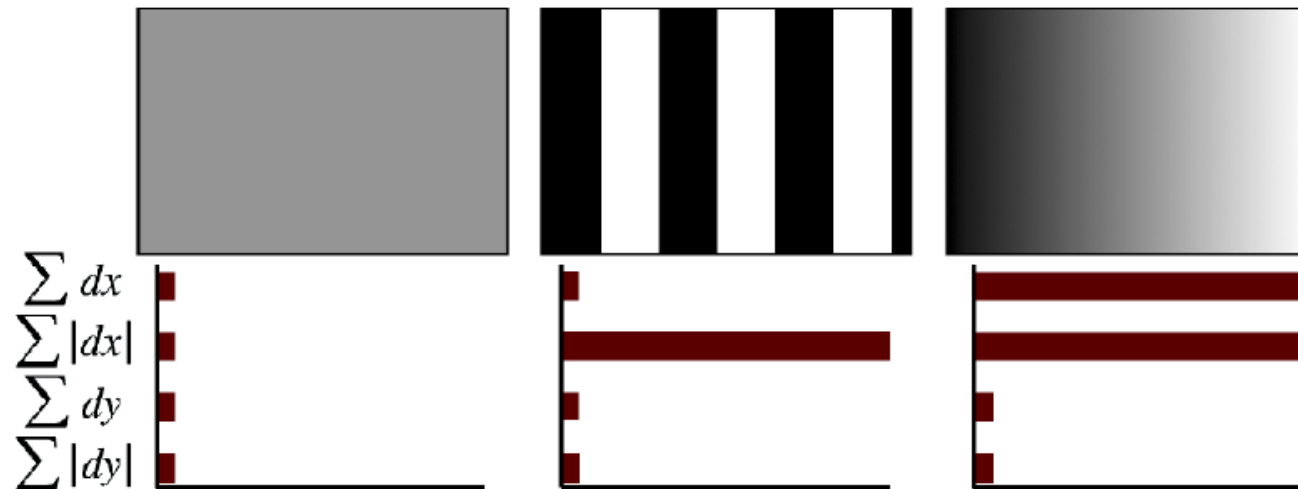
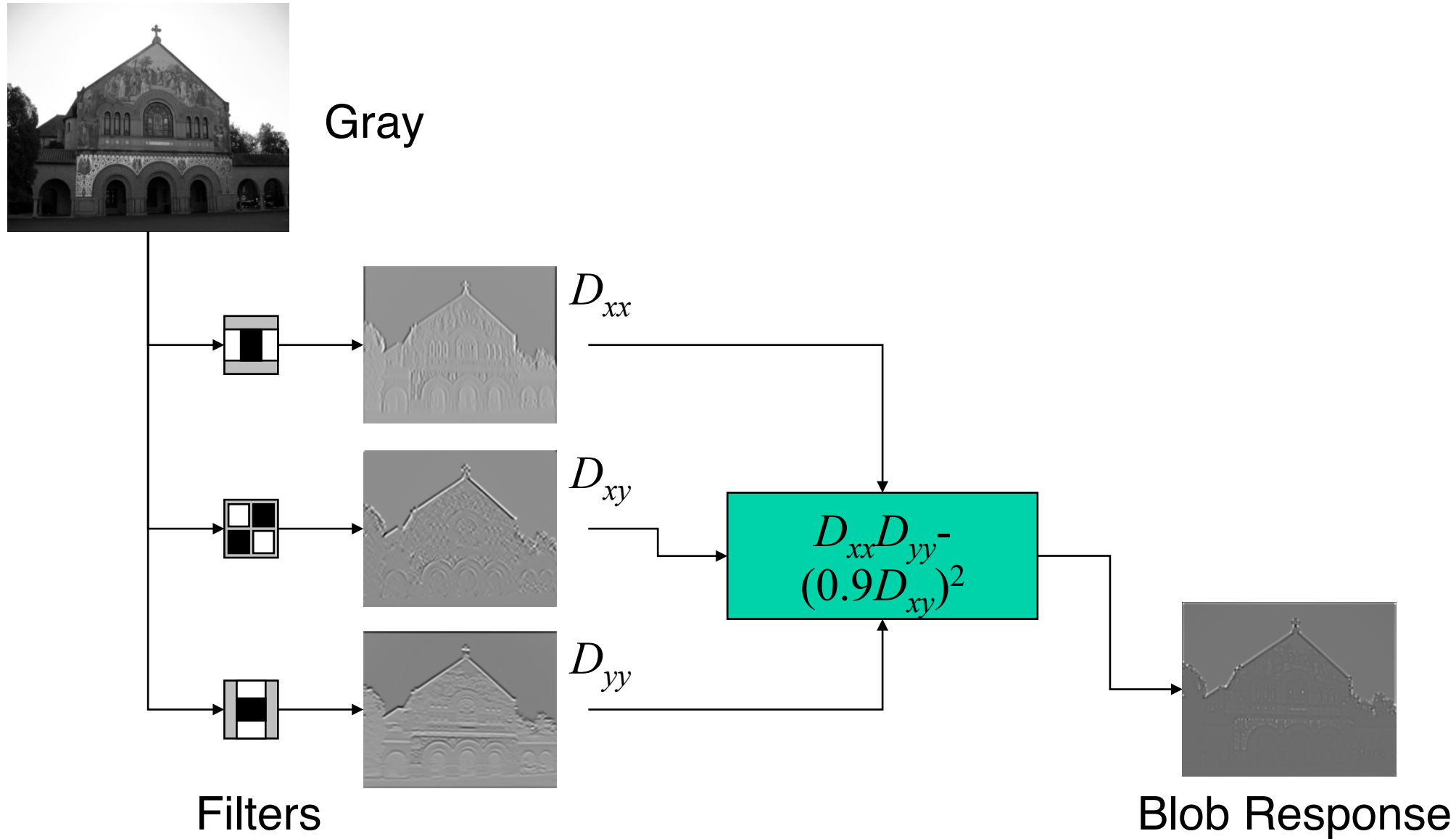


# SURF descriptors

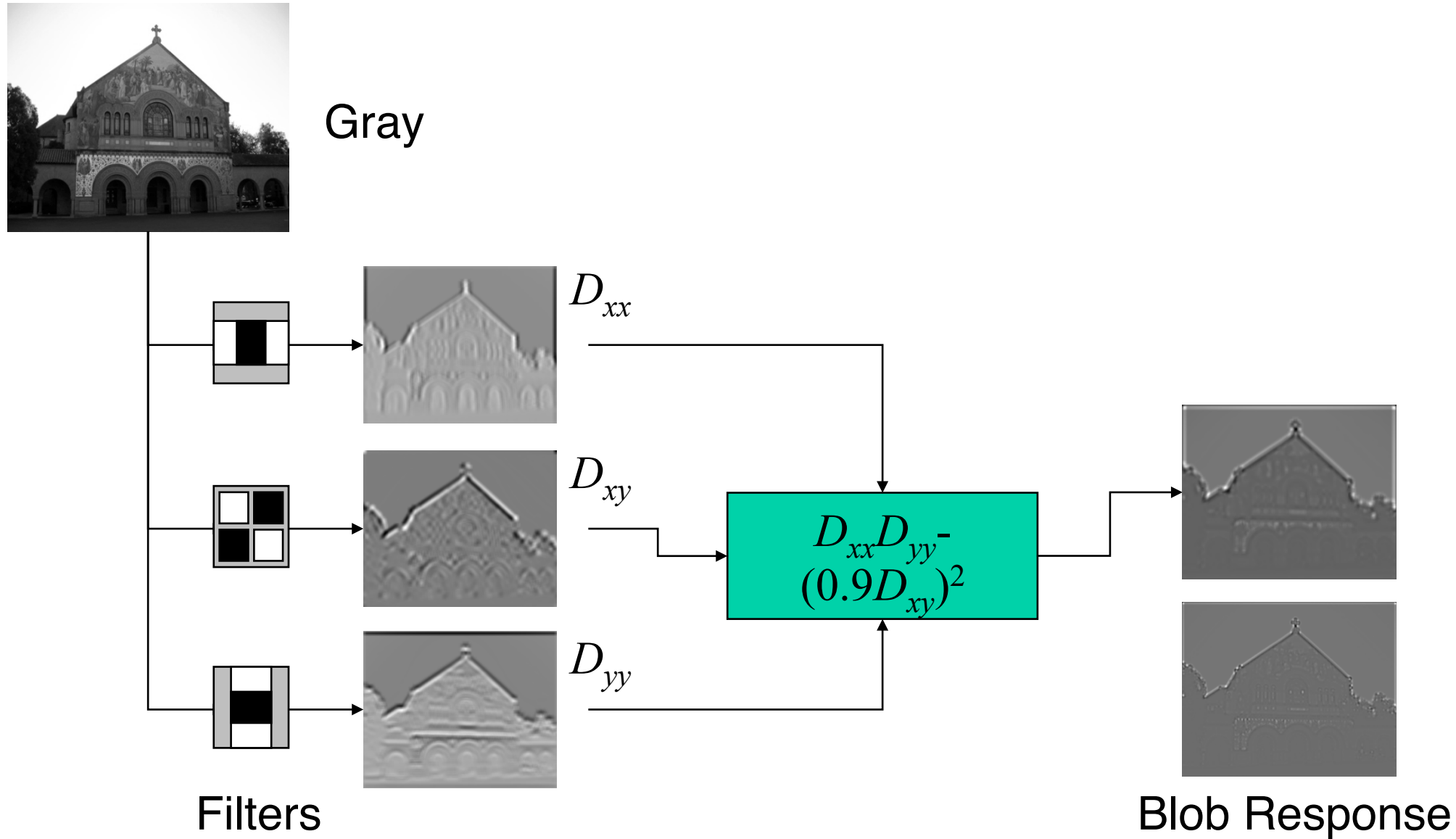
- SURF – Speeded Up Robust Features [[Bay et al. 2006](#)]
- Compute horizontal and vertical pixel differences,  $dx$ ,  $dy$  (in local coordinate system for rotation and scale invariance, window size  $20\sigma \times 20\sigma$ , where  $\sigma^2$  is feature scale)
- Sum  $dx$ ,  $dy$ , and  $|dx|$ ,  $|dy|$  over  $4 \times 4$  subregions (SURF-64) or  $3 \times 3$  subregions (SURF-36)
- Normalize vector for gain invariance, but distinguish bright blobs and dark blobs based on sign of Laplacian (trace of Hessian matrix)



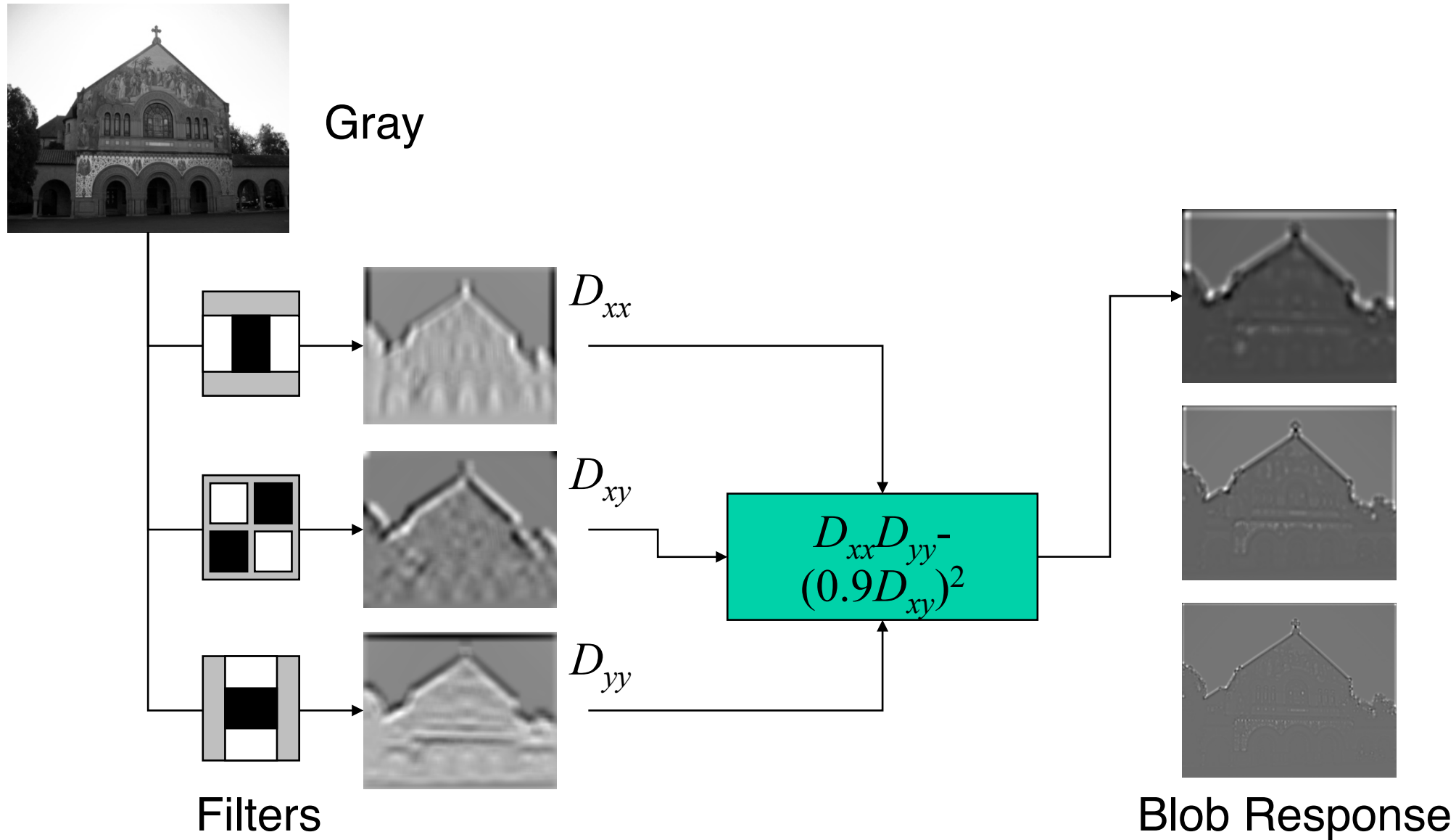
# Computing feature descriptors



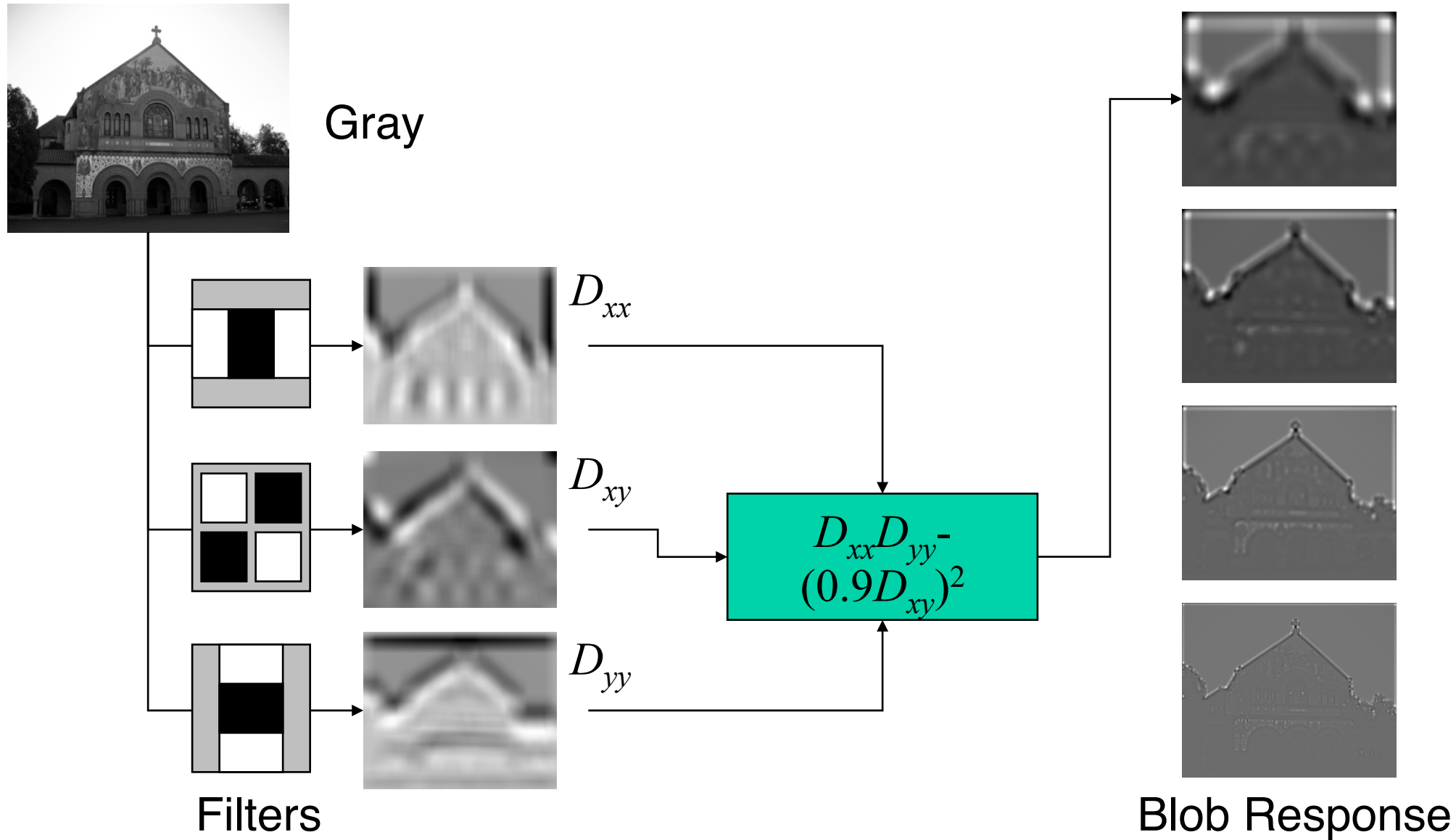
# Computing feature descriptors



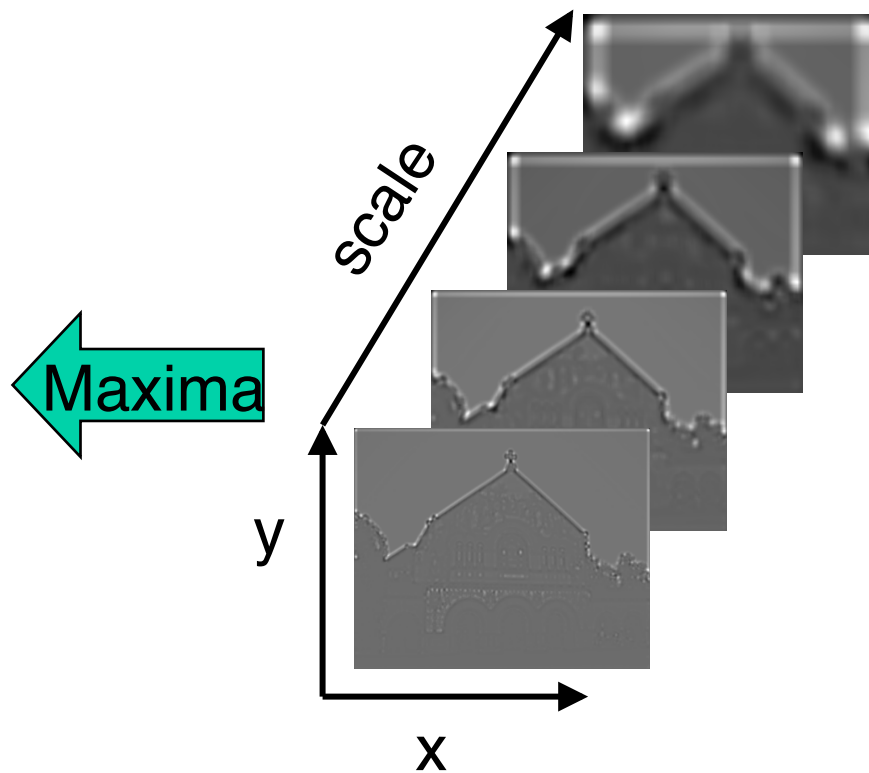
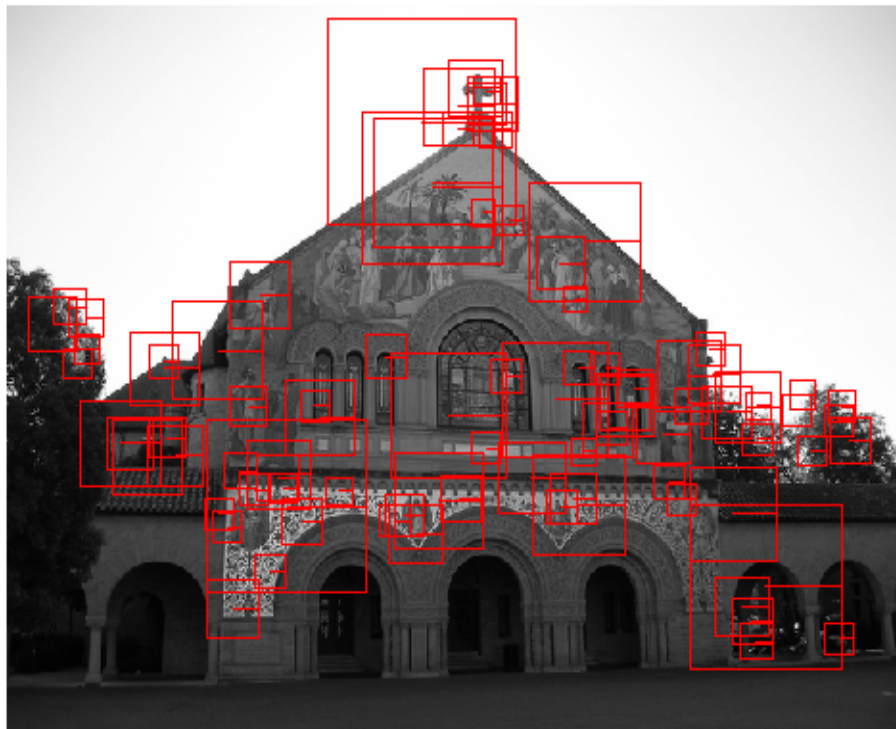
# Computing feature descriptors



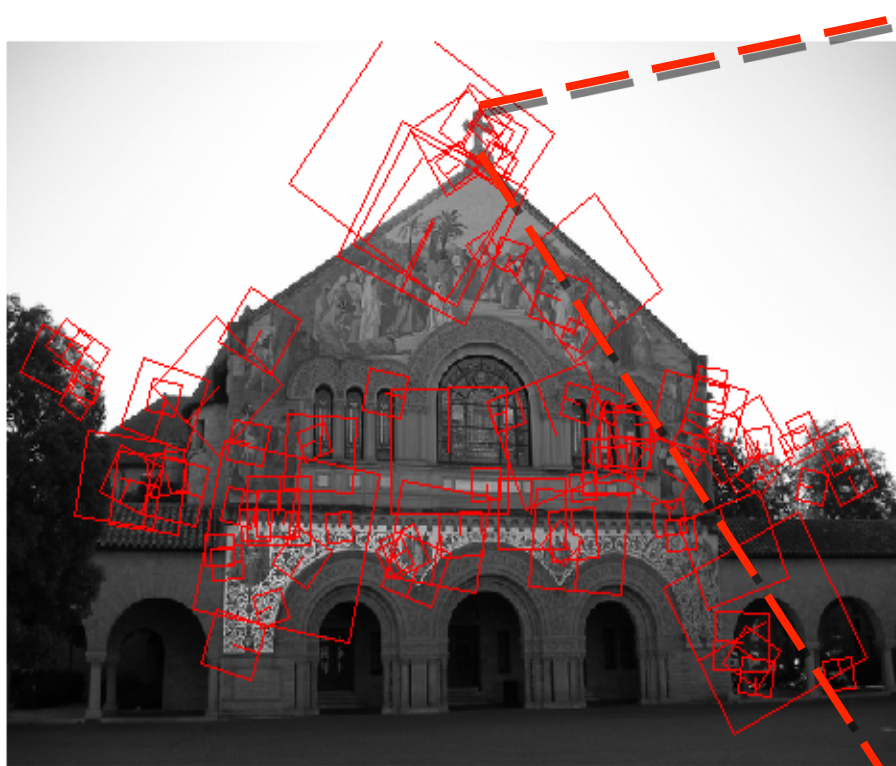
# Computing feature descriptors



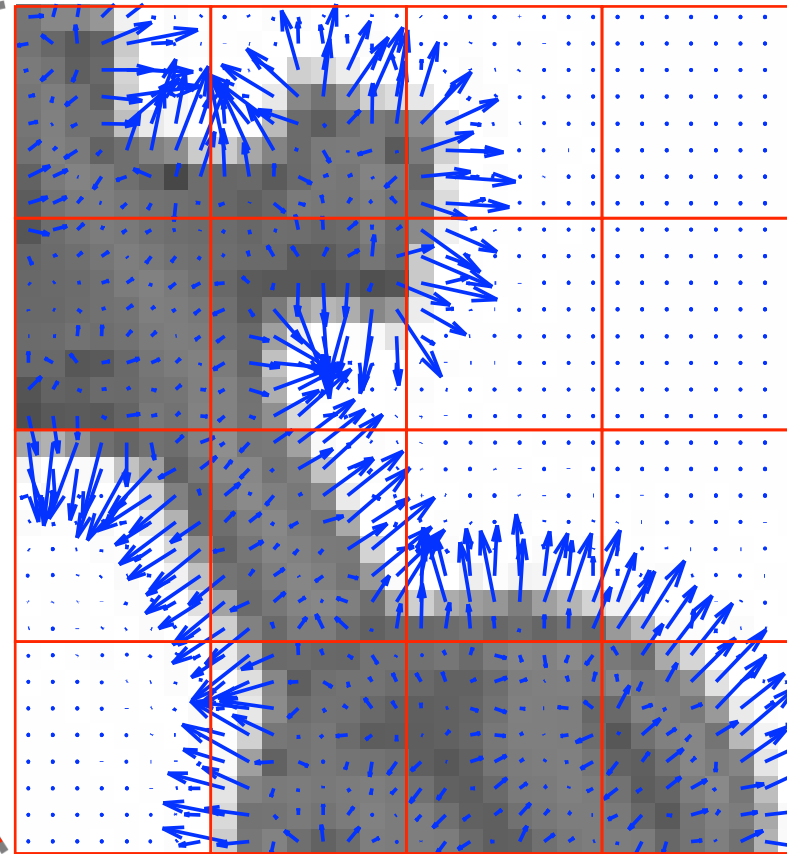
# Computing feature descriptors



# Computing feature descriptors



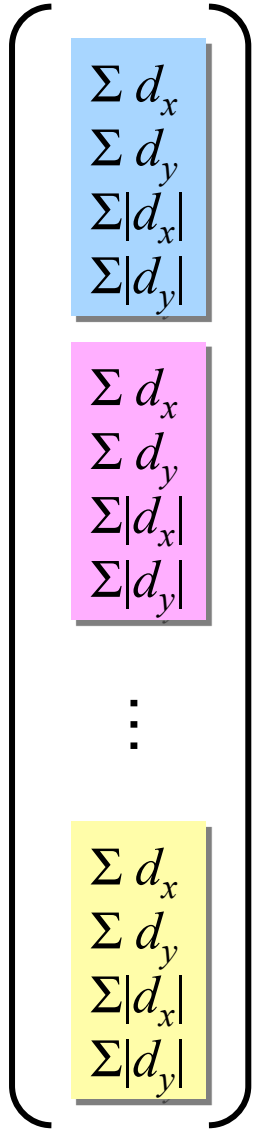
Orient Along  
Dominant Gradient



Gradient Field for  
Oriented Patch

# Computing feature descriptors

SURF Descriptor



SIFT Descriptor

