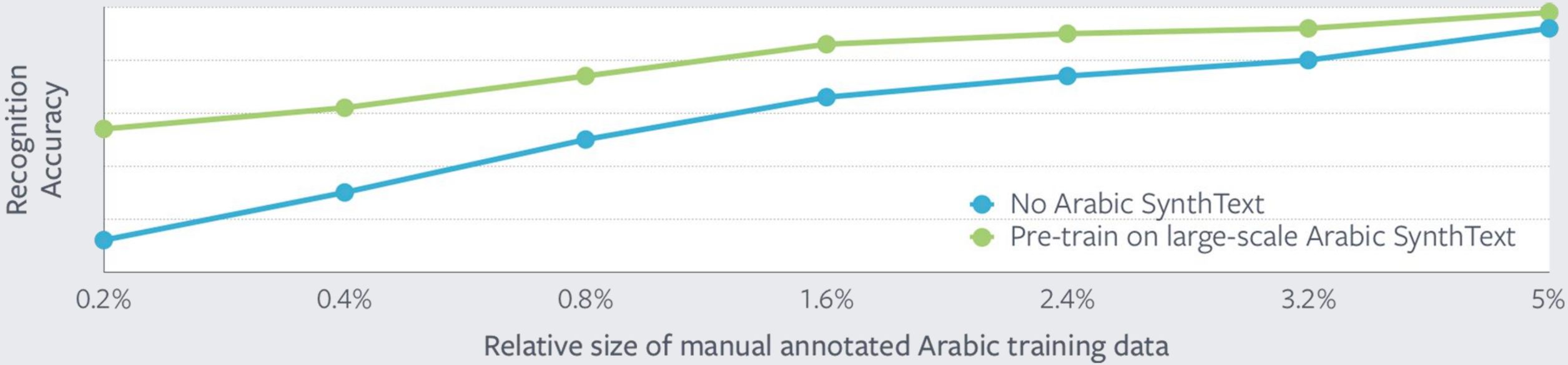
Multilingual



Multilingual



Synthetic Data



Inference

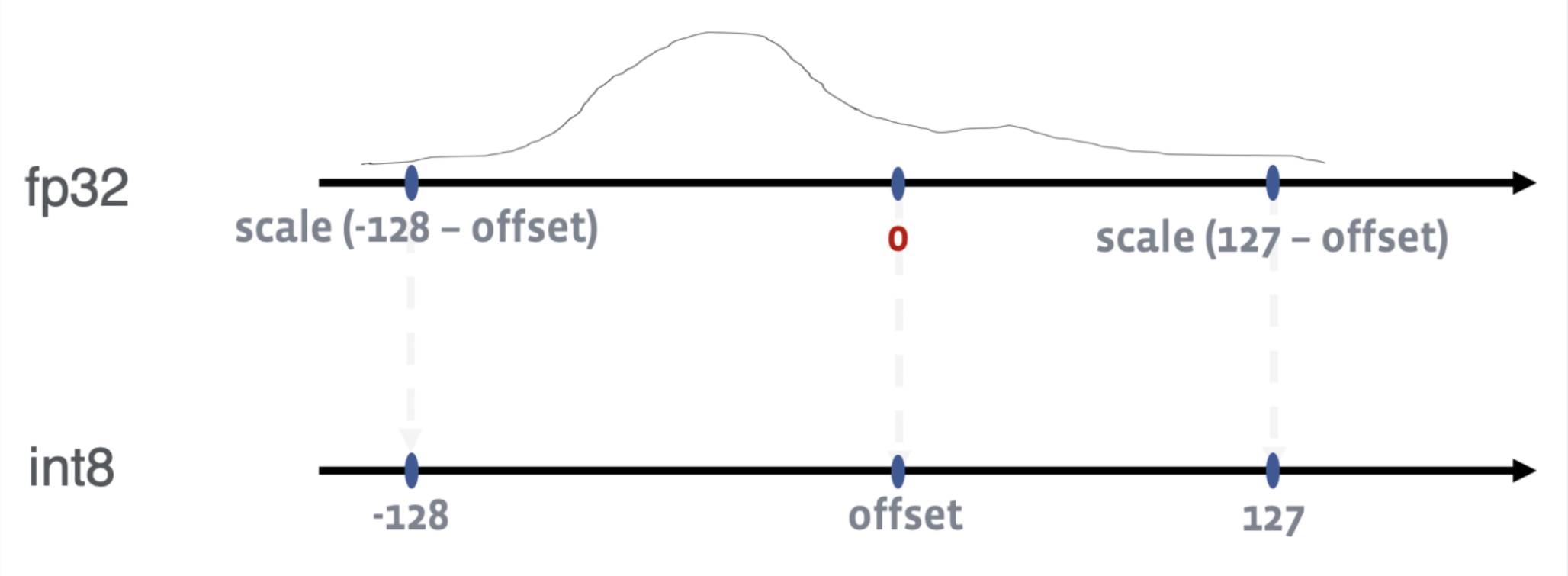
1B images/day x 5 sec/image = Lots of servers!

Int8 Quantization

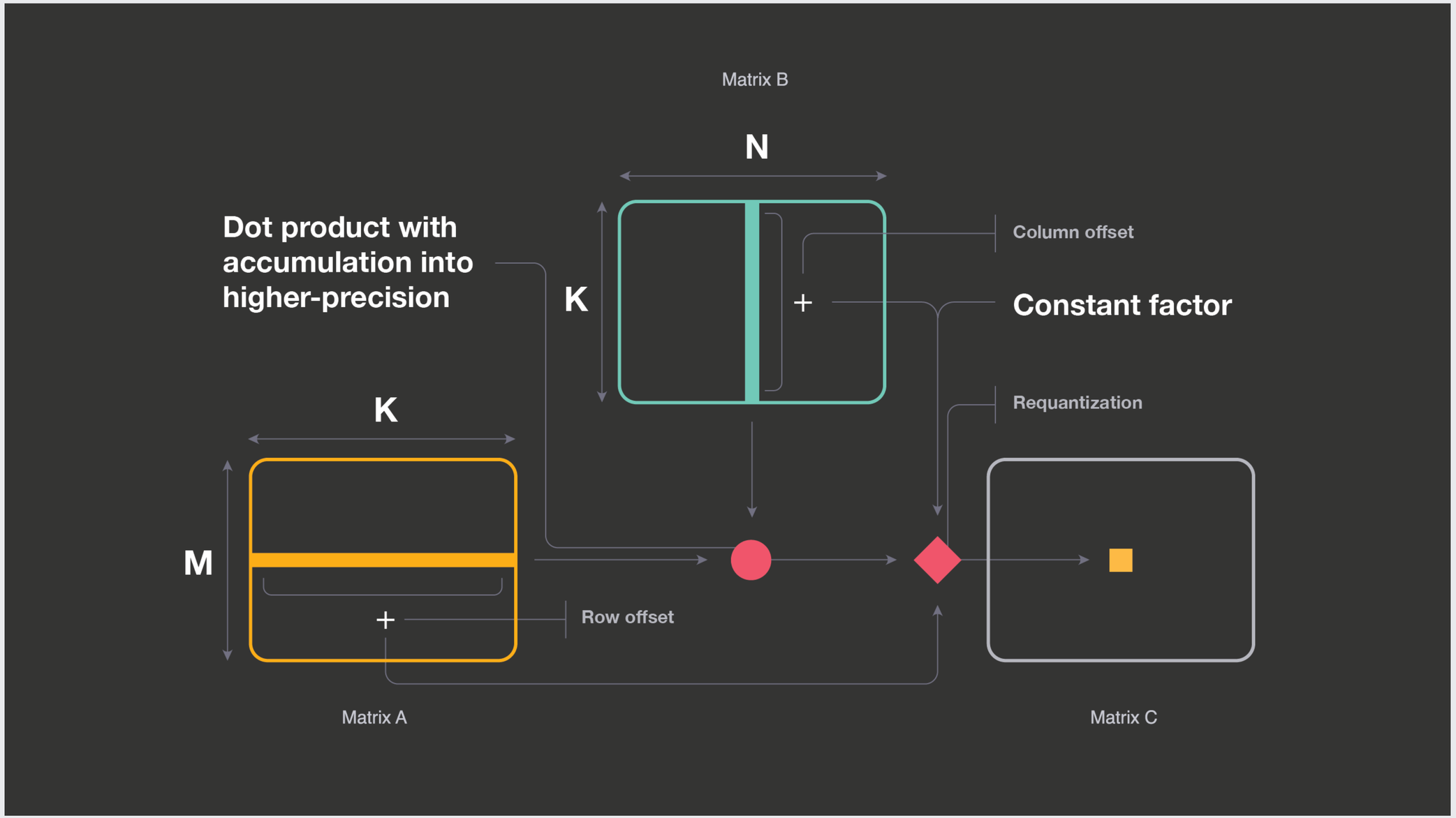
$$x_q = clip(round(\frac{x}{scale}) + offset, -128, 127)$$

Quantization:

De-quantization:



Int8 Quantization



But what about accuracy?

- No quantization error for 0
- Fuse Convolution and ReLU
- L2 Error Minimization vs Min-Max
- Don't quantize the first layer

Initial accuracy gap: 5%

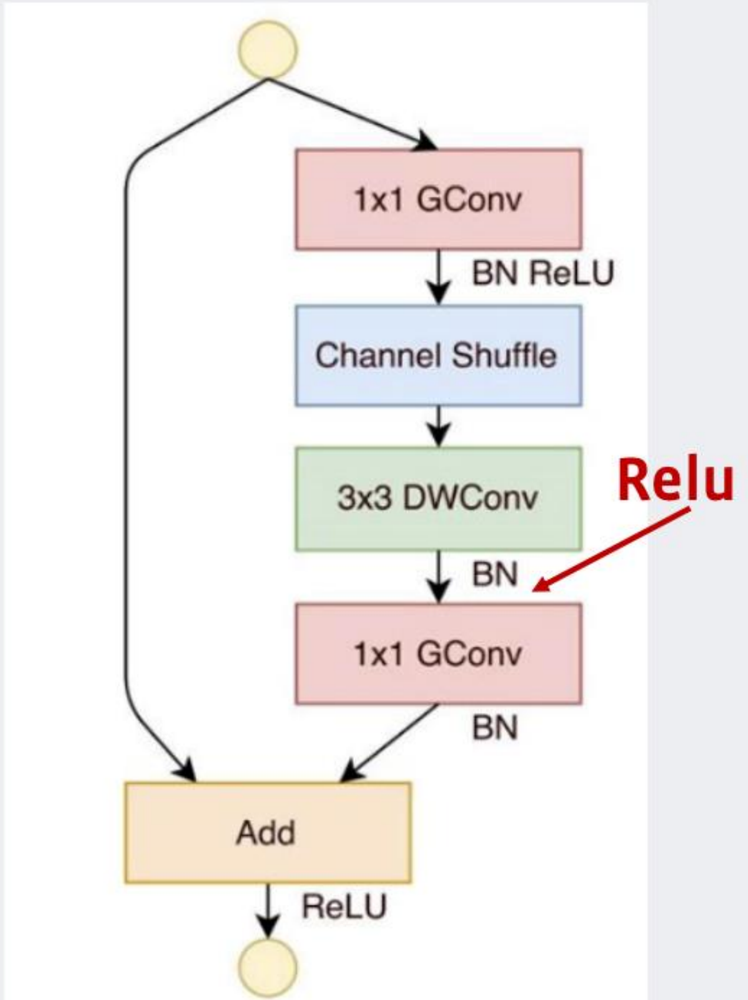
After: 0.2%

Deep Learning Inference in Facebook Data Centers: Characterization, Performance Optimizations and Hardware Implications, Park et al.

Model Co-Design

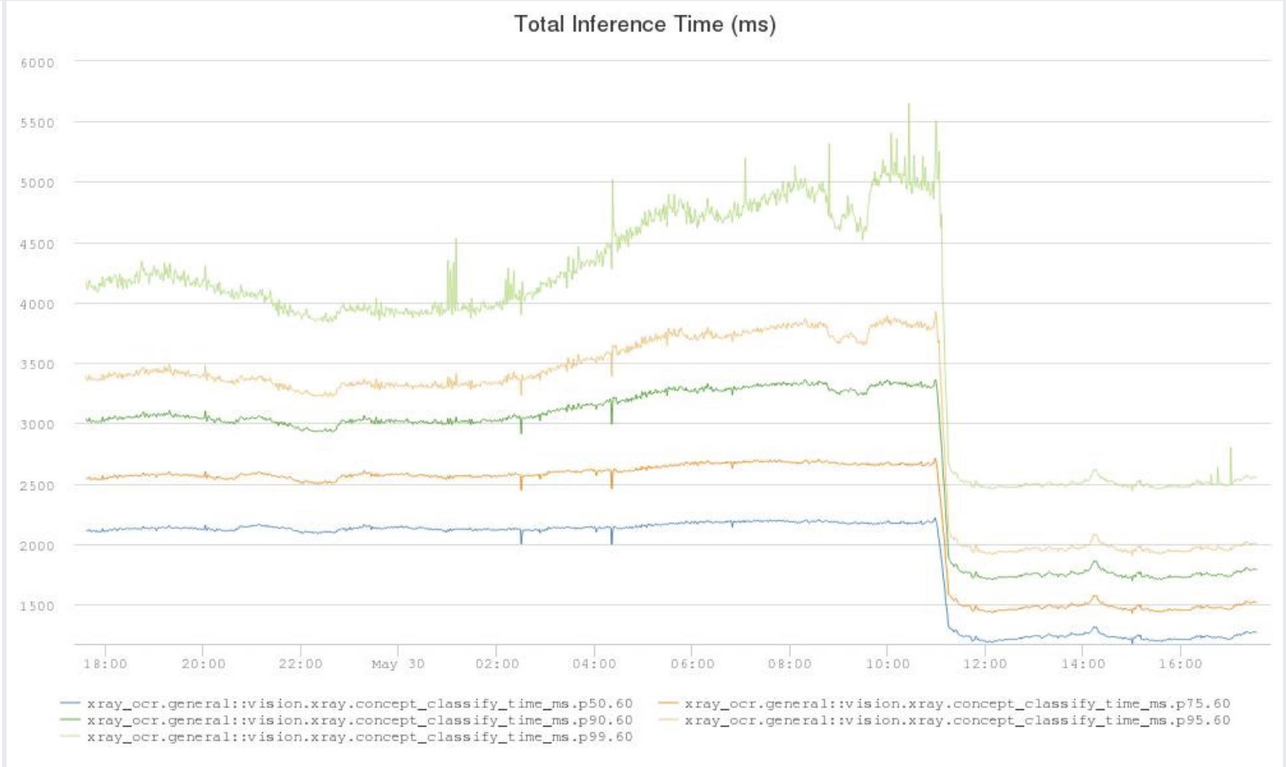
Outlier-aware quantization

- Int8 Quantization with 16-bit accumulation
- Further CPU speedup



Co-design your model and efficiency optimizations together!

Int8 Quantization



2.4x images/server

2x faster

github.com/pytorch/FBGEMM

0 to 1B+ images/day in a few months

Takeaways

Data before models

Synthesize data when needed

Co-design with efficiency in mind

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Thank You!