Towards Low-bit Quantization of Deep Neural Networks with Limited Data

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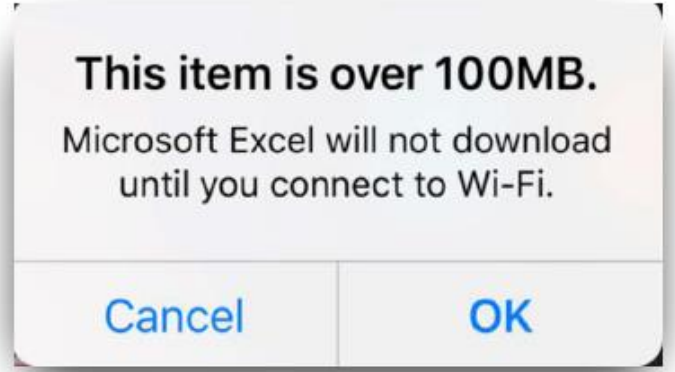
Motivation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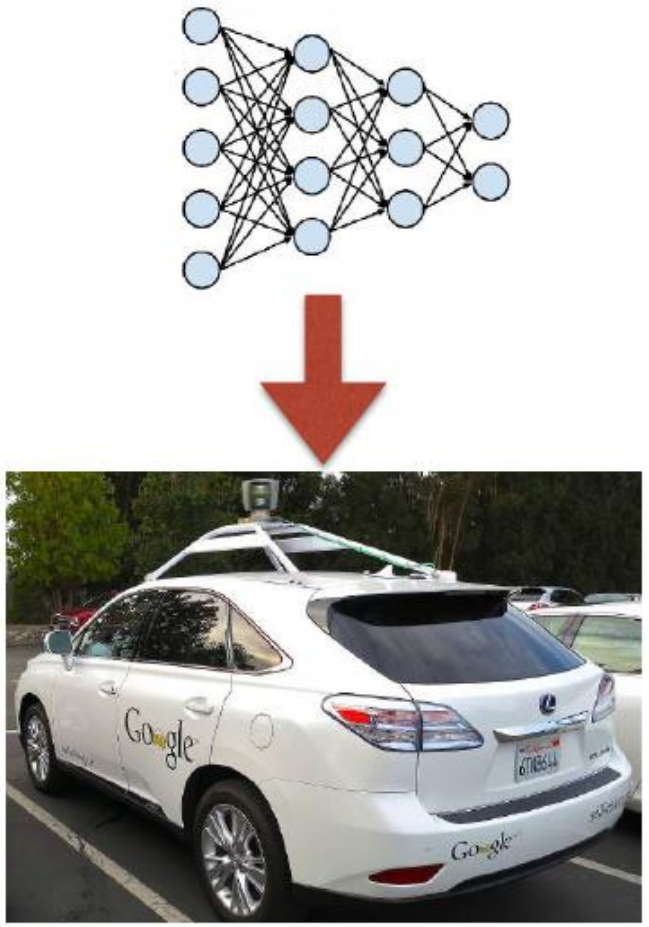
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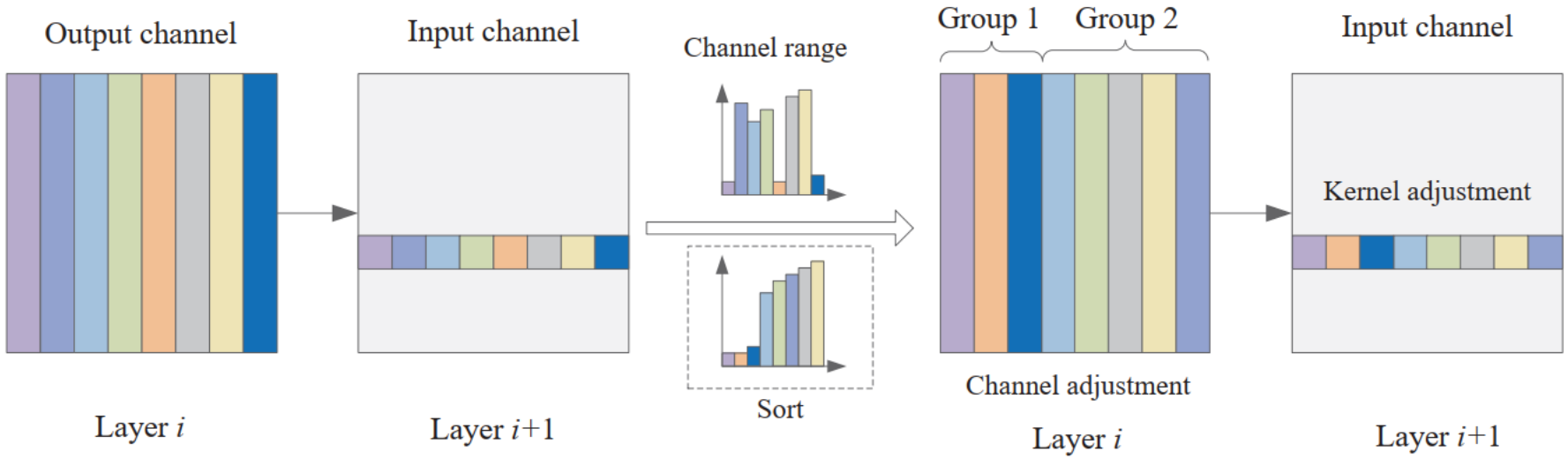
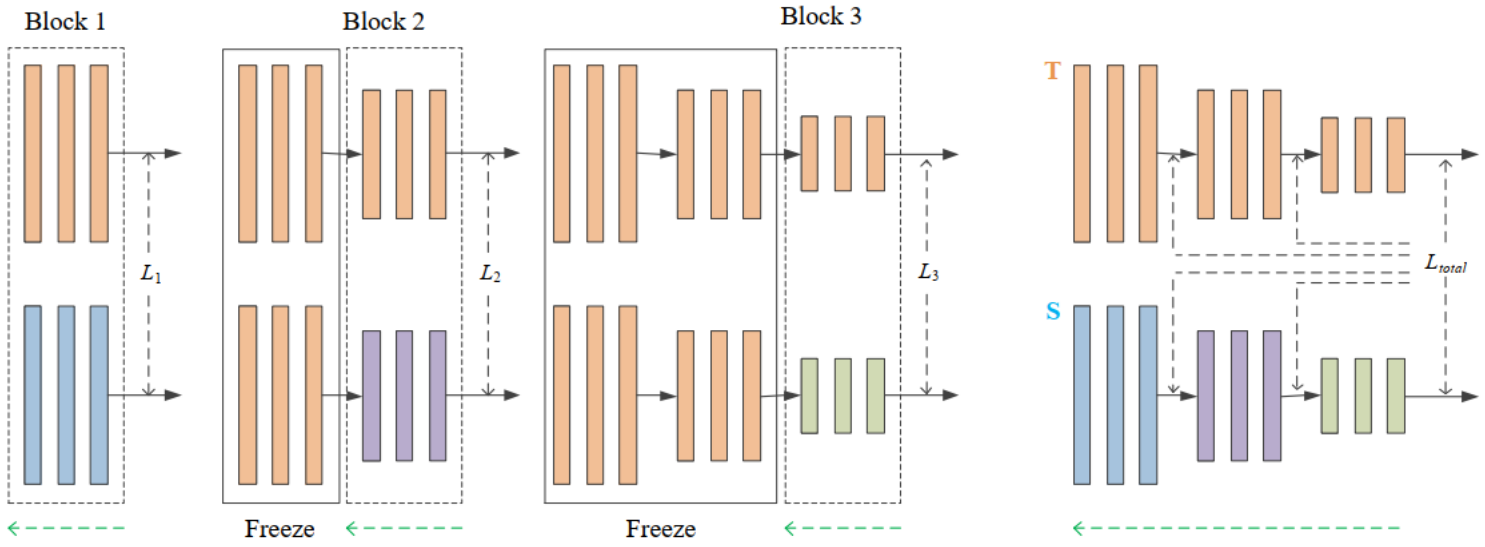
Proposed Method

- **Group-wise quantization**



- # Two-stage knowledge distillation



(a) Independent optimization stage

(b) Joint optimization stage

Experiments

	W-bit	Channel	Layer	Equalization [25]	Group			
					2	4	8	16
ResNet18	4	55.50	0.20	0.25	12.95	31.59	46.29	52.28
	6	69.05	66.90	66.36	68.43	68.53	69.04	69.25
ResNet50	4	70.07	0.12	0.32	5.80	61.33	67.00	68.15
	6	75.86	72.51	73.26	75.27	75.61	75.71	75.70
ShuffleNetV2	4	24.75	0.10	0.44	0.42	5.00	9.92	15.14
	6	67.51	0.12	60.36	60.96	66.37	67.05	67.12
	8	68.89	62.84	68.65	68.89	68.97	69.84	68.80
MobileNetV2	4	13.38	0.10	0.19	0.43	1.23	4.37	8.24
	6	59.03	0.10	33.41	1.03	61.62	58.74	60.82
	8	69.03	0.10	68.90	65.96	68.14	69.57	69.17

	Original	W-bit	Channel				8-Group			
			Init	GS	BS	**Ours**	Init	GS	BS	**Ours**
ResNet18	69.76	4	55.50	67.80	67.93	**68.08**	46.29	67.41	67.57	**67.72**
ResNet50	76.15	4	70.07	74.48	74.75	**74.98**	67.00	74.11	74.36	**74.75**
ShuffleNetV2	69.36	4	24.75	62.79	62.79	**63.65**	10.91	60.84	60.25	**61.05**
MobileNetV2	71.88	4	13.38	64.45	64.89	**65.74**	4.37	64.26	64.50	**65.30**

Thanks for listening