Automated Image Timestamp Inference Using ConvNets

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Project Objective

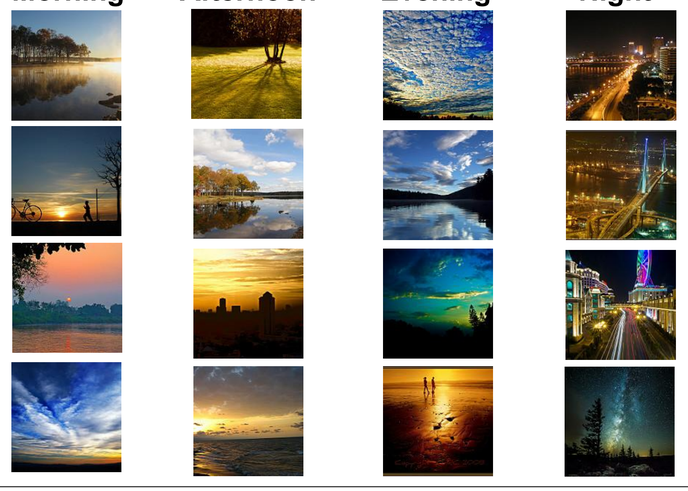
- Given an image, our objective is to predict what time of day it was taken.
- We interpret the data in two ways:
  - By tag: morning, afternoon, evening, and night
  - By time window: 0:00 to 4:00, 4:00 to 8:00, etc.

Data

- **Source**
  - Images were collected using the Flickr API
  - Images have 150x150 pixels with 3 channels
- **Data Distribution**

Tag	Count
Morning	992
Afternoon	763
Evening	994
Night	1020

- **Sample Data**



Models and Results

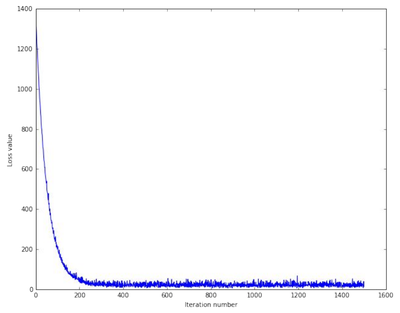
- **SVM**
  - Loss is defined as: $L_i = \sum_{j \neq y_i} \max(0, s_j - s_{y_i} + \Delta)$

	Train	Val	Test
SVM	0.525	0.470	0.475
SVM + HOG + HSV	0.426	0.458	0.428

With Tags

	Train	Val	Test
SVM	0.517	0.455	0.453
SVM + HOG + HSV	0.371	0.383	0.343

With Time Buckets

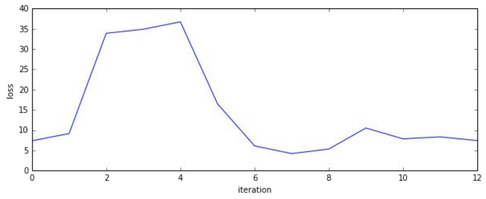


Loss Function

Class Representation

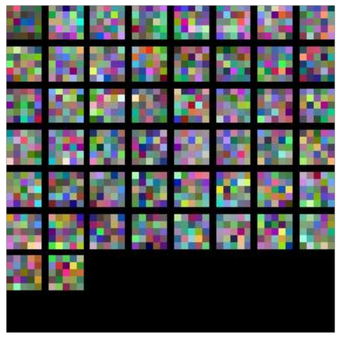
- **3-Layer ConvNet**

	Train	Val	Test
With Tags	0.44	0.41	0.40
With Time Buckets	0.46	0.43	0.41



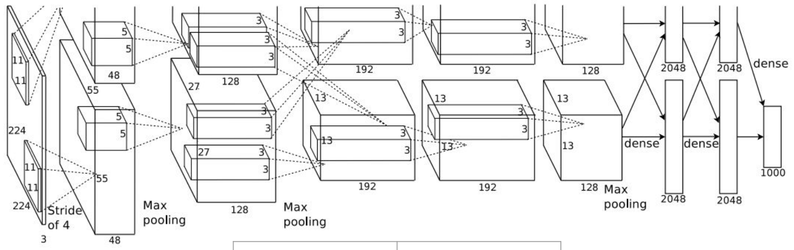
Loss Function

Filters



Models and Results

- **AlexNet**
  - Implemented using TensorFlow
  - Trained on AWS



	Val
AlexNet with Tags	0.55

Future Work

Our current work can be extended in many ways. A few of them are listed below:

- Add more data with more accurate EXIF data
- Add season and location of the images
- Train a VGGNet on the data
- Train an ensemble of models to boost the performance of the dataset

References

- Krizhevsky, Alex. (2012). ImageNet Classification with Deep Convolutional Neural Networks.
- Srivastava, Nitish. (2014). Dropout: A Simple Way to Prevent Neural Networks from Overfitting.
- Kingma, Diederik. (2015). Adam: A Method for Stochastic Optimization.
- Abadi, Martín. (2015). TensorFlow: Large-Scale Machine Learning on Heterogeneous Distributed Systems.