Table 1. Deep Learning algorithms reviewed in the paper

App	Algorithm	Models	Evaluation	Environment	Codes	Refs
Imputation						
	DCA	AE	DREMI	Keras, Tensorflow, scanpy	https://github.com/theislab/dca	[17]
	SAVER-X	AE+TL	t-SNE, ARI	R/sctransfer	https://github.com/jingshuw/SAVERX	[51]
	DeepImpute	DNN	MSE, Pearson's correlation	Keras/Tensorflow	https://github.com/lanagarmire/DeepImpute	[19]
	LATE	AE	MSE	Tensorflow	https://github.com/audreyqyfu/LATE	[52]
	scGAMI	AE	NMI, ARI, HS and CS	Tensorflow	https://github.com/QUST-AIBBDRC/scGMAI/	[53]
	scIGANs	GAN	ARI, ACC, AUC, and F-score	PyTorch	https://github.com/xuyungang/scIGANs	[18]
Batch correction						
	BERMUDA	AE+TL	kBET, entropy of Mixing, SI	PyTorch	https://github.com/txWang/BERMUDA	[57]
	DESC	AE	ARI, KL	Tensorflow	https://github.com/eleozzr/desc	[61]
	iMAP	AE+GAN	kBET, LISI	PyTorch	https://github.com/Svvord/iMAP	[64]
Clustering, latent representation, dimension reduction, and data augmentation						
	Dhaka	VAE	ARI, Spearman Correlation	Keras/Tensorflow	https://github.com/MicrosoftGenomics/Dhaka	[66]
	scvis	VAE	KNN preservation, log-likelihood	Tensorflow	https://bitbucket.org/jerry00/scvis-dev/src/master/	[69]
	scVAE	VAE	ARI	Tensorflow	https://github.com/scvae/scvae	[70]
	VASC	VAE	NMI, ARI, HS, and CS	H5py, keras	https://github.com/wang-research/VASC	[71]
	scDeepCluster	AE	ARI, NMI, clustering accuracy	Keras, Scanpy	https://github.com/ttgump/scDeepCluster	[73]
	cscGAN	GAN	t-SNE, marker genes, MMD, AUC	Scipy, Tensorflow	https://github.com/imsb-uke/scGAN	[76]
Multi-functional models (IM: imputation, BC: batch correction, CL: clustering)						
	scVI	VAE	**IM**: L_1 distance; **CL**: ARI, NMI, SI**; BC**: Entropy of Mixing	PyTorch, Anndata	https://github.com/YosefLab/scvi-tools	[16]
	LDVAE	VAE	Reconstruction errors	Part of scVI	https://github.com/YosefLab/scvi-tools	[80]
	SAUCIE	AE	**IM**: R^2 statistics; **CL**: SI**; BC**: modified kBET; Visualization: Precision/Recall	Tensorflow	https://github.com/KrishnaswamyLab/SAUCIE/	[14]
	scScope	AE	**IM**:Reconstruction errors**; BC**: Entropy of mixing**; CL**: ARI	Tensorflow, Scikit-learn	https://github.com/AltschulerWu-Lab/scScope	[86]
Cell type Identification						
	DigitalDLSorter	DNN	Pearson correlation	R/Python/Keras	https://github.com/cartof/digitalDLSorter	[87]
	scCapsNet	CapsNet	Cell-type Prediction accuracy	Keras, Tensorflow	https://github.com/wanglf19/scCaps	[94]
	netAE	VAE	Cell-type Prediction accuracy, t-SNE for visualization	pyTorch	https://github.com/LeoZDong/netAE	[98]
	scDGN	DANN	Prediciton accuracy	pyTorch	https://github.com/SongweiGe/scDGN	[101]
Function analysis						
	CNNC	CNN	AUROC, AUPRC, and accuracy	Keras, Tensorflow	https://github.com/xiaoyeye/CNNC	[104]
	scGen	VAE	Correlation, visualization	Tensorflow	https://github.com/theislab/scgen	[113]

DL Model keywords: AE: autoencoder, AE+TL: autoencoder with transfer learning, AE: variational autoencoder, GAN: Generative adversarial network, CNN: convolutional neural network, DNN: deep neural network, DANN: domain adversarial neural network, CapsNet: capsule neural network