European Conference on Computer Vision, 2006
Papers that caught my eye.
Tim Cootes
(He goes to conferences so that you don’t have to)

• 811 submissions
• 41 Podium, 151 posters
• Held in Graz, Austria

Markov Random Fields
“Comparison of energy minimisation algorithms for highly connected graphs”
V.Kolmogorov and C.Rother (Vol.2, pp.1-15)
• Demonstrated that Graph Cuts generally outperforms Loopy-Belief
Propagation and Message Passing variants

“A Comparative Study of Energy Minimisation Methods for Markov
Random Fields”
R.Szeliski et al. (Vol.2, pp.16-29)
• Framework for testing different optimisers on a range of MRF
problems
• Aims to separate out effects due to choice of objective function from
those due to optimiser performance
• Implementations of many common optimisers (GC,LBP,ICM etc)

Markov Random Fields
“Measuring Uncertainty in Graph Cut Solutions”,
P.Kohli and P.H.S.Torr (Vol.2,pp.31-43)
• Standard methods produce MAP solution
• Confidence of label $i$ can be estimated by
considering overall energy if given label fixed to
each possible value
• Demonstrates how “Dynamic Graph Cuts”
(ICCV05) can be used to compute this very
efficiently

Human Pose Estimation
“POSECUT: Simultaneous Segmentation and 3D
Pose Estimation of Humans using Dynamic
Graph-Cuts”
• 26 DoF Stick-Man model gives crude prior for
segmenting human outline with GC
• Nested optimisation over Pose parameters
(gradient descent).
• Small changes in prior -> GDC allows fast
computation of cut

Edge-based Object Detection
“Object Detection by Contour Segmentation
Networks”
Aim: Find objects in cluttered images given an outline sketch
Link all edges together into a network (encodes all possible paths)
Search for path matching the model sketch shape
Given initial edgel match, grow it by looking two edgels ahead (semi-
greedy)
Fast algorithm
Encouraging results

Learned Models
“Sparse Flexible Models of Local Features”
Model:
• Network of local appearance models (up to 1000)
• Pairwise geometric relationship with k
neighbours
Search:
• Given match of one node, grow by looking for
neighbours. Allow missing parts.
Learning:
• Generate initial model from one image
• Search other images
• Update model structure and pdfs from resulting matches
Tracking
“Tracking Dynamic Near-regular Textures under Occlusions and Rapid Movements”
W-C.Lin and Y.Liu (Vol.2, pp.44-55)
• Near regular textures are everywhere
• Use Markov model to represent mesh of textons
• Demonstrate good tracking of cloth etc.
• Texture replacement

Orientation Estimation
“A Theory of Multiple Orientation Estimation”
M.Mühlich and T.Aach (Vol.2, pp.69-82)
• Describe algorithms for extracting multiple orientations from scalar and vector images
• Different models for superposition of oriented images
• Cunning use of tensors and eigendecompositions

AAMs
“Resolution-Aware Fitting of Active Appearance Models to Low Resolution Images”
• AAMs perform poorly when matching high-res. model to low res. data.
• Problem is in the interpolation
• Reformulate to measure error in low-res. image
• Much improved results when res. differs by >2.

Learned MRFs
“Efficient Belief Propagation with Learned Higher-order Markov Random Fields”
X.Lan, S.Roth, D.Huttenlocher, M.Black
Vol.2, pp.269-282
Learn pairwise potentials $\exp(-\alpha |\sum_{i=0}^{n} x_i|)$
Or clique potentials $\exp(-\alpha \sum_{i=0}^{n} x_i)$
(“Fields of Experts” –CVPR05)
Cunning approximation of potential using envelope of quadratics
Allows efficient O(N) type inference algorithms
Demonstrated on image de-noising

Posters of interest
“Estimating gaze direction from low-resolution faces in video”
N.Robertson and I.Reid
“Human Detection Using Oriented Histograms of Flow and Appearance”
N.Dalal, B.Triggs, C.Schmid
“Discovering Texture Regularity as a Higher-Order Correspondence Problem”
J.Hays, M.Leordeanu, A.Efros and Y.Liu

Other Papers
“Feature Harvesting for Tracking-by-Detection”
M.Özuysal, V. Lepetit, F.Fleuret, P.Fua,
Vol.3, pp.592-605
• Learn set of features on 3D object from training sequence showing different views
• Use for fast detection
Faces

“Robust Multi-view Face Detection Using Error Correcting Output Codes”
• Four classes: Left, Right, Front, Background
• Train 7 binary classifiers on different combinations
• Combine using ECOC
• Promising results

Faces

“Inter-Modality Face Recognition”
Problem:
• Test images different modality to reference images
  (e.g. IR vs optical, inside vs outside)
Approach:
• Train on examples of both modalities
• Learn mappings into a common frame
• Minimise within-class distance, maximise between class distance

Faces

“Face Recognition from Video Using the Generic Shape-Illumination Manifold”
O.Arandjelović and R.Cipolla. Vol.4, pp.27-40
• Impressive recognition rates from video
• Learns how to re-illuminate sequences to match training

Faces

“Covariant Derivatives and Vision”
• Modifies image derivatives so as to take into account local context
• Better model of how human VS works
• Leads to impressive in-painting etc

Shape Detection

“Example Based Non-rigid Shape Detection”
• Given N training images labelled with points
• Learn mean shape
• Deform each texture with deformation from each image (N x N examples)
• Use RankBoost to learn features to rank an image by distance to each associated shape
• On new image, use the ranker to find nearest shapes
• New shape is weighted combination of these nearest
• Outperforms various other methods (ASM, AAM, …)
“Maximally Stable Local Description for Scale Selection”
• Select scale for feature points where local description has lowest deriv. wrt scale.

“Probabilistic Linear Discriminant Analysis”
S.Ioffe.  Vol.4, pp.531-542
• Like LDA, only with more probability.
• Encouraging results

“Learning to Combine Bottom-Up and Top-Down Segmentation”
Best paper prize
• Generates prob. Based objective function combining local features with more global model
• Impressive segmentation results

Also...
• Vol.1 has some interesting papers on recognition and statistical learning, including:
“Reimannian Manifold Learning for Nonlinear Dimensionality Reduction”