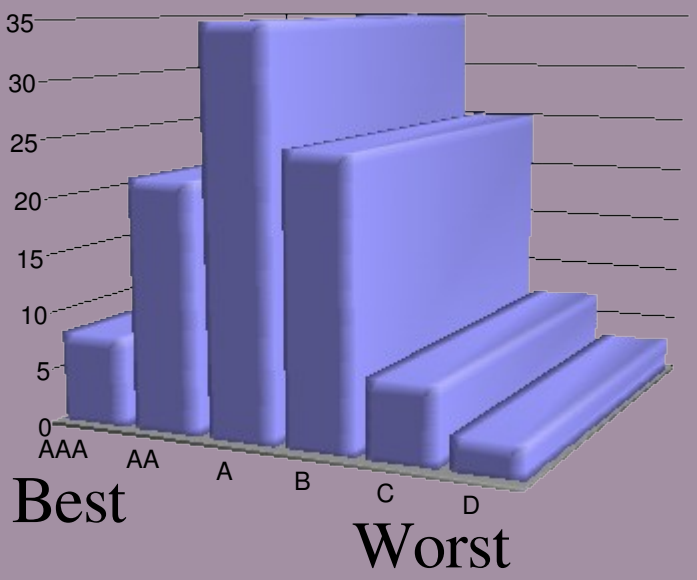
Defect Detection in Raw Hide and Wet Blue Leather

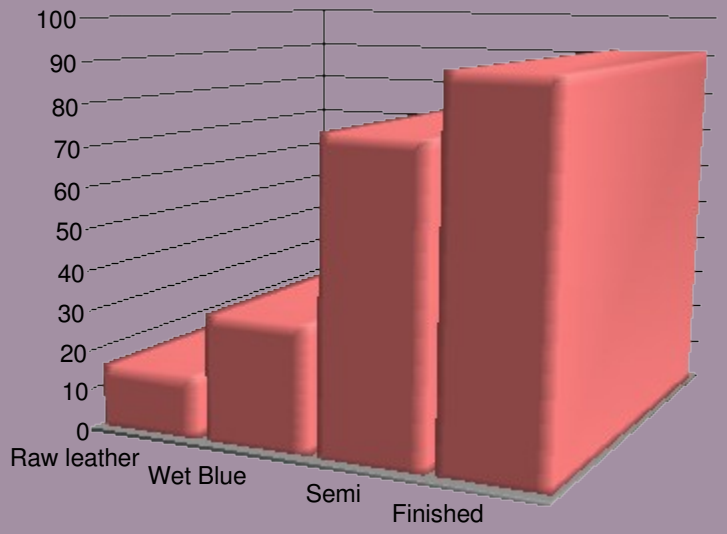
Hemerson Pistori, Willian Paraguassu (UCDB)
Mauro Pereira, Priscila Martins (UCDB)
Mariana Pereira, Manuel Jacinto (EMBRAPA)

Summary

- Context and problem statement
- Proposed Solution
- Feature extraction
- Dimensionality reduction
- First experiments
- Results and Analysis
- Conclusions

Context – Brazilian Leather Market





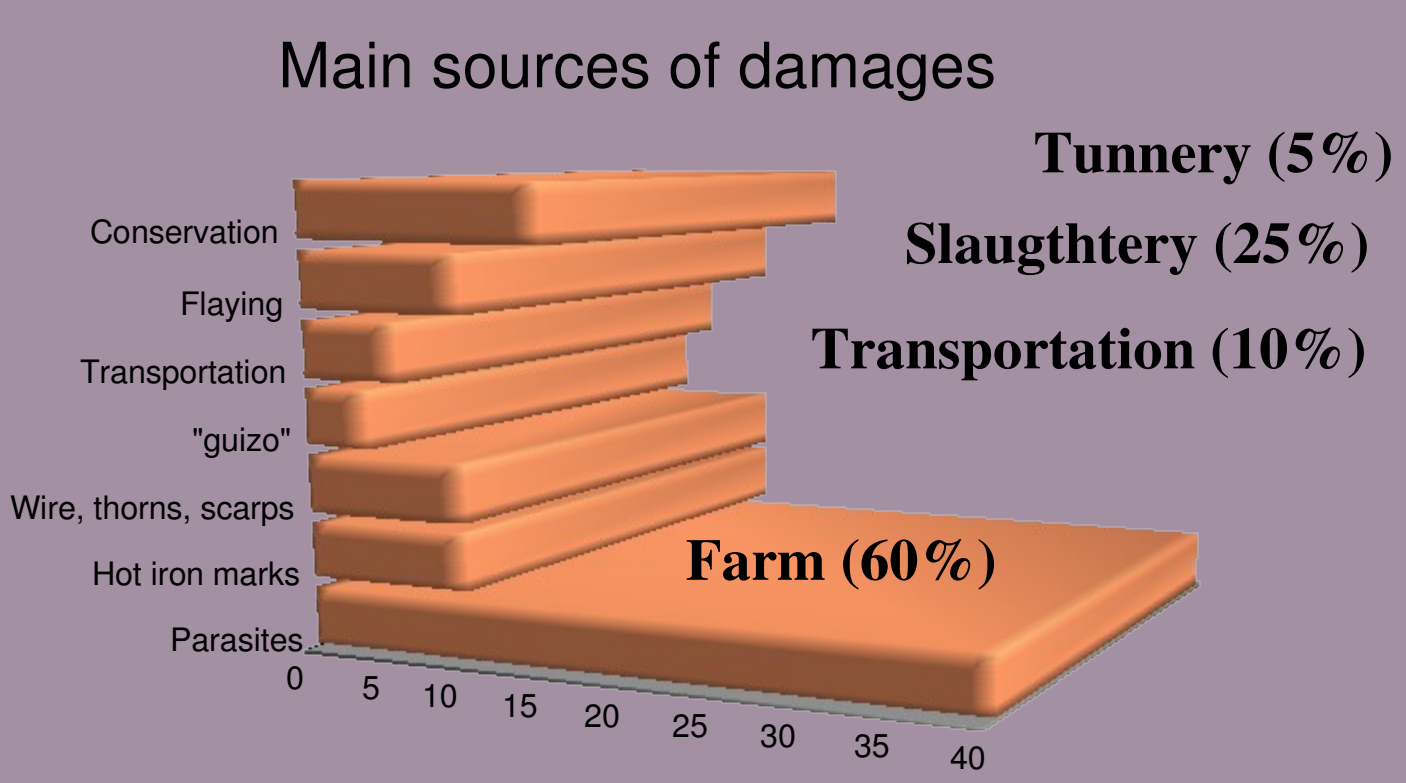
Brazil = 7% AAA

USA = 85% AAA

Value aggregated by Technological Processing (different tunning stages)

Source: CNPGC/EMBRAPA PECURÁRIA DE CORTE

Context – Brazilian Leather Market



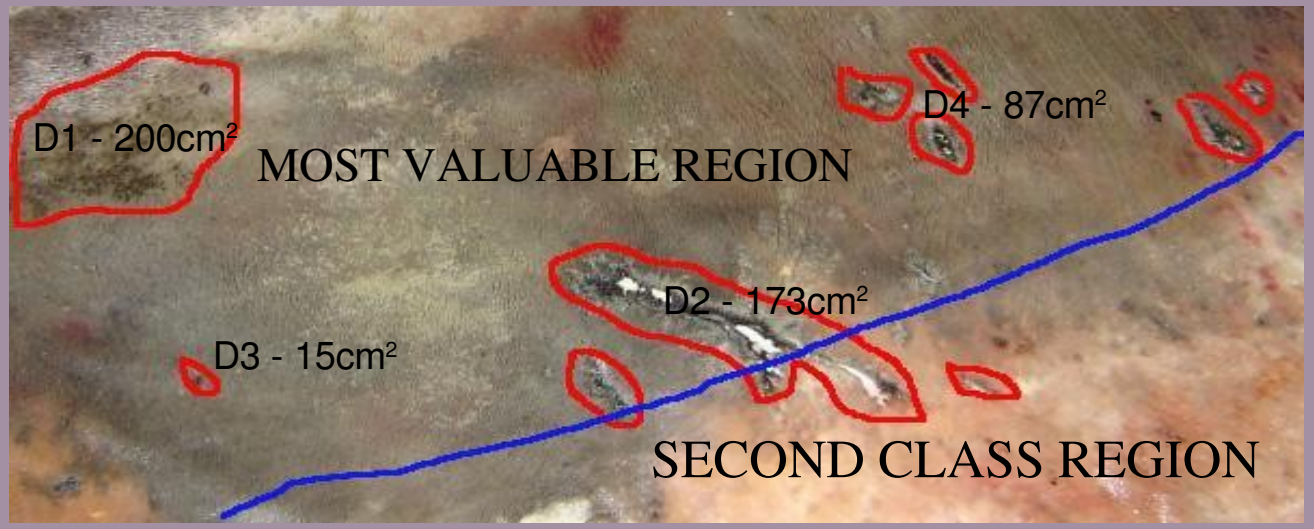
Source: CNPGC/EMBRAPA PECURÁRIA DE CORTE

Problem Statement

Alive cow

Just after flay

Wet Blue (Tunned)



Source: CNPGC/EMBRAPA PECURÁRIA DE CORTE

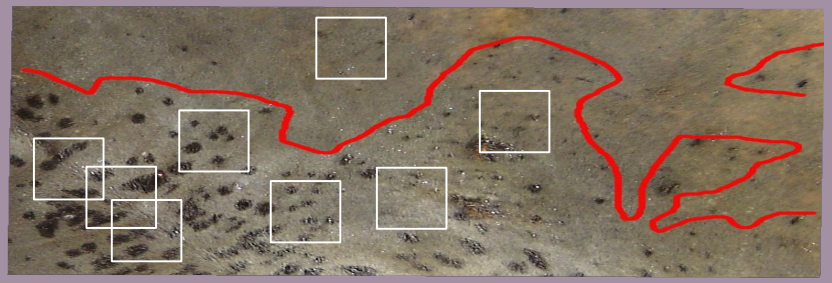
Proposed Solution

Huge dataset of training images

Co-occurrence Matrix | Interaction Maps | Gabor F. B. | LBP | Color | Hough

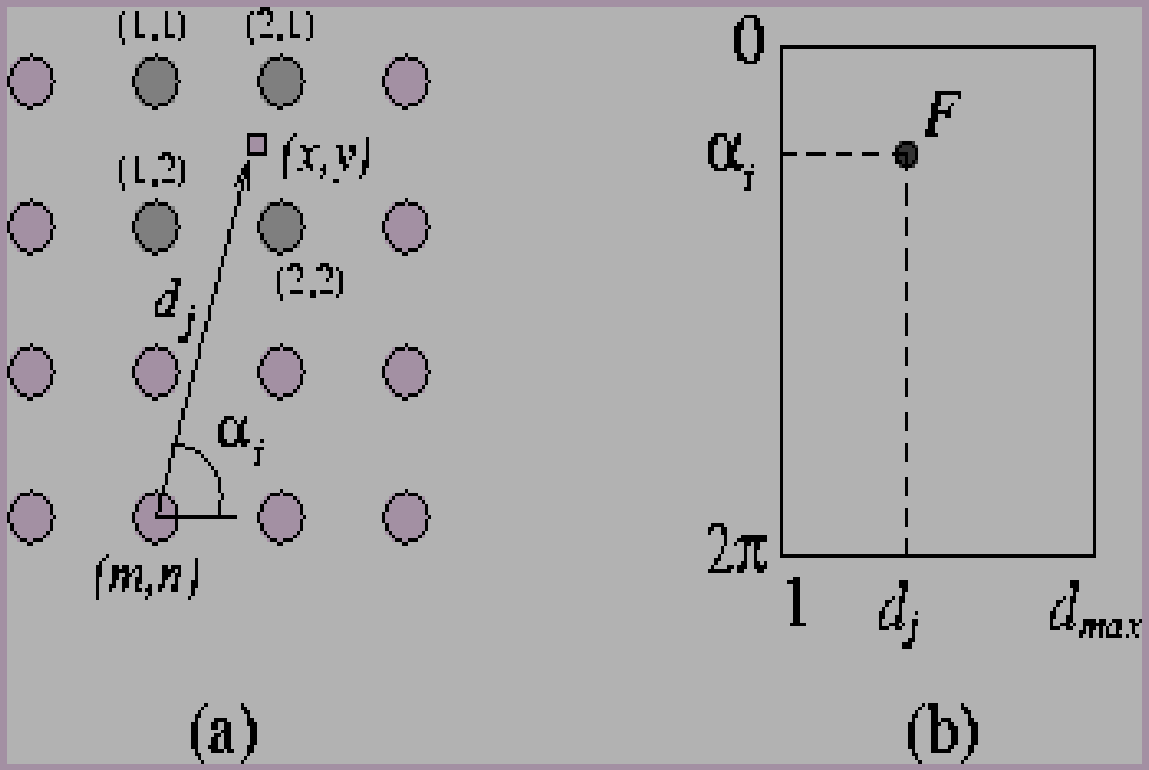
Feature Extraction + Feature Selection

SVM | RBF | KNN | FF-NN | Adaptree



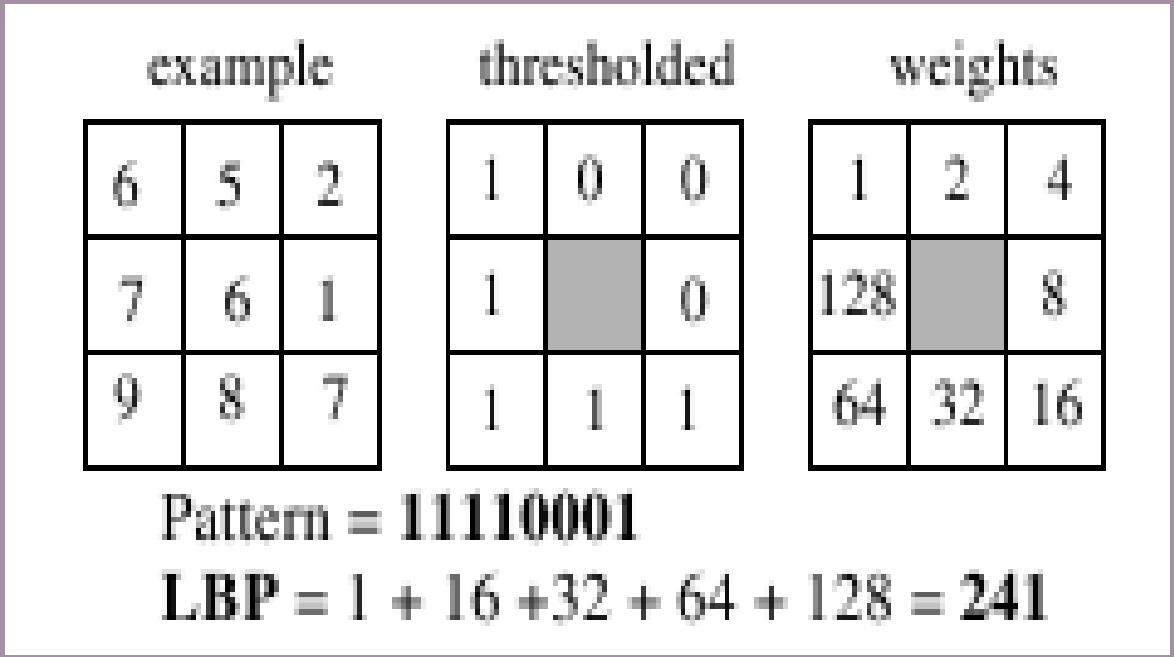
Feature Extraction

Interaction Maps – D. Chetverikov

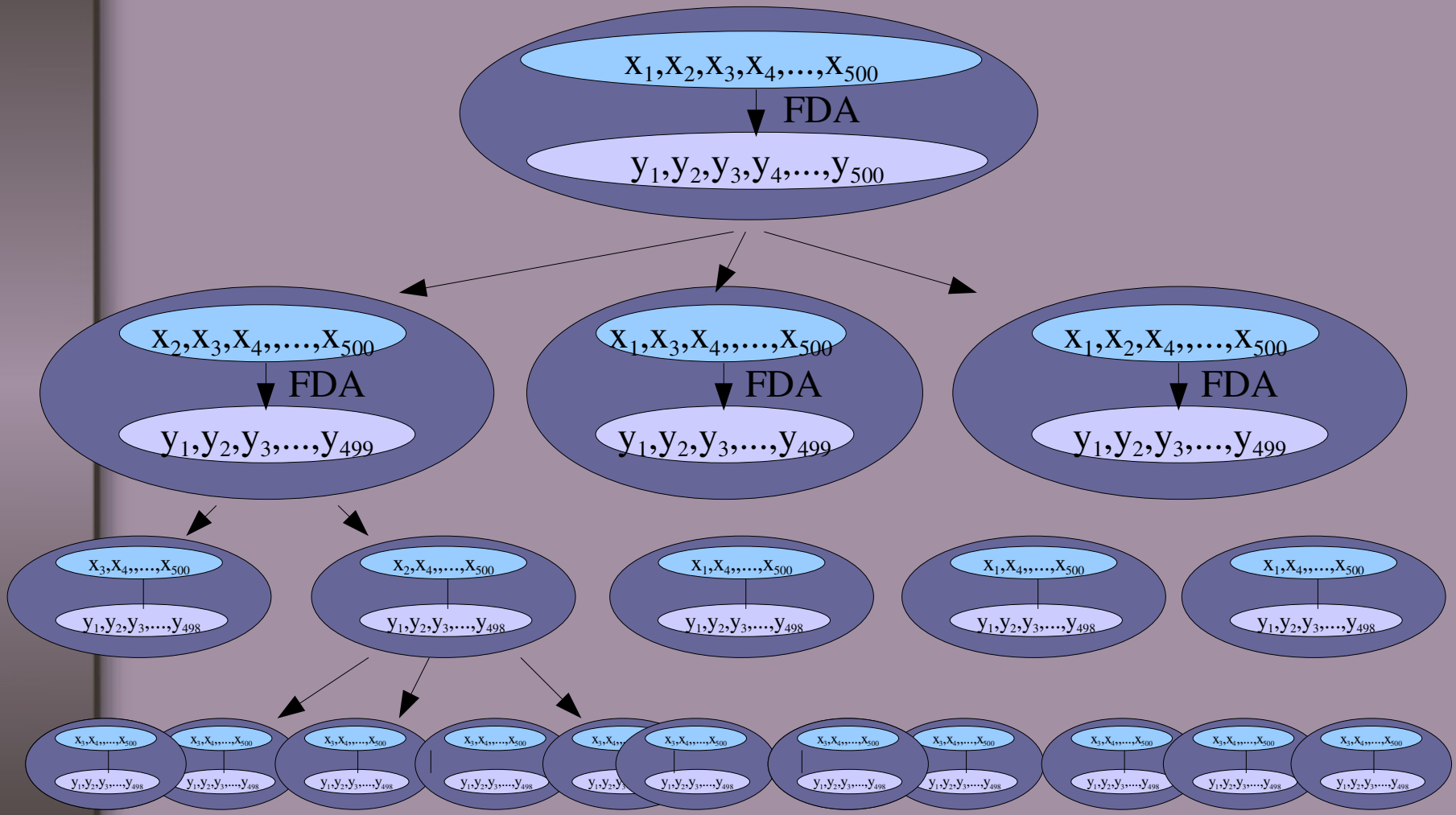


Feature Extraction

Local Binary Pattern – M. Pietikäinen



Dimensionality Reduction



Experiments and Results

- 63 co-occurrence features (3 angles, 3 displacements and 7 measures – entropy, correlation, etc)
- 3 color features (mean H, S and V values)
- 5 classes (tick marks, brand marks made from hot iron, cuts, scabies and non defective areas)
- 400 samples for each class
- 10 fold cross-validation (10 runs)

Data Set	SVM	RBF	KNN
10X10	97.44	87.40 ●	90.42 ●
20X20	99.82	98.40 ●	99.36
30X30	100.00	99.58	99.66
40X40	100.00	99.74	100.00

○ - improvement, ● - degradation

Data Set	SVM	RBF	KNN
10X10	94.32	81.18 ●	91.56 ●
20X20	99.88	96.50 ●	99.20 ●
30X30	100.00	99.06	99.90
40X40	100.00	99.92	100.00

○ - improvement, ● - degradation

Discussion and Conclusion

- Promising results
- Bottleneck: feature extraction takes several minutes
- Just 16 different pieces of leather (8 raw – 8 wet)
- Semi-automatic training samples generation
- Best classifier: SVM using Second Power Polynomial as Basis Functions and SMO (Platt's Sequential Minimal Optimization algorithm) for training