

Graphical Models Tutorials

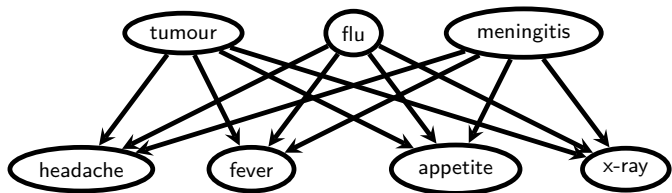
Real-World Applications

Dmitry Adamskiy, David Barber

UCL

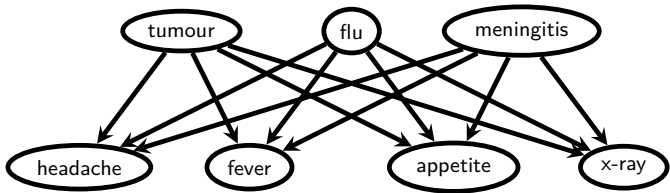
Belief Networks

- Medical Diagnosis (QMR network, Promedas)

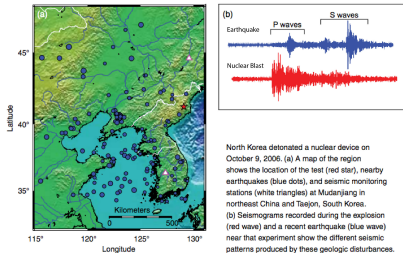


Belief Networks

- Medical Diagnosis (QMR network, Promedas)



- Seismic Monitoring: a Bayesian approach



Undirected Models: Markov Random Fields for Computer Vision



Image segmentation

Undirected Models: Markov Random Fields for Computer Vision

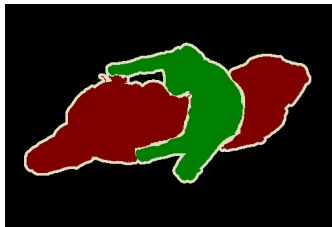


Image segmentation

Undirected Models: Markov Random Fields for Computer Vision

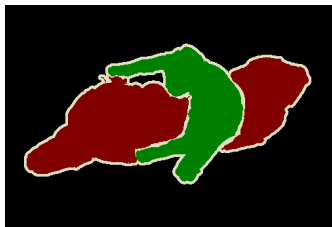
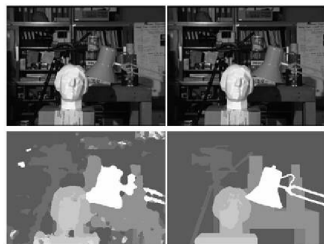


Image segmentation



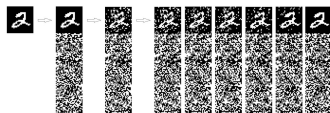
Stereo vision

LPDC-codes

Loopy Belief Propagation is used in LPDC-codes (aka Gallager codes)

LPDC-codes

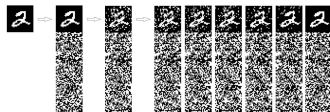
Loopy Belief Propagation is used in LPDC-codes (aka Gallager codes)



LDPC decoding

LPDC-codes

Loopy Belief Propagation is used in LPDC-codes (aka Gallager codes)

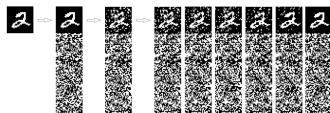


LDPC decoding

(NB: this is not image denoising!
The digit is here just to represent
meaningful binary message)

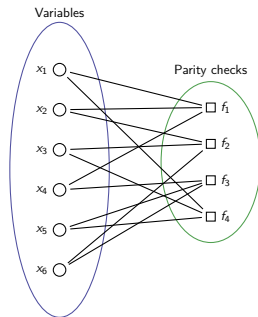
LPDC-codes

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LDPC decoding

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Factor-graph for LDPC-decoding.

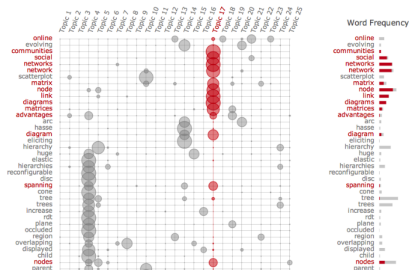
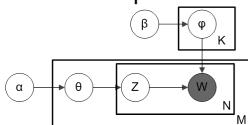
Ranking: True Skill



- ▶ Players' skills need to be evaluated for matching.
- ▶ Games could be played with more than two players (not possible to use, say, ELO system).
- ▶ TrueSkill – developed by Microsoft, used on Xbox Live.

Topic Modelling

- ▶ Topic models are generative models of documents.
- ▶ The assumption is that there are underlying latent variables (topics). Each document has some topics associated with it and the words are generated from the topics.



Variational Autoencoders

- ▶ Connection to Deep Learning
- ▶ Unsupervised learning of complicated distributions
- ▶ Powerful generative model

