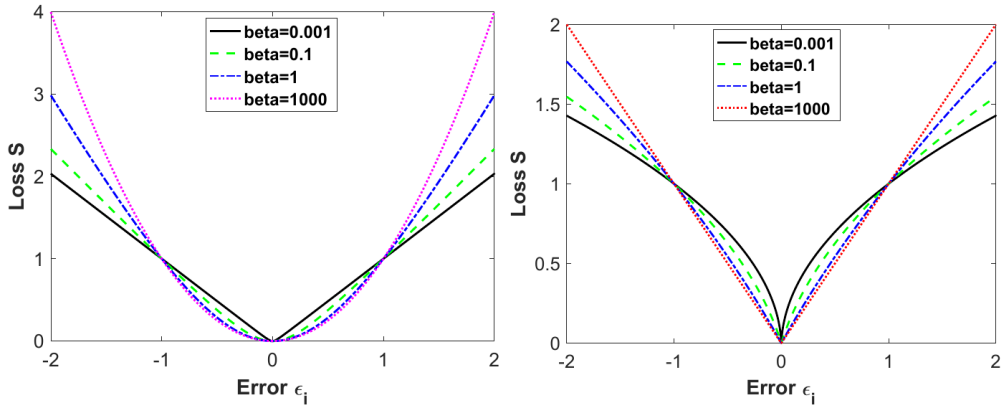
Probabilistic robust regression with adaptive weights —a case study on face recognition

Jin LI, Quan CHEN, Jingwen LENG, Weinan ZHANG, Minyi GUO

Frontiers of Computer Science, DOI: 10.1007/s11704-019-9097-x

Problems & Ideas

- Problems of robust regression for adaptive loss
  - No universal model for different losses
  - No probabilistic model
- Ideas: Probabilistic robust regression with adaptive weights
  - Soft Huber $(\ell_q\ loss,\ 1 \leq q < 2)$
  - Nonconvex Huber $(\ell_q\ loss,\ \frac{1}{2} \leq q < 1)$



(a) Soft Huber Loss (b) Nonconvex Huber Loss

Fig. 1 The shape of our proposed losses when $\sqrt{\zeta} = \sqrt{\beta} + \sqrt{\beta + 1}$.

Main Contributions

Table 1 Recognition rates on AR dataset without occlusion

Dimension	30	54	120	300
La_Gau	64.2%	78.8%	88.1%	91.1%
La_La	72.1%	83.5%	89.7%	90.6%
Huber_L2	64.2%	79.0%	88.4%	91.3%
Huber_L1	73.5%	83.3%	90.1%	93.3%
CNN	62.7%	77.5%	88.3%	90.1%
RRC_L2	61.5%	84.3%	94.3%	95.3%
RRC_L1	70.8%	87.6%	94.7%	96.3%
t_Gau	55.7%	79.3%	92.1%	93.5%
t_La	68.4%	82.7%	92.8%	94.3%
SH_Gau	64.5%	84.6%	94.7%	95.7%
SH_SH	75.0%	**88.1%**	95.4%	97.3%
SH_La	76.1%	87.7%	94.4%	96.4%
SH_NCH	**76.3%**	**88.1%**	**95.6%**	**97.4%**

Table 3 Recognition rates on AR dataset with scarf disguise

Session	#1	#2
La_Gau	53.0%	32.7%
La_La	54.3%	33.3%
Huber_L2	40.3%	33.0%
Huber_L1	47.5%	36.3%
CNN	55.8%	50.1%
RRC_L2	94.7%	77.3%
RRC_L1	93.3%	76.3%
t_Gau	94.4%	76.8%
t_La	93.1%	75.8%
SH_Gau	95.0%	78.7%
SH_SH	**95.7%**	**83.0%**
SH_La	95.5%	81.6%
SH_NCH	95.5%	81.9%

(a) Original images (b) Huber_L2 Recover (c) Huber_L1 Recover (d) SH_L2 Recover (e) SH_SH Recover

Fig. 2 Face image recovery results