CS230: Lecture 5
Case Study
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**Goal**: Determine which parts of a microscope image corresponds to which individual cells.

**Data**: Doctors have collected 100,000 images from microscopes and gave them to you. Images have been taken from three types of microscopes:

<table>
<thead>
<tr>
<th>Type</th>
<th>Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A</td>
<td>50,000</td>
</tr>
<tr>
<td>Type B</td>
<td>25,000</td>
</tr>
<tr>
<td>Type C</td>
<td>25,000</td>
</tr>
</tbody>
</table>

**Question**: The doctors who hired you would like to use your algorithm on images from microscope C. How you would split this dataset into train, dev and test sets?
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Answer:
i) Split has to be roughly 90,5,5. Not 60,20,20.
ii) Distribution of dev and test set have to be the same (contain images from C).
iii) There should be C images in the training as well, more than in the test/dev set.

Question: Can you augment this dataset? If yes, give only 3 distinct methods you would use. If no, explain why (give only 2 reasons).

Answer: Many augmentation methods would work in this case:
– cropping
– adding random noise
– changing contrast, blurring.
– flip
– rotate
**First try**: You have coded your neural network (model M1) and have trained it for 1000 epochs. It doesn’t perform well.

**Transfer Learning**: One of your friends suggested to use transfer learning using another labeled dataset made of 1,000,000 microscope images for skin disease classification (very similar images).

A model (M2) has been trained on this dataset on a 10-class classification. Here is an example of input/output of the model M2.

**Question**: You perform transfer learning from M2 to M1, what are the new hyperparameters that you’ll have to tune?
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\[
l = \text{number of layers transferred from M2} \\
la = \text{number of new layers added to the new model's head} \\
f = \text{number of frozen layers}
\]
For next Tuesday

**Completed modules:**
- C4M1: Foundations of Convolutional Neural Network (slides)
- C4M2: Deep Convolutional Models (slides)

**Quizzes (due at 9 45 am PST (right before lecture)):**
- The basics of ConvNets
- Deep convolutional models

**Programming Assignments (due at 9 45 am PST (right before lecture)):**
- Convolutional Model: step by step
- Convolutional Model: application
- Keras Tutorial: This assignment is optional.
- Residual Networks