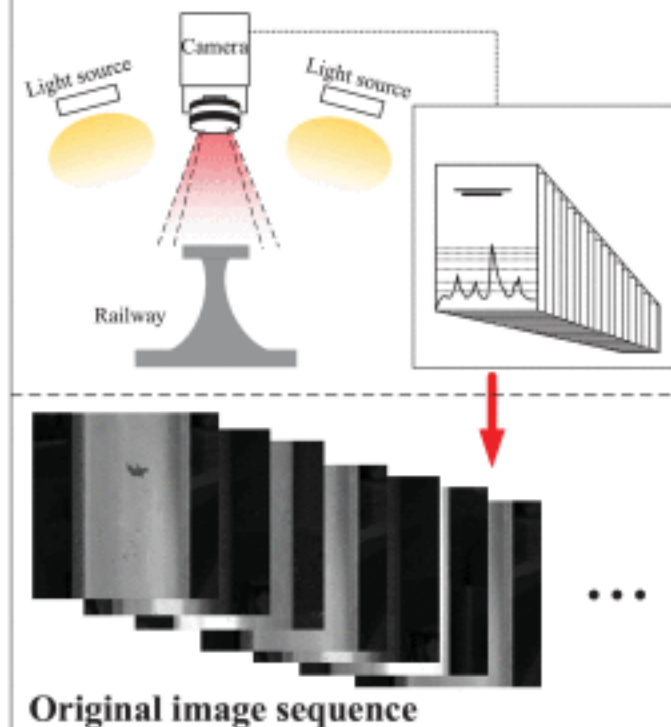
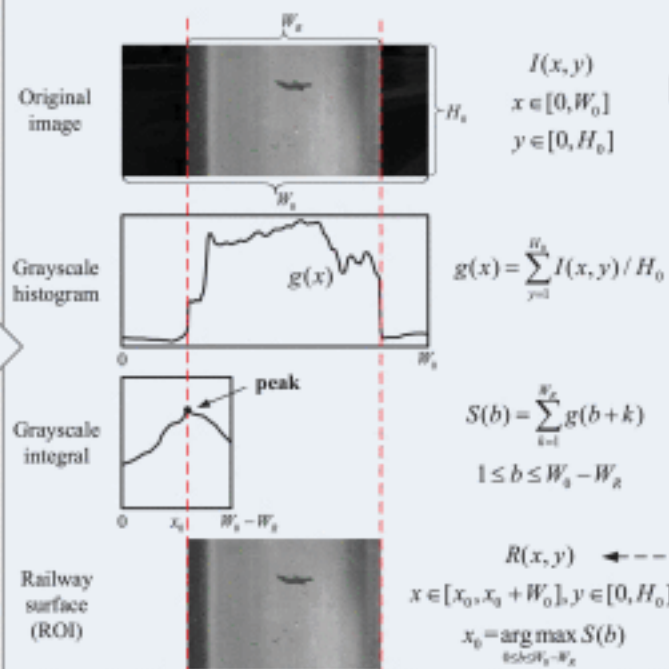


## Step 1. Acquire image sequence

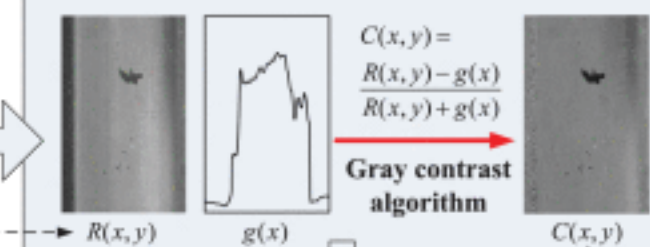


## Step 2. ROI extraction

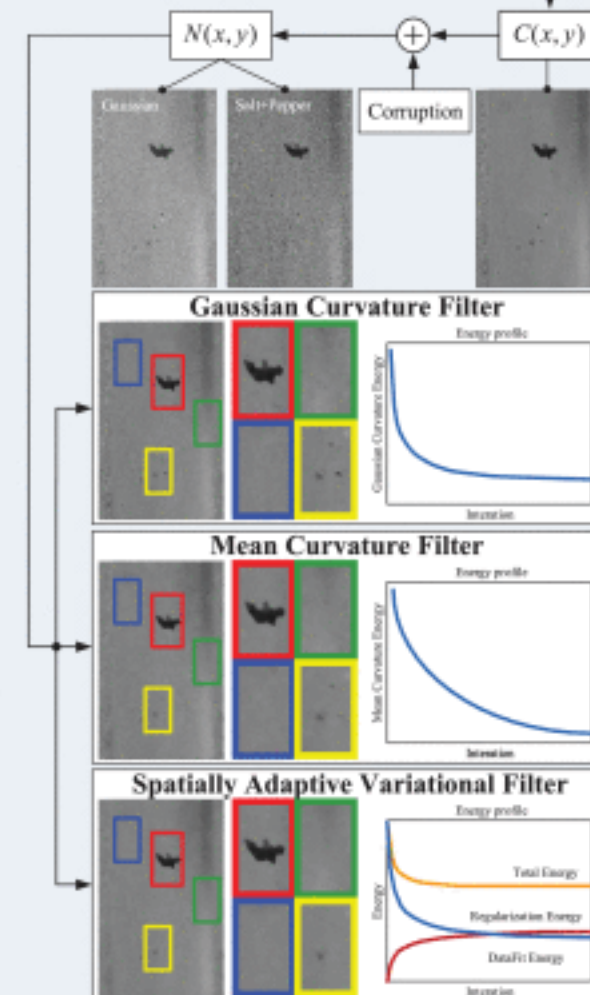
Extraction algorithm based on gray vertical projection



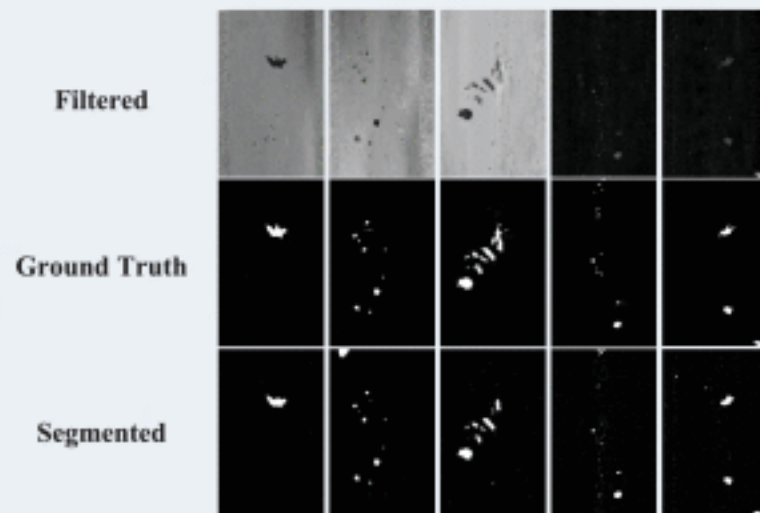
## Step 3. Gray equalization



## Step 4. Filtering: Curvature Filter



## Step 5. Segmentation: An improved Gaussian mixture model



Parameter-learning phase of proposed mixture model

- Input:**  $x_i$  observation at the  $i$ th pixel,  $i = 1, 2, \dots, N$
- Output:**  $\Omega_j$  label in D-dimension image,  $j = 1, 2, \dots, K$
- Initialize** Parameters  $\{\Pi, \Theta\}$ : the means  $\mu_j$ , covariance values  $\Sigma_j$ , and prior distributions  $\pi_j$ .
- 1: **E step:**
  - 2: Evaluate the values  $z_{ij}$  in (16) using the current parameter values.
  - 3: Update the factor  $G_{ij}$  by using (11).
  - 4: **M step:** Re-estimate the parameters  $\{\Pi, \Theta\}$ .
  - 5: Update the means  $\mu_j$  by using (20).
  - 6: Update covariance values  $\Sigma_j$  by using (21).
  - 7: Update prior distributions  $\pi_j$  by using (25).
  - 8: Evaluate the log-likelihood in (14) and check the convergence of either the log-likelihood function or the parameter values. If the convergence criterion is not satisfied, then go to **E step**.