

## Map Estimation for MRFs and CRFs

- MLE has the problem of overfitting
- MLE maximizes the likelihood function
- Use parameter priors
- In bayesian networks it was computationally elegant
- Conjugate priors in the parameter priors (integrate a dirichlet prior into the likelihood to obtain a closed form posterior)
- In MRFs And CRFs the likelihood cannot be maintained in closed form
- Maximum a posteriori (MAP) estimate of the parameters

### Gaussian Parameter Prior

$$P(\theta : \sigma^2) = \prod_{i=1}^k \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{-\frac{\theta_i^2}{2\sigma^2}\right\}$$

↓  
close to 0

$\theta$  mean univariate  
GAUSSIAN  
small variance  $\rightarrow$  better  
 $\sigma^2$  hyperparameter  
(same as dirichlet)

### Laplacian Parameter Prior

$$P(\theta : \beta) = \prod_{i=1}^k \frac{1}{2\beta} \exp\left\{-\frac{|\theta_i|}{\beta}\right\}$$