Where to go from here?

What we will be covering in this module?

- Introduction is Image Segmentation
- How to solve Image Segmentation problems?
- Approaches for Image Segmentation
  - Use Traditional Methods
  - Leverage Deep Learning
- Understanding Deep Learning Architectures for Image Segmentation
- Project on Lane Segmentation for Self Driving Cars
- What's Next?

What is Image Segmentation?

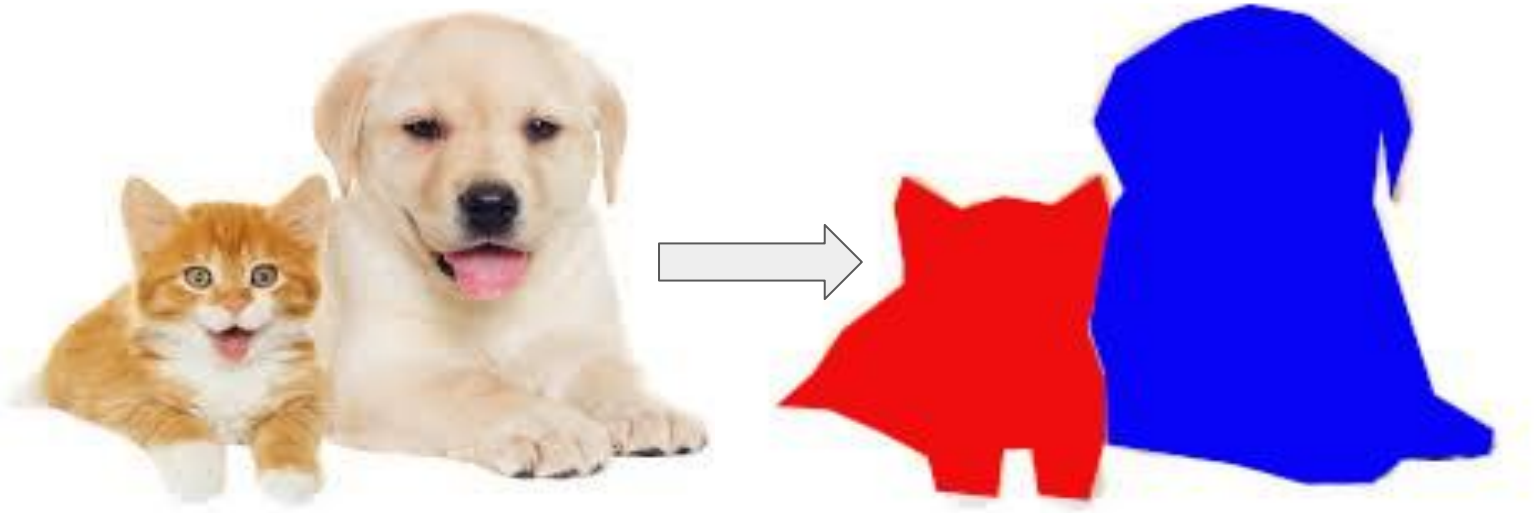

Image Segmentation is the task of partitioning an image into multiple segments

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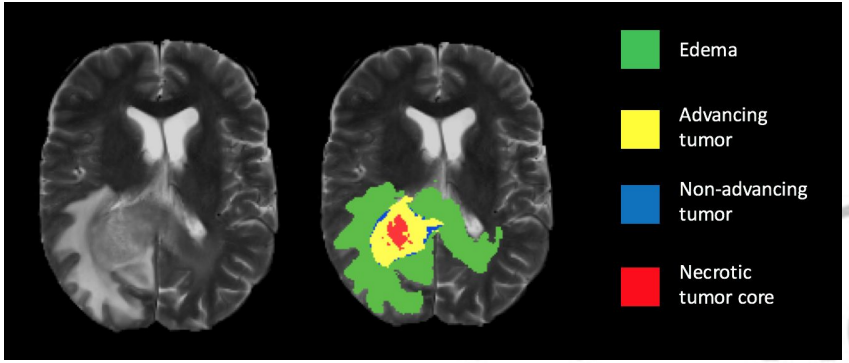
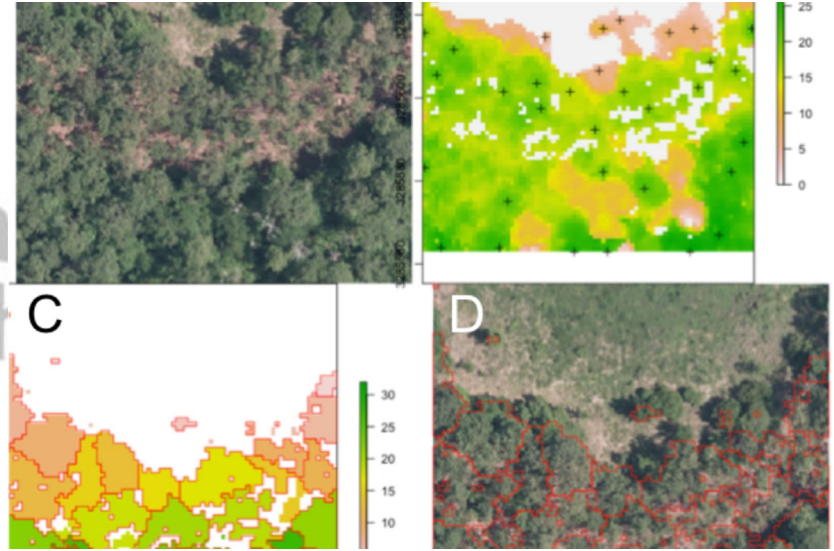
Applications of Image Segmentation





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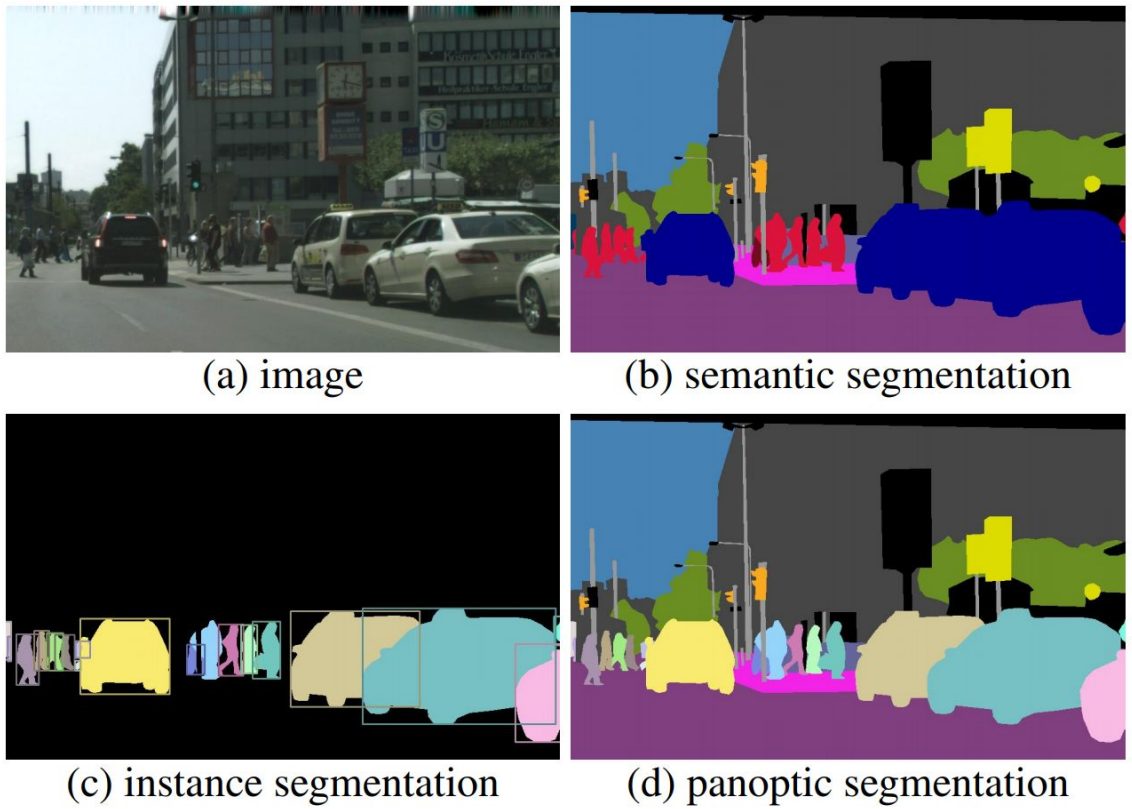
Types of Image Segmentation Problems



(a) image (b) semantic segmentation

(c) instance segmentation (d) panoptic segmentation

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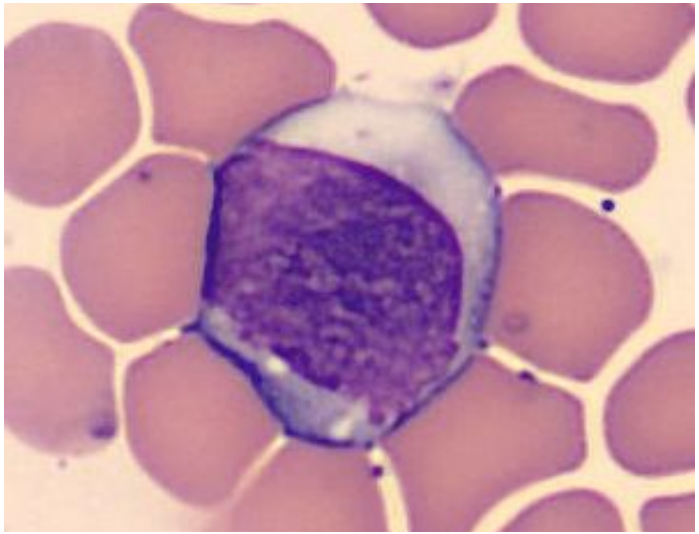
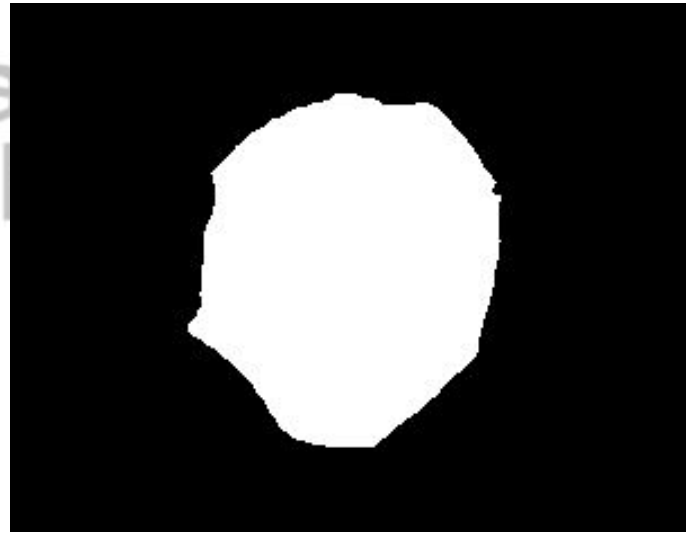
Exploring Blood Cell Segmentation Dataset

Problem Statement: Segmenting WBCs in the Images of Blood Cells

Binary Semantic Segmentation!



Sample Image



WBC

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Image Segmentation through Thresholding

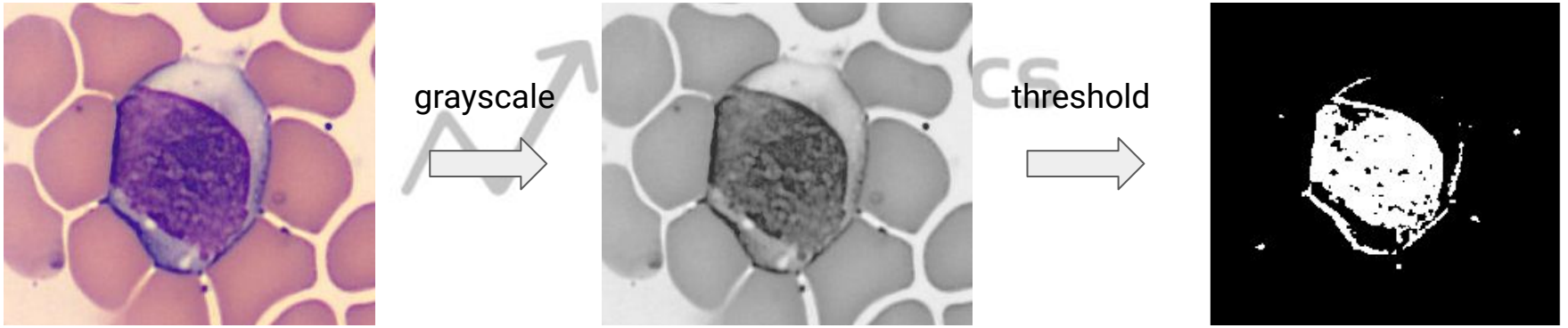

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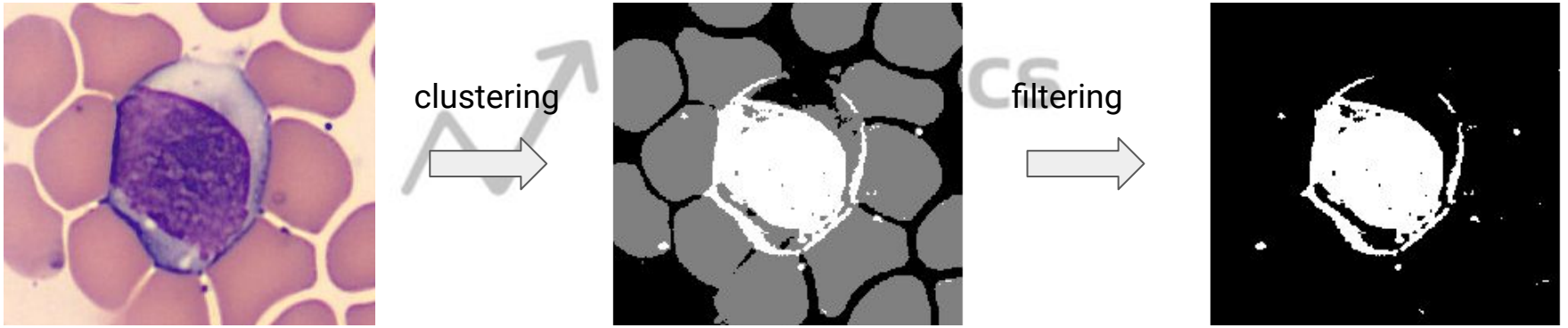
Image Segmentation through Clustering



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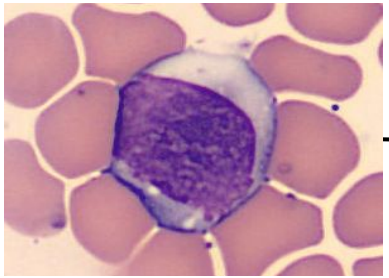
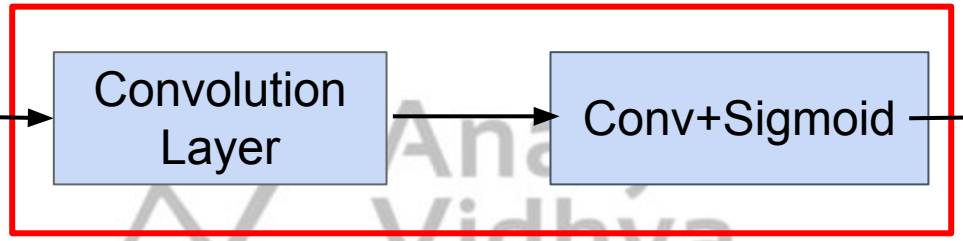
Modified CNN for Image Segmentation

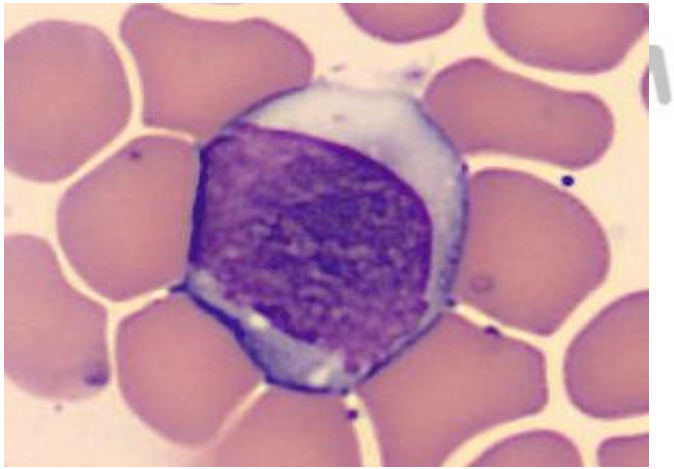




Feature Extractor

Binary Cross-Entropy Loss

Approach to solve Blood Cell Segmentation



Advanced
Deep Learning

What do we need?

- Feasible but still computationally expensive

➔ Inverse Operation for Pooling (Bilinear Interpolation, Max Unpooling)

- Options for DL architecture is limited

➔ A Convolution Operation which increases size of output (Transpose Convolution)

- Simplistic DL model, doesn't take ideas from complex networks

➔ Better Deep Learning architecture

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Understanding DL Architectures for Image Segmentation

- U-Net Family
- DeepLab Family
- R-CNN Family

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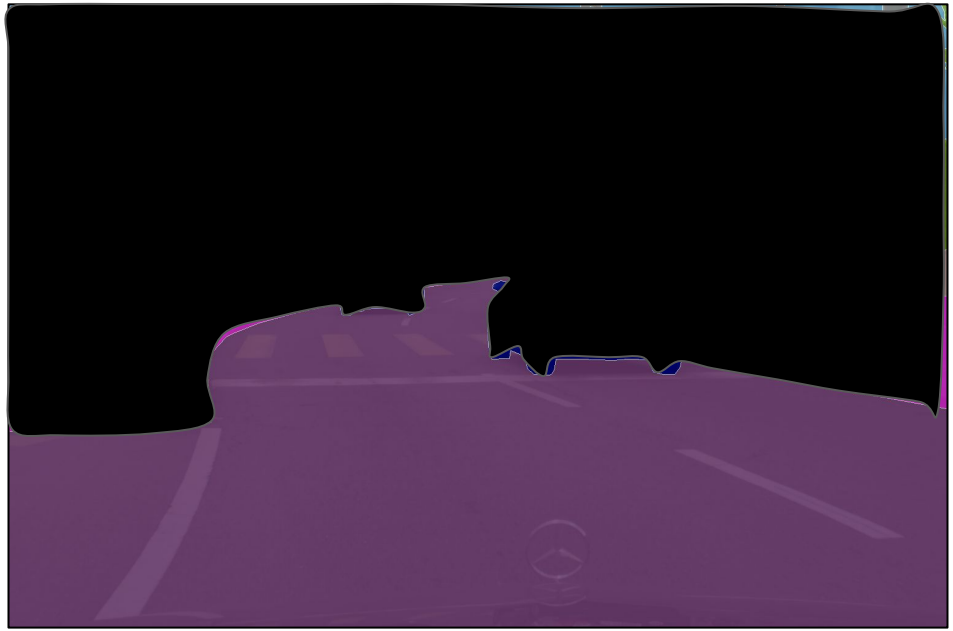
Lane Segmentation problem



Source: Marius Cordts et al: "The Cityscapes Dataset for Semantic Urban Scene Understanding", 2016

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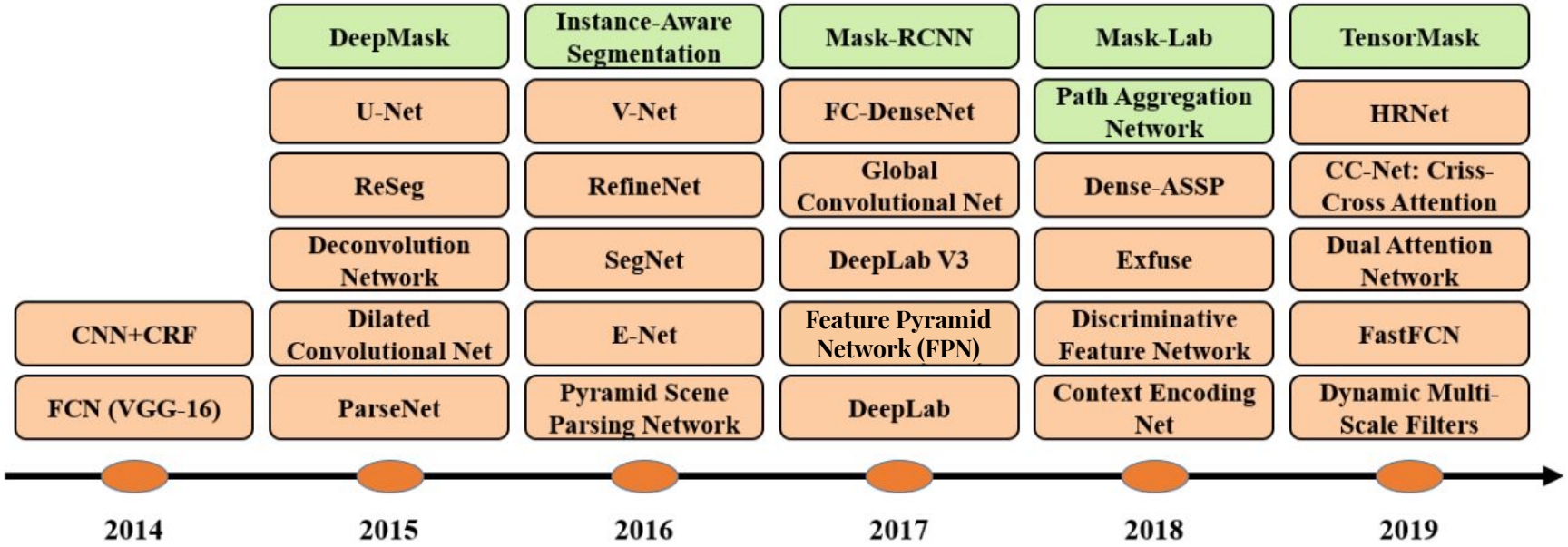
Deep Learning Architectures for Image Segmentation



Source: Shervin Minaee et. al. (2020)"Image Segmentation Using Deep Learning: A Survey"

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Best Practices for solving Image Segmentation problems

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Thank you

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