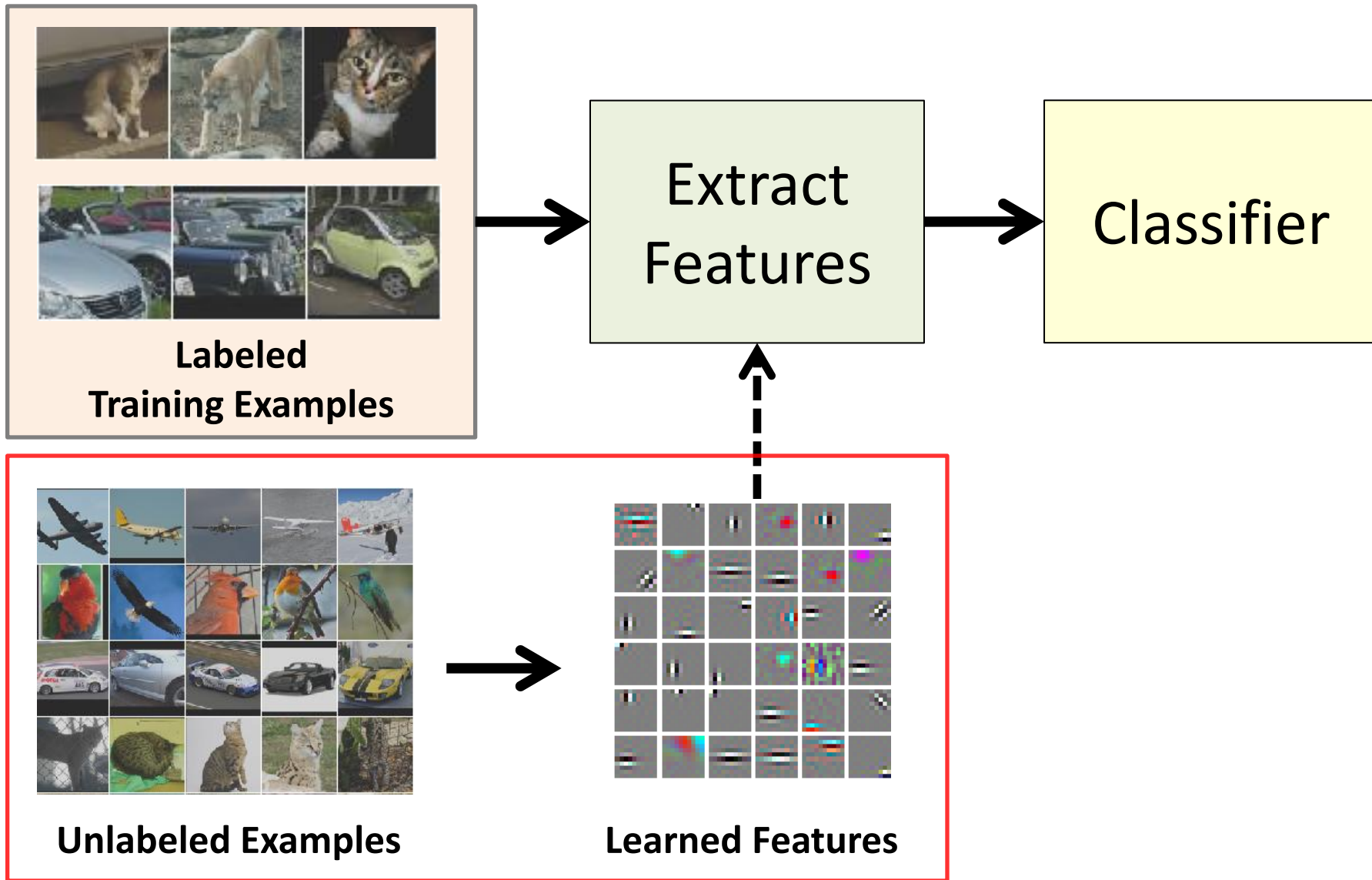




# Sparse Filtering

Jiquan Ngiam, Pang Wei Koh, Zhenghao Chen, Sonia Bhaskar & Andrew Y. Ng



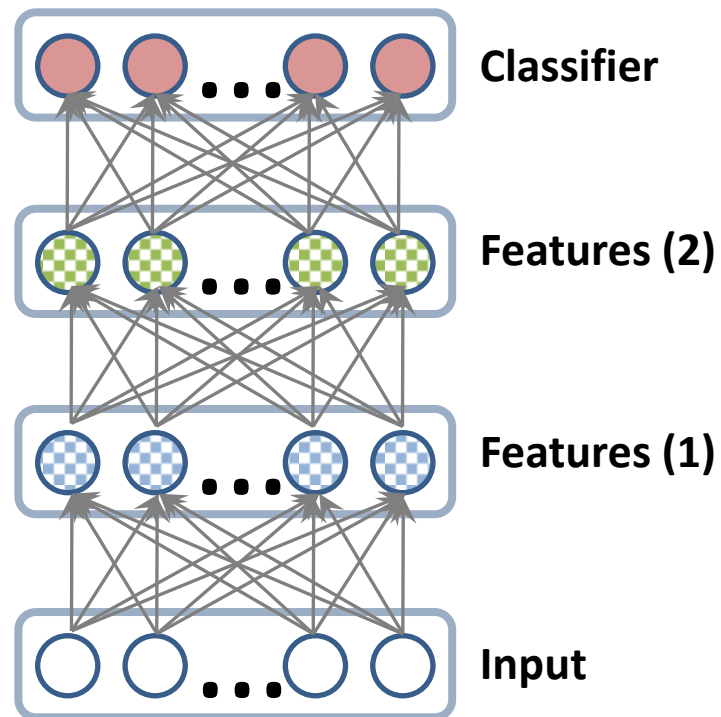


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## Why Sparse Filtering?

- **Easy, fast** approach to feature learning
- No hyper-parameters that need tuning
- Easy to evaluate objective function
- Minimal data preprocessing required
- Trains well with off-the-shelf optimization toolboxes (e.g., L-BFGS).





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## Examples

Feature Values

	$x_1$	$x_2$	$x_3$	$x_4$	...	$x_m$
$f_1$	0.5	2	0	1.5	...	4
$f_2$	0	0	2.5	0	...	0
...			...			
$f_{99}$	3.2	0	1.6	0.3	...	1
...			...			
$f_n$	4	0.5	0	1	...	3

$$M_{ij} = |w_i^T x_j|$$

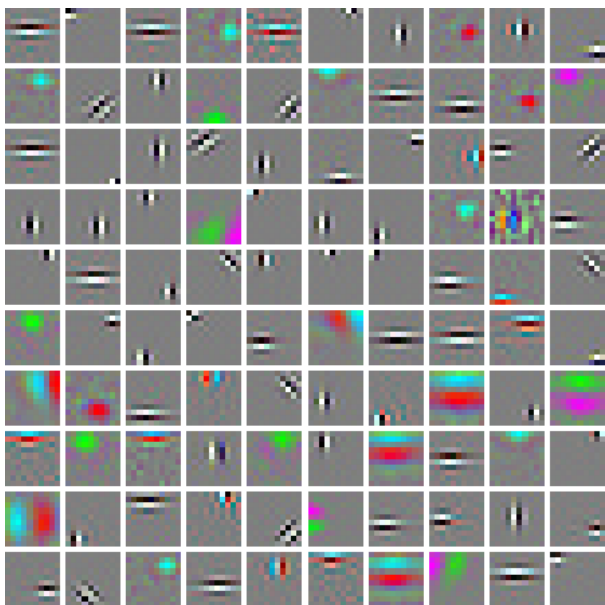
## Sparse Filtering Objective Function

1. Normalize across rows
2. Normalize across columns
3. Cost Function =  
Sum of the normalized entries

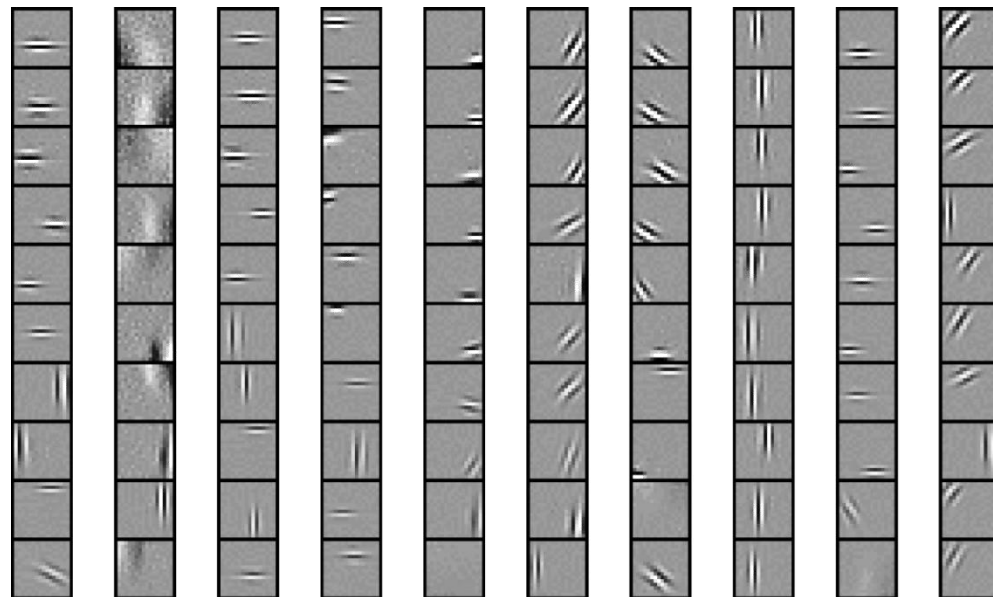


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1<sup>st</sup> Layer Visualizations (STL Dataset)



2<sup>nd</sup> Layer Visualizations (Natural Images)

Evaluated sparse filtering features on natural images, image classification (STL Dataset), audio classification (TIMIT).

*Results comparable to state-of-the-art and fast!*

code available at <http://cs.stanford.edu/~jngiam/>