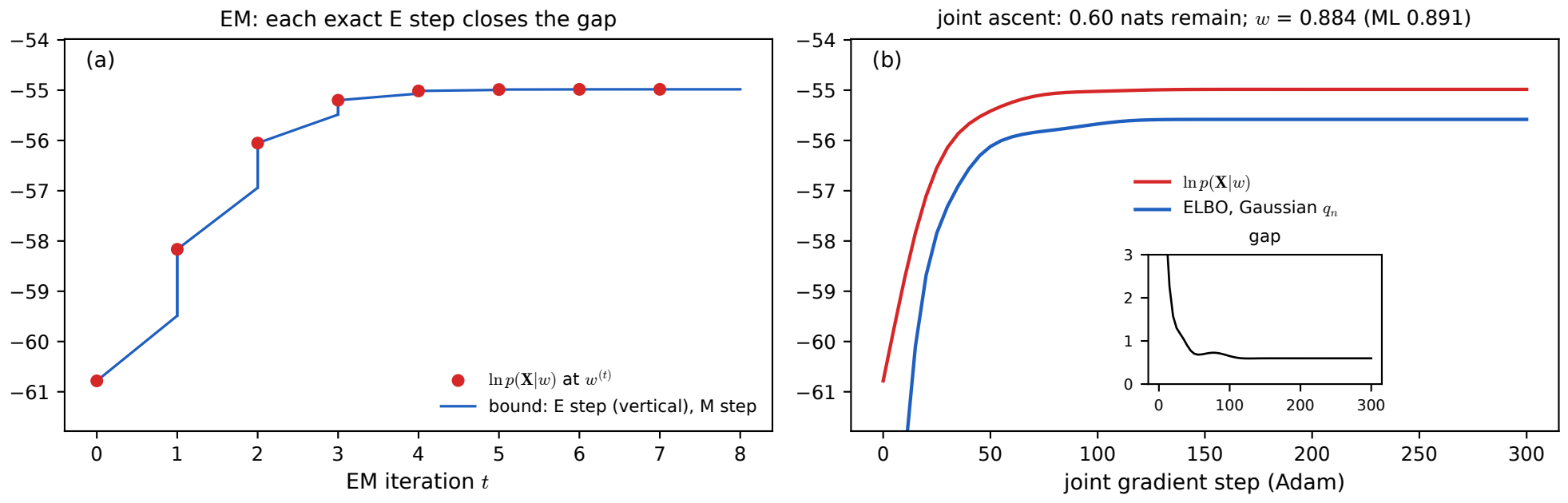

EM: each exact E step closes the gap
(a)
−54
−55
−56
−57
−58
−59
−60
−61
0
1
2
3
4
5
6
7
8
EM iteration t
$\ln p(\mathbf{X}|w)$ at $w^{(t)}$
bound: E step (vertical), M step
joint ascent: 0.60 nats remain; w = 0.884 (ML 0.891)
(b)
0
50
100
150
200
250
300
joint gradient step (Adam)
$\ln p(\mathbf{X}|w)$
ELBO, Gaussian q_n
gap
3
2
1
0
0
100
200
300