Problems Machine Learning can Solve

by Ted Thompson
Outline

Repetitive Tasks Really Fast

Generate Synthetic data
Predict
Predict

Label

Classification

Regression
Predict

<table>
<thead>
<tr>
<th>Features</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>High temp</td>
<td>Elec. usage</td>
</tr>
<tr>
<td>Low temp</td>
<td>71626</td>
</tr>
<tr>
<td>Sunlight</td>
<td>69778</td>
</tr>
<tr>
<td>Humidity</td>
<td>63798</td>
</tr>
<tr>
<td>Daytime</td>
<td></td>
</tr>
</tbody>
</table>

- 18.4 | 8.1 | 4.3 | 63 | 755

- 13.3 | 7.7 | 0  | 68 | 758

- 17   | 9.5 | 0  | 90 | 759

These features result in:

- 71626
- 69778
- 63798

Learns the relationship between features and the labels.
Predict

Deep Feed Forward
Cluster/Organize
Cluster/Organize

- Similarity/Relationship
- Recommendation Engine
- Topic Modelling
Cluster/Organize
Cluster/Organize

Configuration (Kruskal's stress (1) = 0.002)
Cluster/Organize

Manifold Learning with 1000 points, 10 neighbors

- LLE (0.098 sec)
- LTSA (0.13 sec)
- Hessian LLE (0.21 sec)
- Modified LLE (0.18 sec)

- Isomap (0.38 sec)
- MDS (1.4 sec)
- SE (0.069 sec)
- t-SNE (6.8 sec)
Cluster/Organize
Summarize
Summarize
Generate Synthetic data
Generate Synthetic data

- Images
- Video
- Sound (Voices, Music)
- Art
- Signals
- Numbers
## Discriminative Model

<table>
<thead>
<tr>
<th>Goal</th>
<th>Discriminative model</th>
<th>Generative model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Directly estimate $P(y</td>
<td>x)$</td>
</tr>
<tr>
<td><strong>What's learned</strong></td>
<td>Decision boundary</td>
<td>Probability distributions of the data</td>
</tr>
<tr>
<td><strong>Illustration</strong></td>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td>Regressions, SVMs</td>
<td>GDA, Naive Bayes</td>
</tr>
</tbody>
</table>

### Generative Model
Generate Synthetic data
Generate Synthetic data
Generate Synthetic data

Generative Adversarial Network (GAN)
The End.