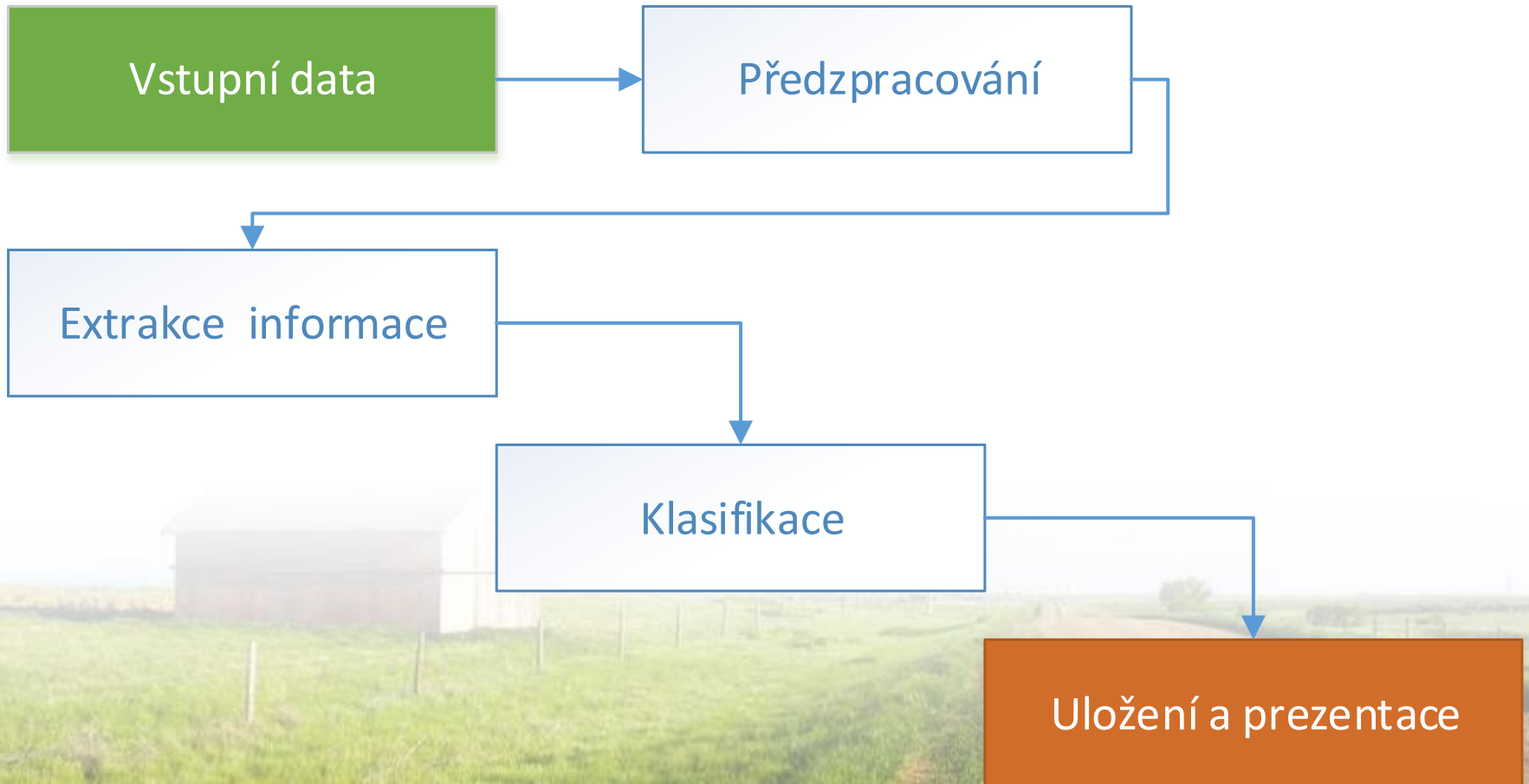


# Automatic recognition of vehicle attributes using machine learning

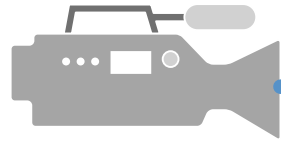


Mgr. Jan Sedlák

# System



# Input data



Kamera



Kamera

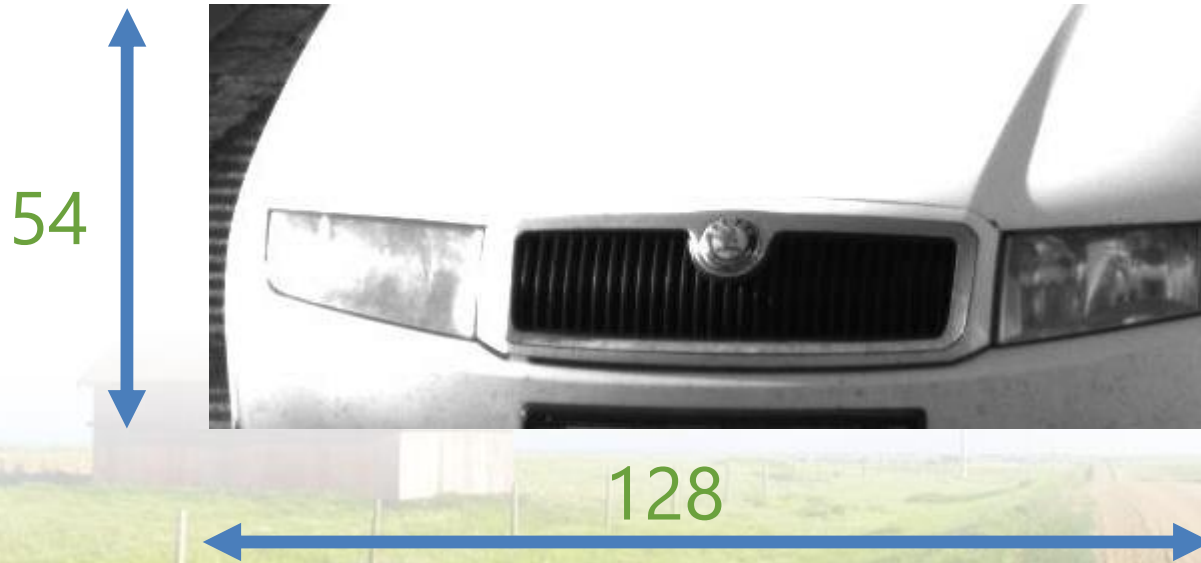


SERVER



# Region of interest

➤ Pixel intensity values

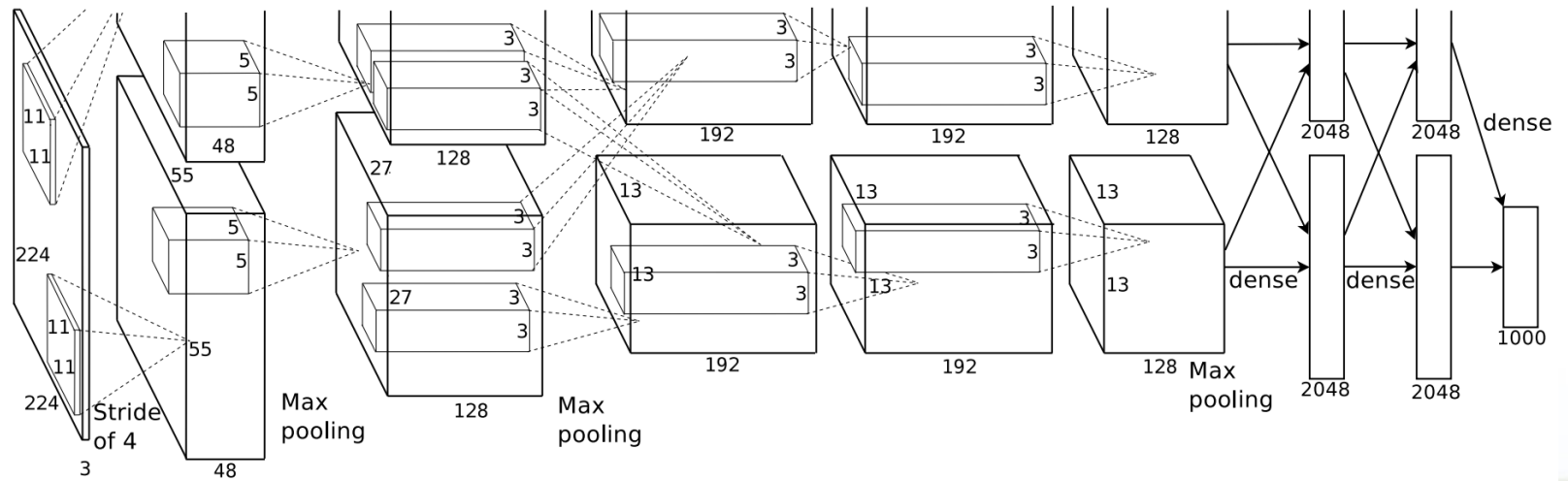


# Preprocessing



# How to classify?

➤ Let's go deep...



# Deep learning

- Test some recommended configurations
  - hidden = [200,200]
  - hidden = [512]
  - hidden = [64,64,64]
  - hidden = [32,32,32,32,32]
  - hidden = [1024,512,256]
- Overfitting and dropout
- Use dropout ratio
- Use adaptive rate



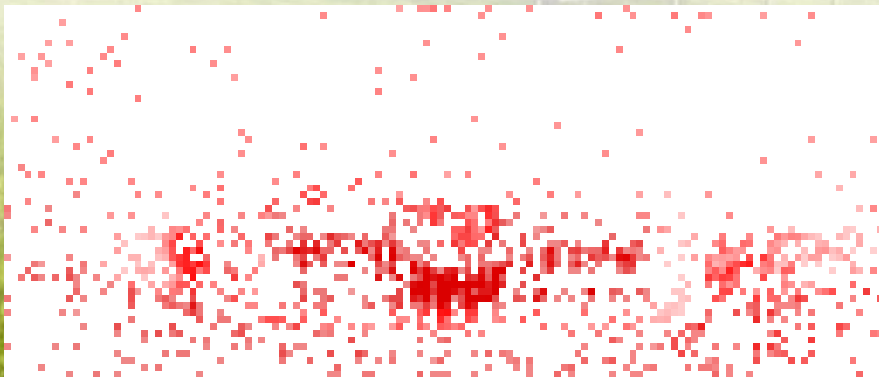
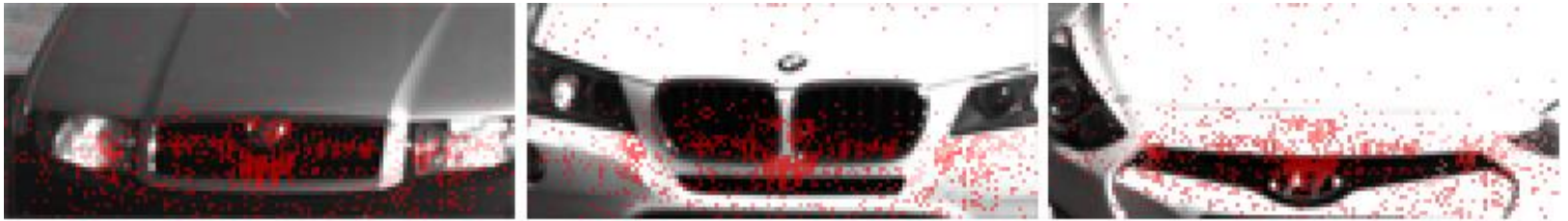
# What about results?

Klasifikátor	Metrika	Sada-Škoda
RandomForest (100 ntree, 15 mtry)	Přesnost	97.21 %
SVM - RBF (C=10, $\gamma=0.001$ )	Přesnost	95.68 %
Neuronové sítě (0.2 dropout na vstupní vrstvě)	Přesnost	95.55 %
(200 Tanh)->(200 Tanh)->(2 Softmax)		

Klasifikátor	Metrika	Sada-Volkswagen
RandomForest (100 ntree, 15 mtry)	Přesnost	98.10 %
SVM - RBF (C=10, $\gamma=0.001$ )	Přesnost	92.21 %
Neuronové sítě (dropout 0.2 na vstupní a 0.5 na skrytých vrstvách)	Přesnost	93.16 %
(512 R)->(128 R)->(128 R)->(32 R)->(2 Softmax)		



# Random forest?



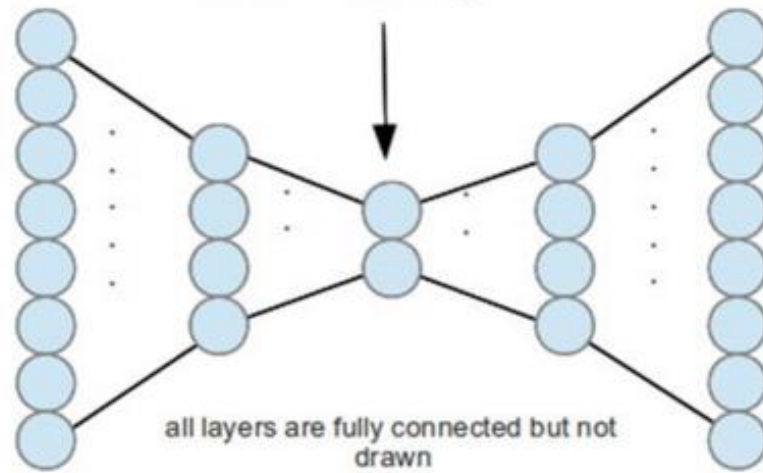
# Deep learning - features



# Advantages and disadvantages



# Detecting anomalies



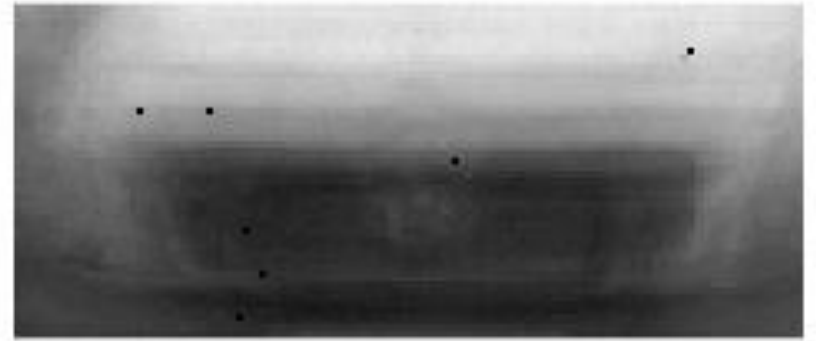
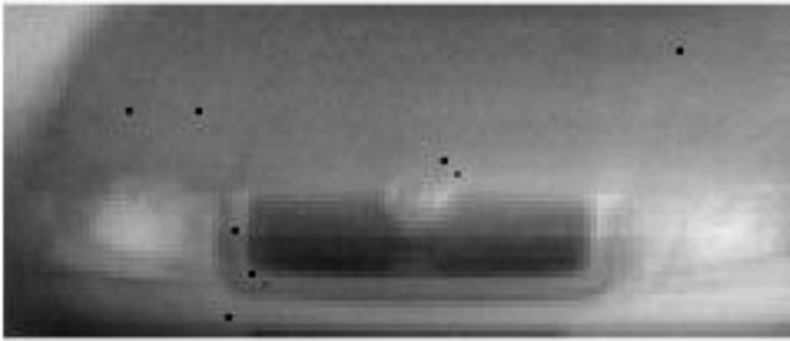
Bad MSE



Good MSE

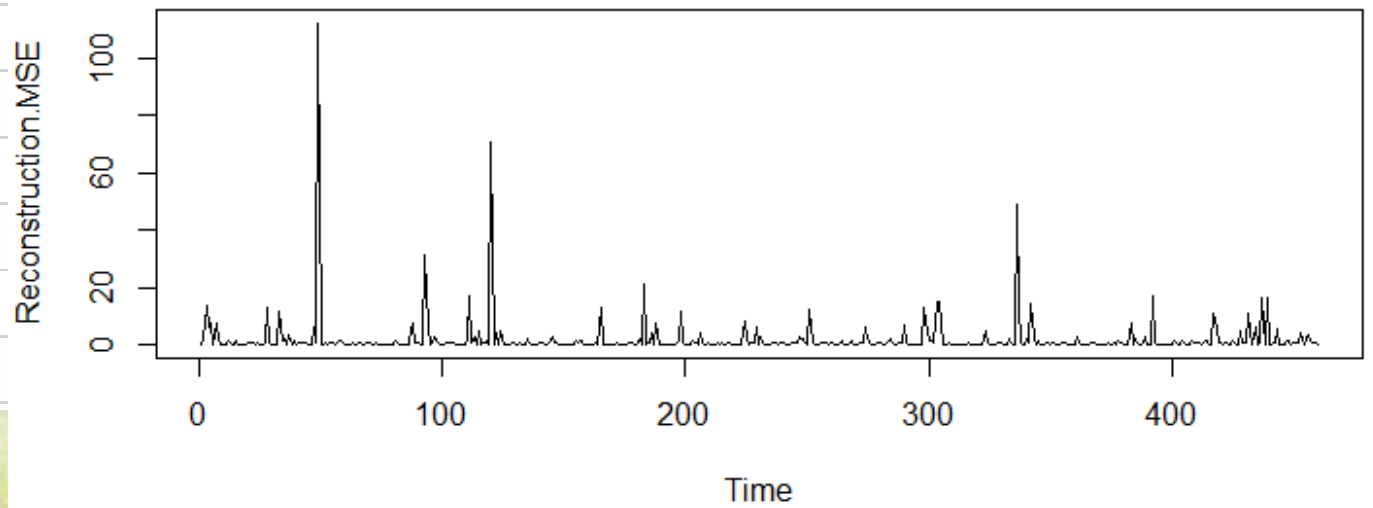


# Reconstruction example



# Reconstruction error

	Reconstruction.MSE ▾
49	112.103859
120	70.627163
336	48.722634
93	31.306080
183	
392	
111	
439	
437	
303	



# Detected anomalies

