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Contour Refinement of Leukocyte Segmentations in Scans of Stained Bone Marrow

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$$E_{\text{int}} = \frac{1}{2}\alpha\|\boldsymbol{x}_i - \boldsymbol{x}_{i-1}\|^2 + \frac{1}{2}\beta\|\boldsymbol{x}_{i-1} - 2\boldsymbol{x}_i + \boldsymbol{x}_{i+1}\|^2$$

Segmentation - Active Contour Models Snakes

Theoretical Background

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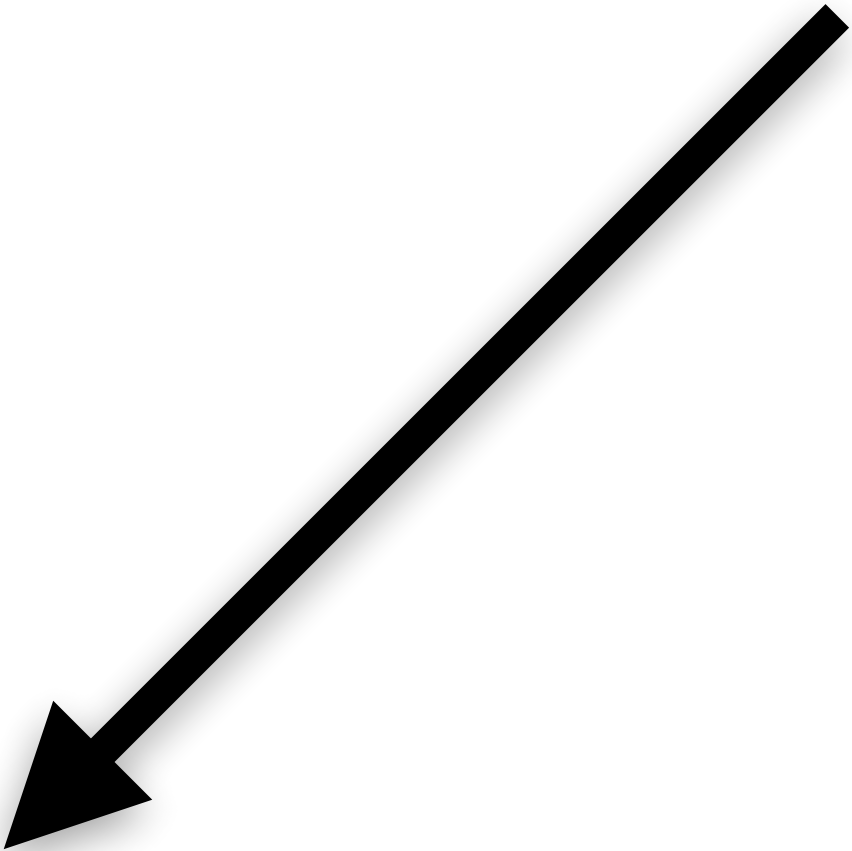
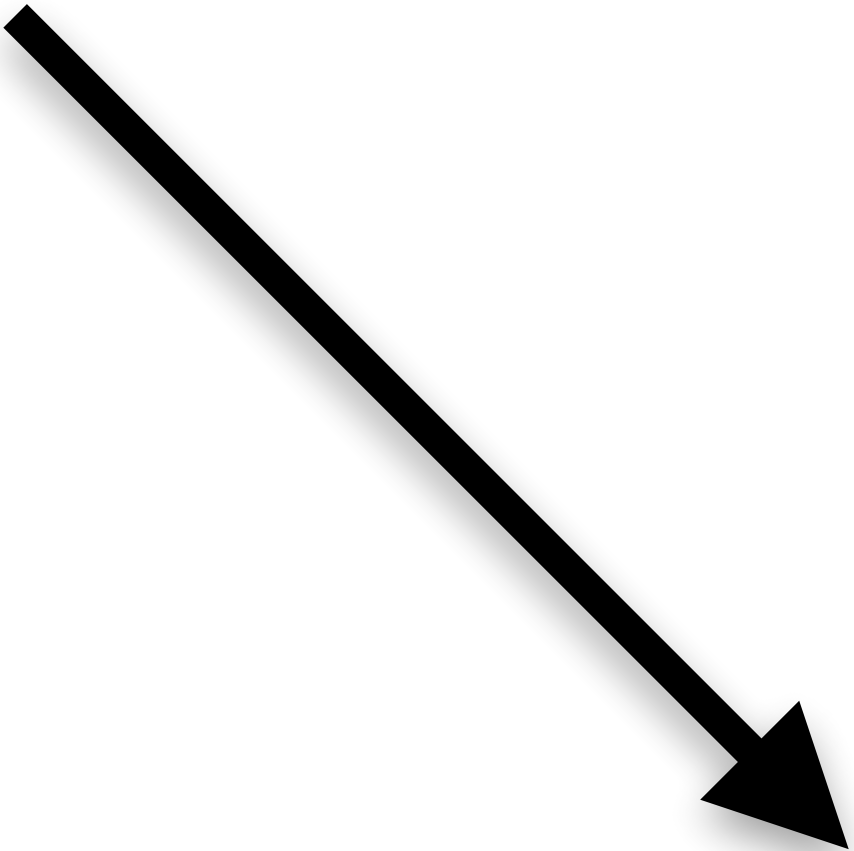
$$E_{\text{snake}} = \sum_{\boldsymbol{x} \in \mathscr{C}} E_{\text{int}}(\boldsymbol{x}) + E_{\text{image}}(\boldsymbol{x})$$

- Idea: minimise the *Energy Function*

$$E_{\text{image}} = w_{\text{line}} E_{\text{line}} + w_{\text{edge}} E_{\text{edge}}$$

$$E_{\text{image}} = -w_{\text{line}}\boldsymbol{I}(\boldsymbol{x}) - w_{\text{edge}}\left|\nabla \boldsymbol{I}(\boldsymbol{x})\right|^2$$





$$E_{\text{int}} = \frac{1}{2}\alpha_i(\boldsymbol{x})E_{\text{cont}} + \frac{1}{2}\beta_i(\boldsymbol{x})E_{\text{curv}}$$

Segmentation - Active Contour Models Snakes

- Idea: minimise the *Energy Function*

$$E_{\text{snake}} = \sum_{\boldsymbol{x} \in \mathscr{C}} E_{\text{int}}(\boldsymbol{x}) + E_{\text{image}}(\boldsymbol{x})$$

$$E_{\text{int}} = \frac{1}{2}\alpha \|\boldsymbol{x}_i - \boldsymbol{x}_{i-1}\|^2 + \frac{1}{2}\beta \|\boldsymbol{x}_{i-1} - 2\boldsymbol{x}_i + \boldsymbol{x}_{i+1}\|^2$$

$$E_{\text{image}} = -w_{\text{line}} \boldsymbol{I}(\boldsymbol{x}) - w_{\text{edge}} |\nabla \boldsymbol{I}(\boldsymbol{x})|^2$$

Segmentation - Active Contour Models Chan-Vese

- Idea: minimise the *Energy Function*
- Known as: ***A**ctive **C**ontours **W**ithout **E**dges*

$$E_{ACWE}(\overline{I}_1, \overline{I}_2, \mathscr{C}) = \mu \cdot l(\mathscr{C}) + \lambda_1 \int_{inside(\mathscr{C})} |I(\boldsymbol{x_0}) - \overline{I}_1|^2 d\boldsymbol{x} + \lambda_2 \int_{outside(\mathscr{C})} |I(\boldsymbol{x_0}) - \overline{I}_2|^2 d\boldsymbol{x}$$