

Aplicações de Visão Computacional e Reconhecimento de Padrões à Biotecnologia

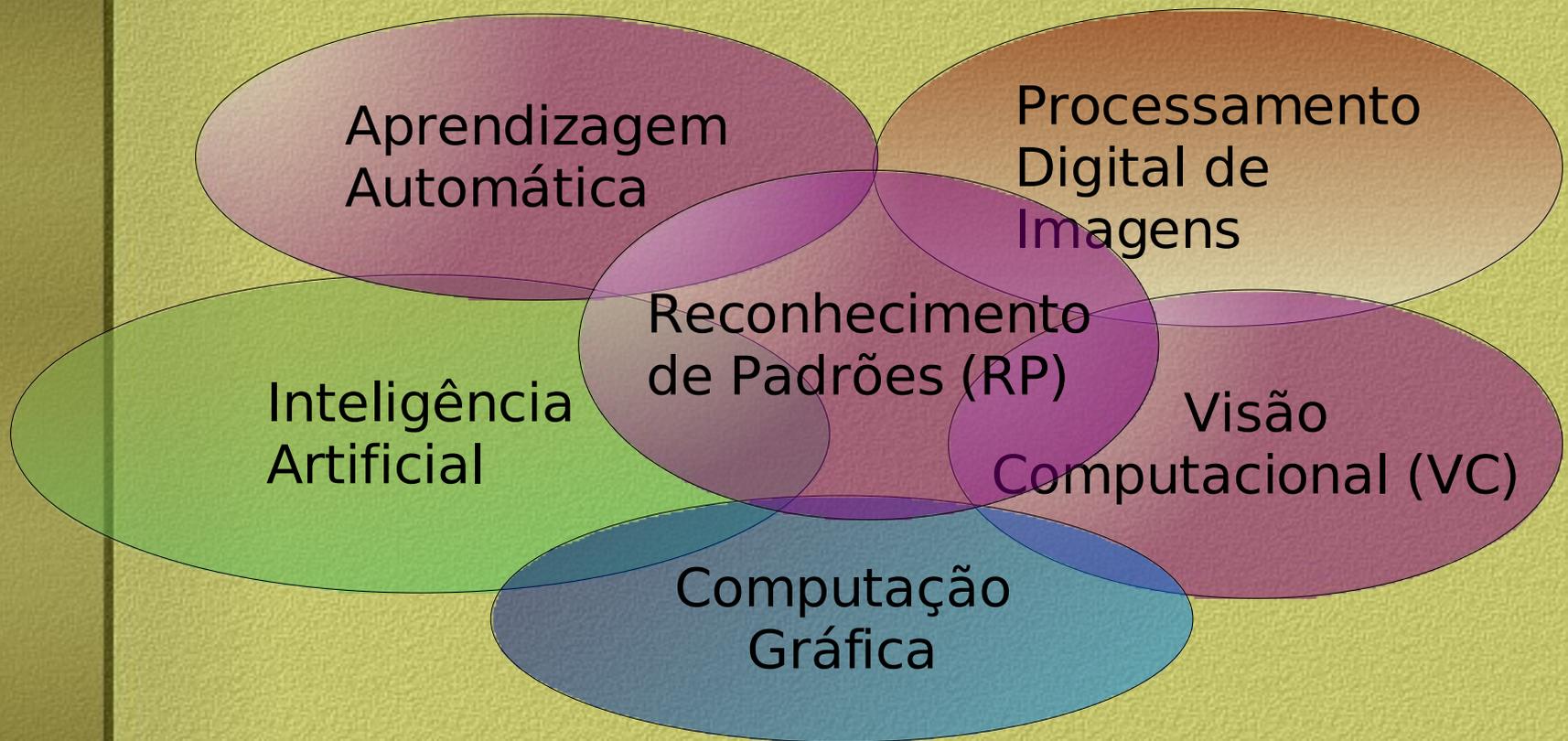
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Grupo de Pesquisa em Engenharia e Computação – GPEC
Universidade Católica Dom Bosco - UCDB

Sumário

- Visão geral e áreas correlatas
- Aplicações (desenvolvidas pelo GPEC)
- Arquitetura de de um sistema de visão computacional
- Tópicos em Aprendizagem Estatística
- Demonstração
- Conclusão

Visão Geral



RP: Identificação ou classificação de “objetos” ou “coisas”
(Faces, expressões, voz, sons, bases, comportamento, textos, etc)

VC: Interpretação e reação a partir de imagens
(Filmes, fotos, imagens de satélite, raio-x, tomografia, etc)

Classificação de Couro Bovino

www.gpec.ucdb.br/dtcouro



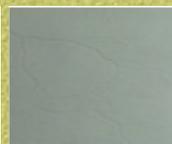
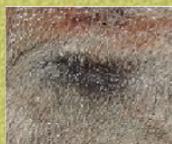
fazenda



frigorífico

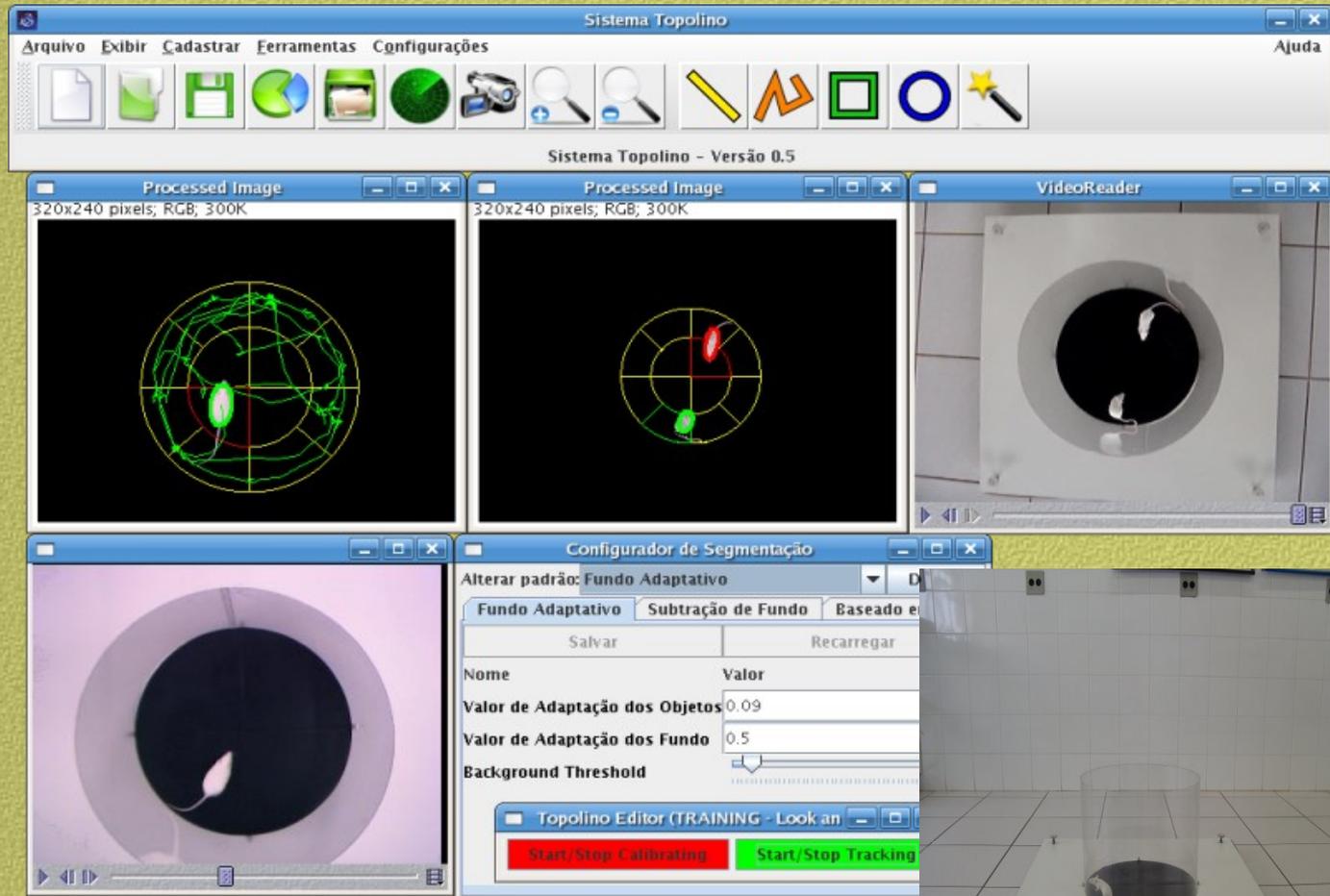


curtume



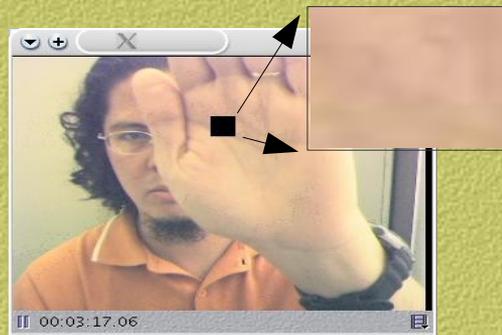
Identificação de Comportamento Animal

www.gpec.ucdb.br/topolino

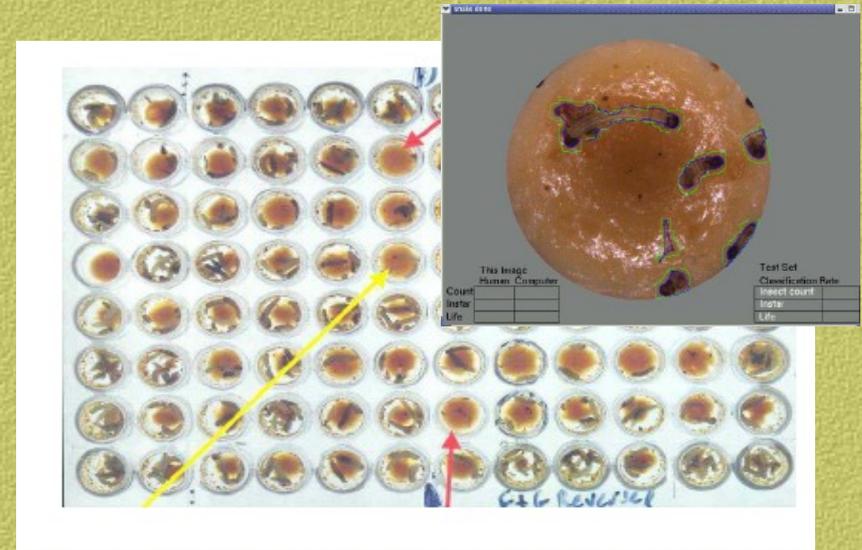


Interação Homem-Máquina

www.gpec.ucdb.br/sigus



Monitoramento de Bioensaios

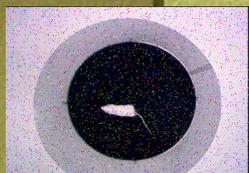


Patten et Alli (UNR e Verdia Inc.)



<http://www.vims.edu/pfiesteria/>

Arquitetura de Sistema de VC



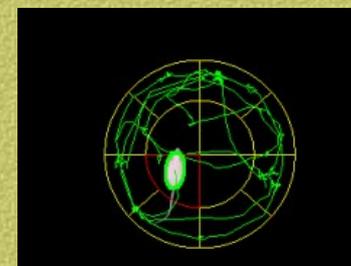
Captura



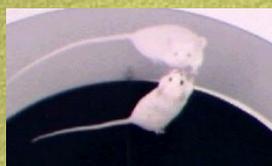
Pré-processamento



Segmentação



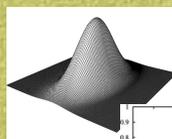
Rastreamento



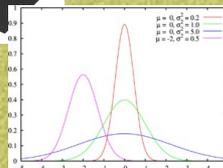
[0.2 0.1 40 30 0.2]

Vertical

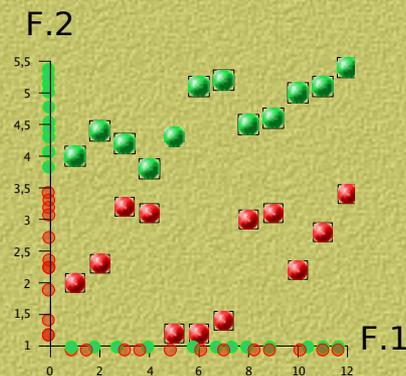
Classificação



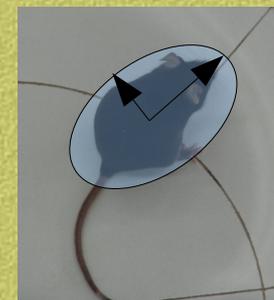
F.2 > 3.6



Aprendizagem



Seleção Atrib.



Extração Atrib.

Aprendizagem Estatística



ω_1 : Carrapatos ω_2 : Estrias ω_3 : Mosca

Problema de Classificação em 3 Classes

ω_1 : Horiz. ω_2 : Vert.

2 Classes

$$p(\omega_j | x) = \frac{p(x | \omega_j) p(\omega_j)}{p(x)}$$

ω_j : Classe j

x : Vetor de atributos

$p(\omega_j | x)$: Prob. a posteriori de ω_j

$p(x | \omega_j)$: Verossimilhança of ω_j

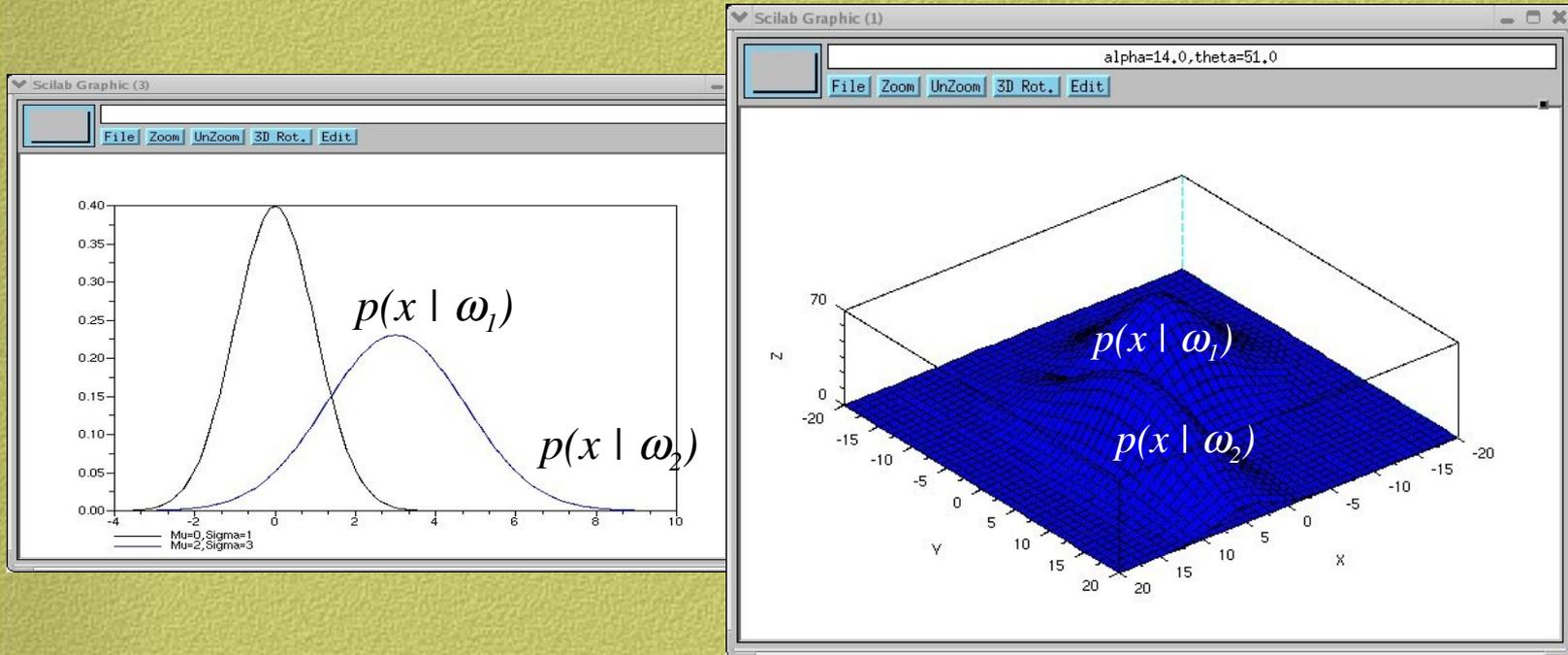
$p(\omega_j)$: Prob. a priori de ω_j

$p(x)$: Prob. de x (evidência)

Decisão Bayesiana

$$\underset{j}{\operatorname{argmax}} p(\omega_j | x)$$

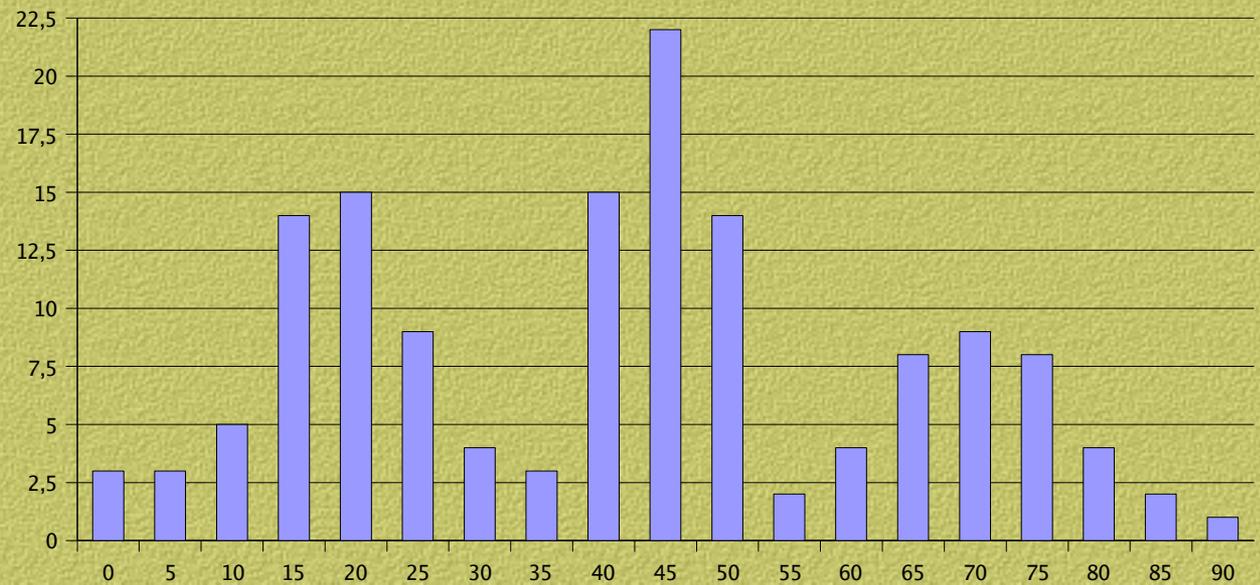
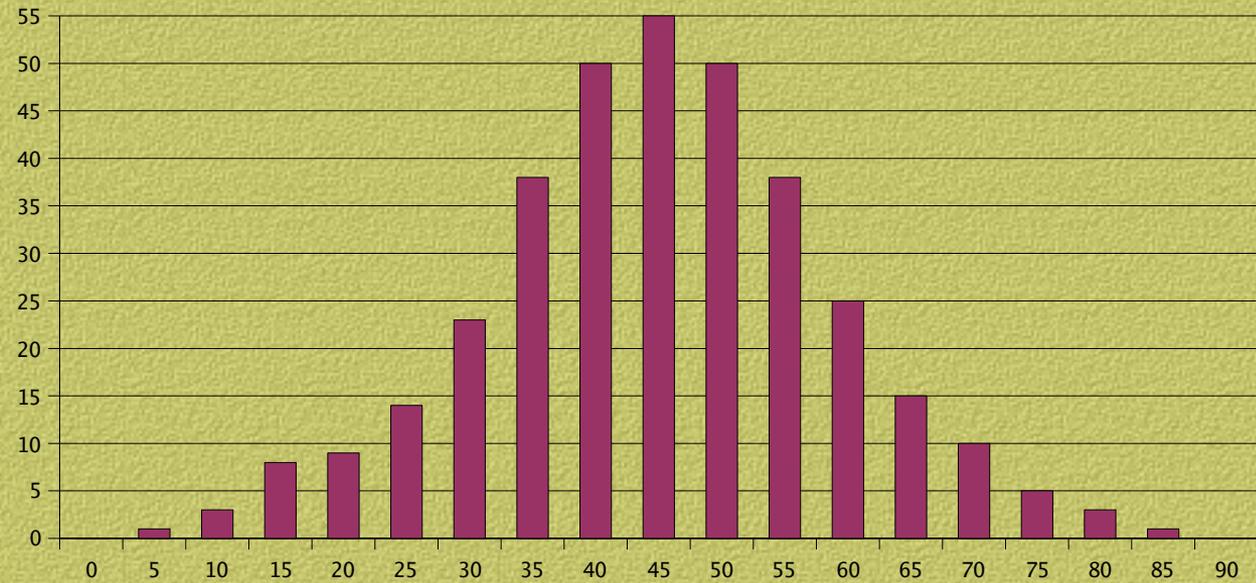
Aprendizagem de Modelos Gaussianos



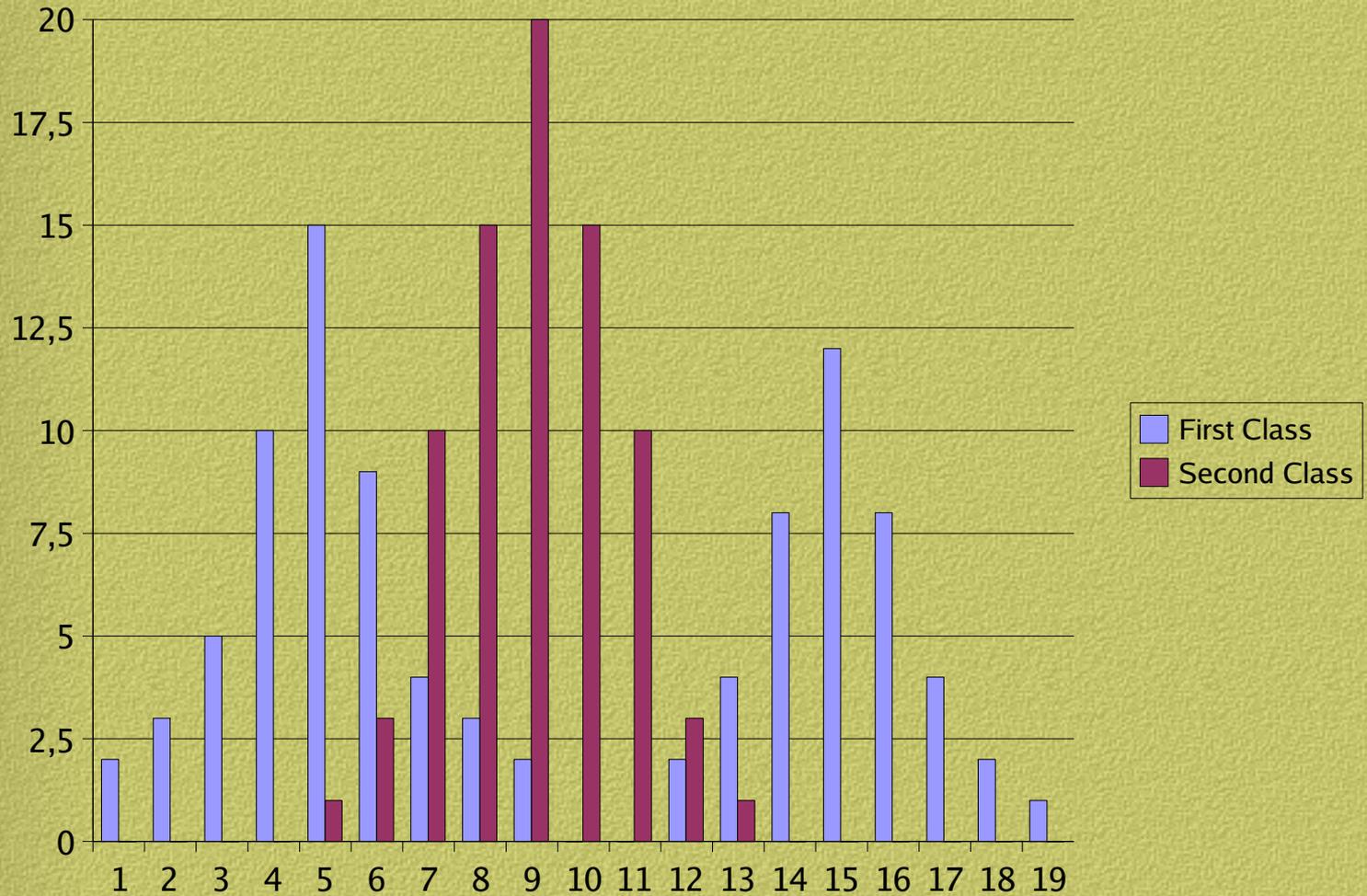
Estimativa de Máxima Verossimilhança

$$\underset{\mu, \Sigma}{\operatorname{argmax}} \prod_{i=1}^n p(x_i | \omega_j) \quad p(x | \omega_j) = \frac{1}{(2\pi)^{D/2} |\Sigma|^{1/2}} e^{-\frac{1}{2}(x-\mu)^T \Sigma^{-1}(x-\mu)}$$

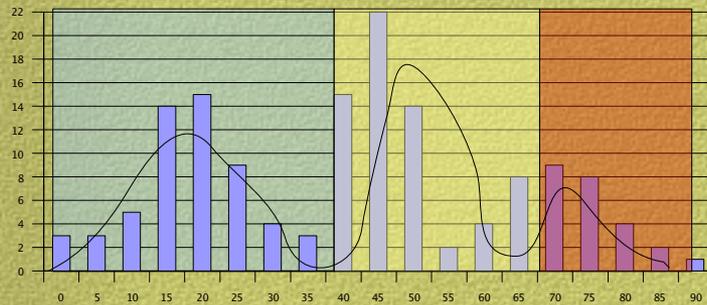
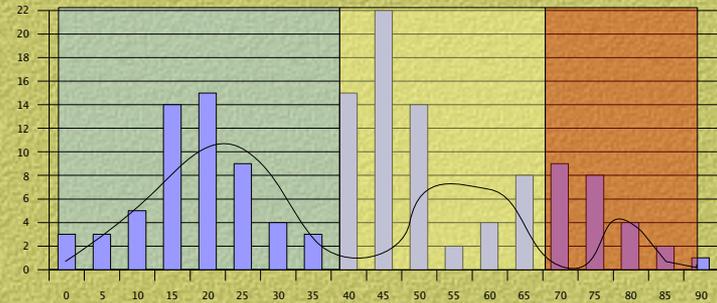
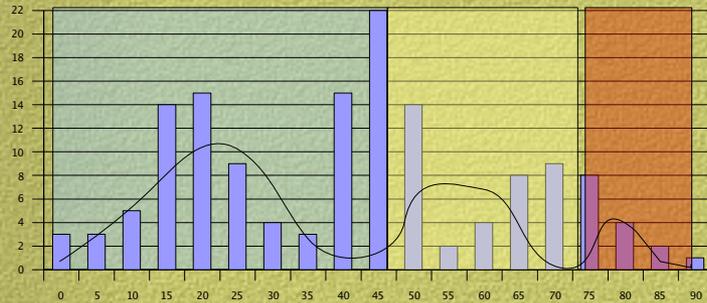
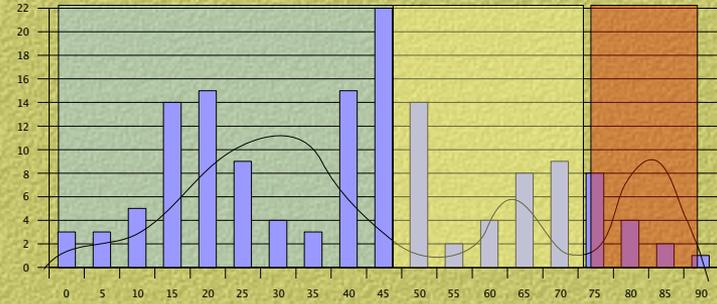
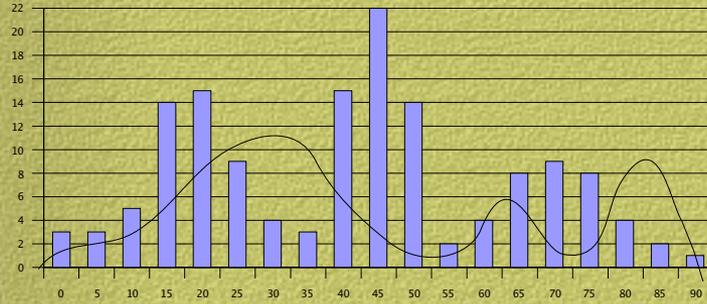
Modelos Paramétricos X Não Paramétricos



Mistura de Modelos Gaussianos

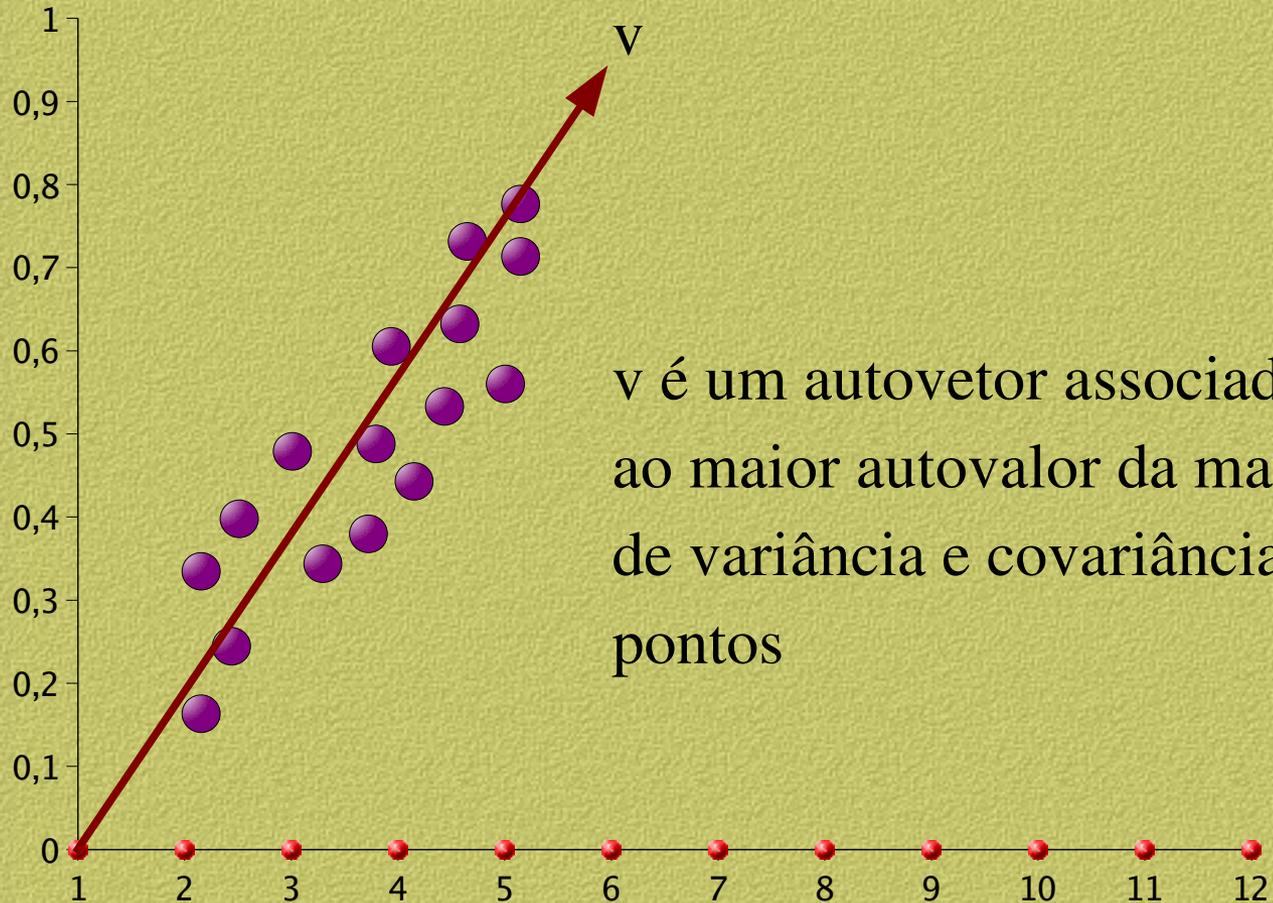


Métodos Iterativos de Estimativa



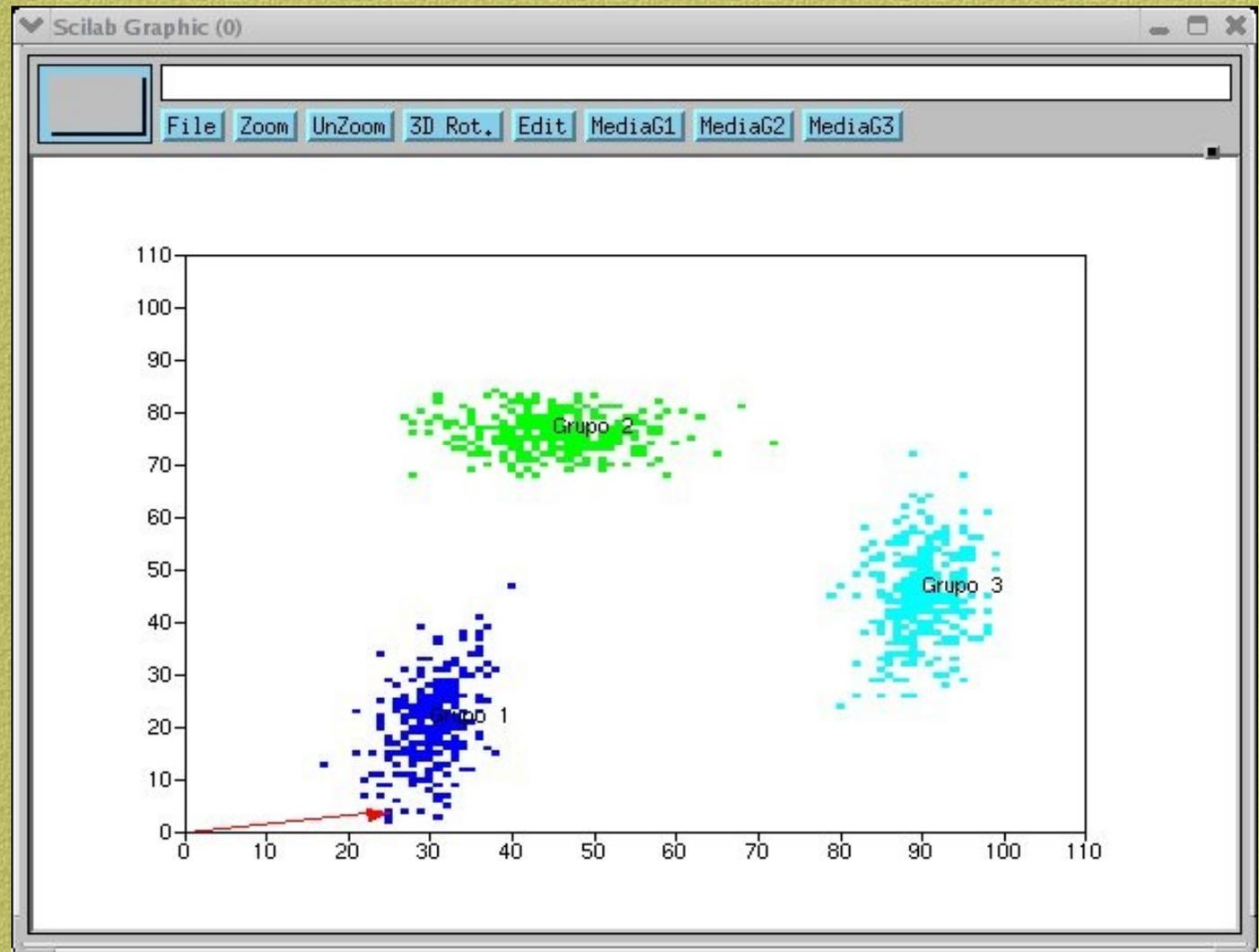
E.M. - Expectation-Maximization

Redução de Dimensão - PCA

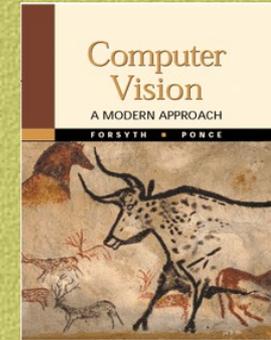
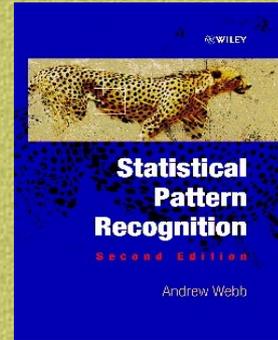
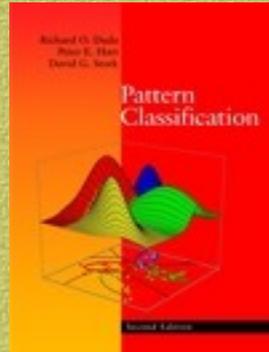


v é um autovetor associado ao maior autovalor da matriz de variância e covariância dos pontos

Redução de Dimensão - FLDA



Informações Adicionais



www2.acad.ucdb.br/pistori

Dr. Hemerson Pistori - Mozilla Firefox

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<http://www2.acad.ucdb.br/pistori/>

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Associe-se SBC

Prof. Dr. Hemerson Pistori

[GPEC - UCDB \(location in GoogleEarth\)](#)
[Salesians Institutions for Higher Education - IUS](#)

Resume

Hemerson Pistori received his doctorate in 2003 from the [University of São Paulo, USP](#), at the Computer Engineering Department, and his M.Sc. degree in Computer Science from [State University of Campinas, UNICAMP](#), in 1998. Currently, he is working as a professor of Discrete Mathematics and of Computer Vision at [Dom Bosco Catholic University, UCDB](#). He is also a member of the [UCDB Scientific Committee](#) and of the [Colabora's](#) editorial board. Recently, he joined the IUS Engineering Group, an international board of [Salesians Institutes of Higher Education](#), as the UCDB's representative. Since February of 2004, he leads the [Research Group in Engineering and Computing, GPEC](#). His current research interests include statistical learning, stochastic modeling, adaptive devices, dissimilarity measures, predictive filters, graphical models and

<http://www.sdb.org/>