

# A comparison of classifiers for oil spill detection

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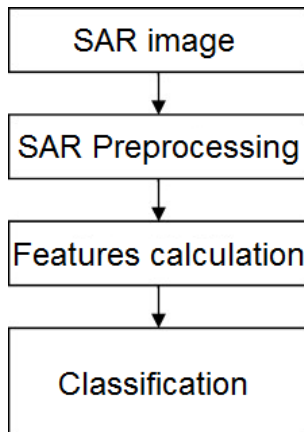
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# What are Oil Spills?

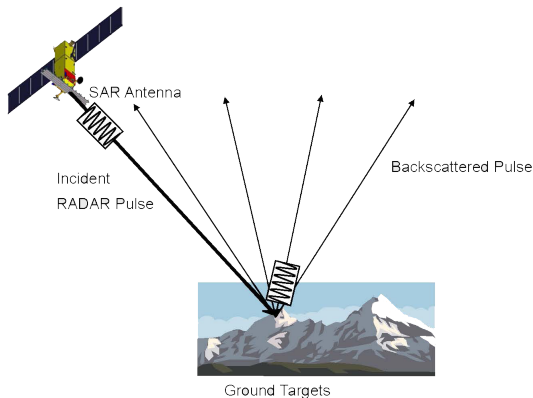


# General oil spill detection approach

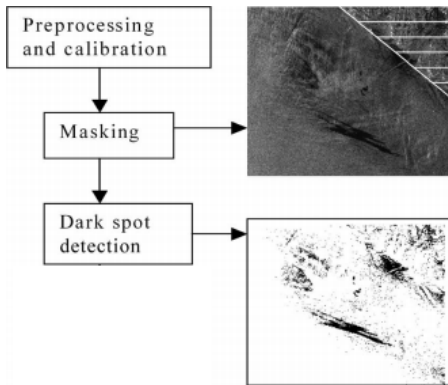


# Synthetic Aperture Radar Image

- Radar?
- Synthetic Aperture?
- Advantages
- Problems



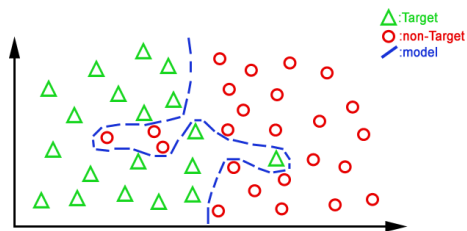
# SAR Preprocessing



- What are features?
- Types of features
  - Geometrical
  - Physical
  - Texture
  - Contextual

# Feature Selection

- Choosing features
- Over fitting
- Curse of dimensionality

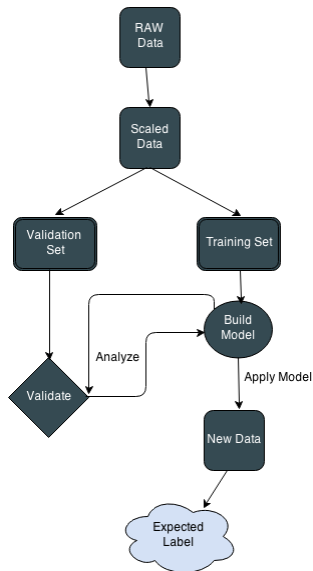




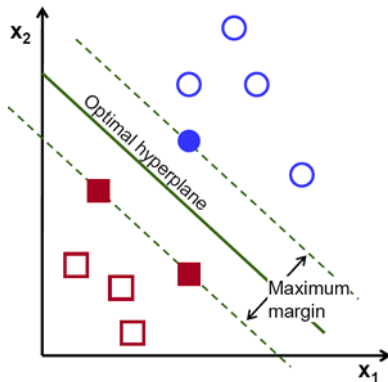
# Typical problems

- Lookalikes
- Imbalanced dataset
- Data is scarce
- Gathering contextual features

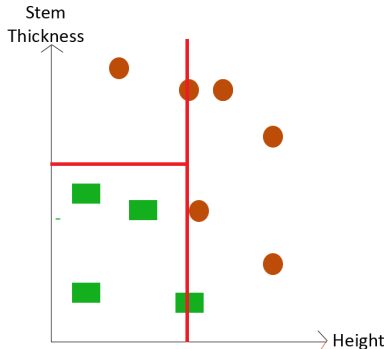
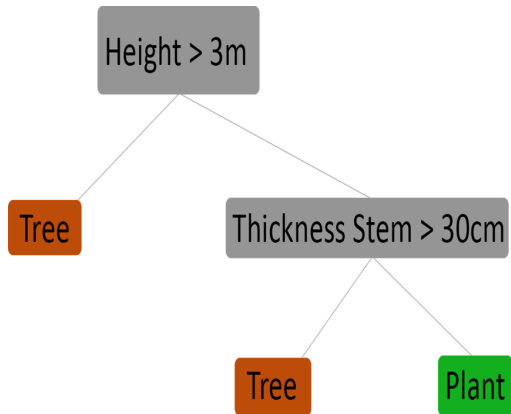
# Supervised learning



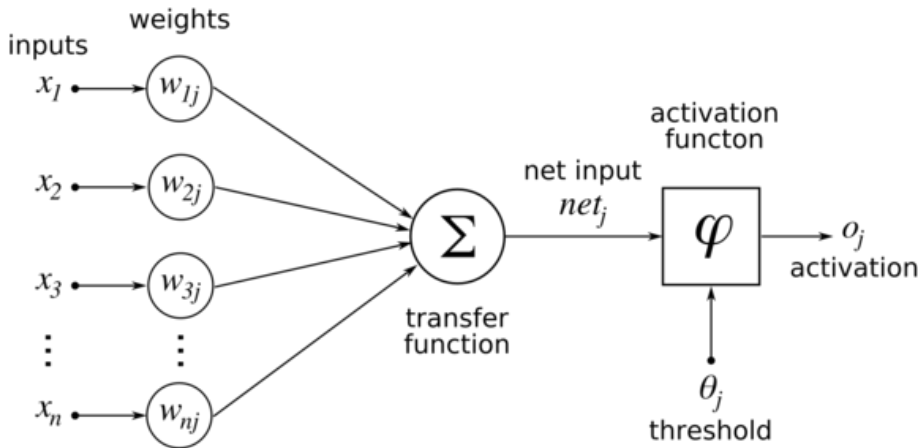
# Support vector machines



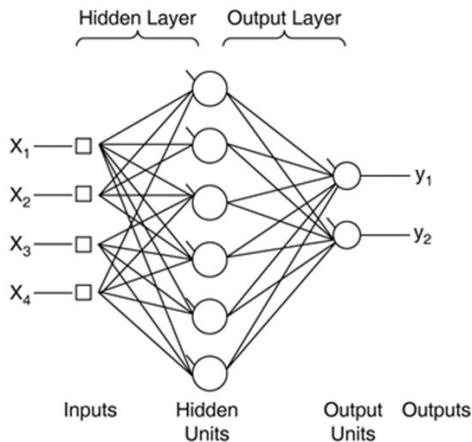
# Decision Tree



# Perceptron



# Multilayer perceptrons



# Research goals

- Accuracy comparison
- Classifier characteristics vs field specific problems

# Difficulties researching

- SVM was hardly used
- Not all details were specified
- Use of different datasets (unverified samples)
- Use of different features
- Free lunch theorem



We did not manage to compare our three classifiers

# The best classifier?

- Different accuracy in different situations
- SVM and MLP for large datasets
- SVM and MLP for non-linear cases
- DT for small datasets
- DT easiest to interpret

# Recommendations

- More research on SVM
- More research on Random Forest
- Shared database
- Bagging
- Image fusion

# Summary

- Oil spill detection
- Classifiers
- Research
- Difficulties
- Recommendations



Study	Data Type	Preprocessing	# Features	Formations(lookalike & oilspills)	Results
Oil spills[57]	ERS-2 SAR, 24 high-res images 8-bit	transformation, Filtering, data normalization	10	90 & 69	MLP(10:51:2) accuracy: 86.67% lookalike acc. 91.18% oil spills acc.
Oil spills[57]	ERS SAR, 600 low-res images	Resampling,Radiometric range correction, georeference	11	68 & 71	MLP(11:6-4-1) accuracy: 90% lookalike acc. 82% oil spills acc.
Oil spills[62]	ERS-2 SAR, 24 high-res images	-	10	90 & 69	MLP(10:51:2) accuracy: 84.4% lookalike acc. 85.3% oil spills acc.
Oil spills[69]	ERS SAR, 12 high-res images	8-bit transformation, filtering	-	-	MLP(4-2-1) accuracy: 96.46% overall acc.
Oil spills[18]	ERS SAR, 70 images	-	12	78 & 111	MLP(12-8-8-1) 0.227 root mean square error(rmse)
Oil spills[66]	RADARSAT-1, 93 images	log-transformation, standardization	15	94 & 98	MLP 75.93% overall acc. SVM 79.63% overall acc. DT(Bundling) 90.74% overall acc.
Oil spills[37]	Envisat, 47 images	-	9	155 & 80	MLP(9:11:2) 96.3% lookalike acc. 92.9% oil spill acc. DT 92.6% lookalike acc. 92.9% oil spill acc.
Oil spills[56]	ERS-1 SAR, 59 low-res images	-	9	2471 & 42	DT 96% lookalike acc. 86% oil spill acc.
Oil spills[61]	ERS-2 SAR, 24 high-res images	-	9	90 & 69	DT forest 84.4%
Hydro-acoustics [64]	Sonar	Echoview	15	-	SVM accuracy: 89.5%, DT accuracy: 86.8%
Land coverage1986 [2]	LandSat SAR	'Using data miner'	11	-	SVM max accuracy: 90.53%, DT accuracy: 93.48%
Land coverage2001 [2]	LandSat SAR	'Using data miner'	10	-	SVM max accuracy: 93.67%, DT accuracy: 94.07%
ECG arrhythmias[40]	MIT-BIH arrhythmia database	-	10	-	accuracy SVM 99% , MLP 98.22%
Remote Sensing[68]	Satimage	feature extraction	26	-	accuracy for SVM 93.16% and for MLP 96.98%
signature recognition[59]	user signature data	feature extraction	2	-	Recognition rate SVM 66.5 , MLP 71.2
wind speed prediction[41]	daily wind speed data	-	high dimensional feature	-	MSE on testing data for the MLP is 0.0090 while it is 0.0078 for the SVM
Hashimoto's disease[44]	66 Thyroid ultrasound images	normalization	39	84 healthy and 85 sick	MLP(6-8-1): 89.4% sick class 61.1% healthy class. DT: 89.4% sick class 94.4% healthy class.

In case you need our credentials

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