Method	Top-1 Accuracy	Source	Year	Type
AlexNet	0.633	ImageNet Classification with Deep Convolutior	2012	Without Extra Training Data
Five Base + Five HiRes	0.663	EfficientNet: Rethinking Model Scaling for Con	2013	Without Extra Training Data
VGG-19	0.745	EfficientNet: Rethinking Model Scaling for Con	2014	Without Extra Training Data
Inception V3	0.788	EfficientNet: Rethinking Model Scaling for Con	2015	Without Extra Training Data
ResNeXt-101 64x4 + multi-scale dense testing	0.823	Billion-scale semi-supervised learning for imag	2016	Without Extra Training Data
PNASNet-5	0.829	Dual Path Networks	2017	Without Extra Training Data
GPIPE	0.844	Densely Connected Convolutional Networks	2018	Without Extra Training Data
AdvProp (EfficientNet-B8)	0.855	Adversarial Examples Improve Image Recognit	2019	Without Extra Training Data
Fix-EfficientNet-B8 (MaxUp + CutMix)	0.858	Fixing the train-test resolution discrepancy: Fix	2020	Without Extra Training Data
MAE (ViT-H, 448)	0.878	Masked Autoencoders Are Scalable Vision Lear	2021	Without Extra Training Data
AlexNet - 7CNNs + ImageNet 2011 pretrain	0.633	Self-training with Noisy Student improves Imag	2012	With Extra Training Data
VGG-19	0.745	EfficientNet: Rethinking Model Scaling for Con	2014	With Extra Training Data
Inception V3	0.788	EfficientNet: Rethinking Model Scaling for Con	2015	With Extra Training Data
JFT-300M Finetuning	0.792	EfficientNet: Rethinking Model Scaling for Con	2017	With Extra Training Data
ResNeXt-101 32x48d	0.854	Xception: Deep Learning with Depthwise Sepa	2018	With Extra Training Data
BiT-L (ResNet)	0.8754	Big Transfer (BiT): General Visual Representatic	2019	With Extra Training Data
EfficientNet-L2-475 (SAM)	0.8861	Sharpness-Aware Minimization for Efficiently I	2020	With Extra Training Data
CoAtNet-7	0.9088	CoAtNet: Marrying Convolution and Attention	2021	With Extra Training Data

Method	Top-5 Accuracy	Source	Year	Type
AlexNet	0.846	ImageNet Classification with Deep Convolutional Neu	2012	Without Extra Training Data
OverFeat - 7 a	0.868	GPipe: Efficient Training of Giant Neural Networks usi	2013	Without Extra Training Data
VGG-19	0.92	EfficientNet: Rethinking Model Scaling for Convolutio	2014	Without Extra Training Data
Inception V3	0.944	EfficientNet: Rethinking Model Scaling for Convolutio	2015	Without Extra Training Data
Inception ResN	0.963	Squeeze-and-Excitation Networks	2016	Without Extra Training Data
NASNET-A(6)	0.962	Learning Transferable Architectures for Scalable Imag	2017	Without Extra Training Data
ResNeXt-101 3	0.972	Exploring the Limits of Weakly Supervised Pretraining	2018	Without Extra Training Data
AdvProp (Effici	0.973	Adversarial Examples Improve Image Recognition	2019	Without Extra Training Data
FixEfficientNet	0.976	Fixing the train-test resolution discrepancy: FixEfficier	2020	Without Extra Training Data
NFNet-F6 w/ S	0.979	High-Performance Large-Scale Image Recognition Wit	2021	Without Extra Training Data
AlexNet - 7CN	0.846	Self-training with Noisy Student improves ImageNet c	2012	With Extra Training Data
ResNet-101	0.9395	Deep Residual Learning for Image Recognition	2015	With Extra Training Data
JFT-300M Fine	0.947	EfficientNet: Rethinking Model Scaling for Convolutio	2017	With Extra Training Data
ResNeXt-101 3	0.976	Xception: Deep Learning with Depthwise Separable C	2018	With Extra Training Data
BiT-L (ResNet)	0.9846	Big Transfer (BiT): General Visual Representation Lear	2019	With Extra Training Data
NoisyStudent (	0.987	Self-training with Noisy Student improves ImageNet c	2020	With Extra Training Data
Florence-CoSw	0.9902	Florence: A New Foundation Model for Computer Vis	2021	With Extra Training Data

Model	Fréchet Inception Distance (FID)	Source	Year
Dist-GAN	36.19	Dist-GAN: An Improved GAN using Distance Constraints	2018
DEGAS	28.76	DEGAS: Differentiable Efficient Generator Search	2019
E2GAN	25.35	Off-Policy Reinforcement Learning for Efficient and Effective GAN Architecture Search	2020
UDM (RVE)	7.71	Score Matching Model for Unbounded Data Score	2021

Model	Fréchet Inception Distance (FID)	Year
WGAN-GP	29.3	2017
BigGAN	14.73	2018
AutoGAN	12.42	2019
Denoising Diffusion	3.17	2020
LSGM (FID)	2.1	2021

Source	Year	Dataset	Accuracy (%)
Rich Models for Steganalysis of Digital Images	2012	DeepFake	0.7364
Learning Spatiotemporal Features with 3D Convolutional Networks	2015	DeepFake	0.851
Xception: Deep Learning with Depthwise Separable Convolutions	2017	DeepFake	0.9515
FaceForensics++: Learning to Detect Manipulated Facial Images	2019	DeepFake	0.9636
Thinking in Frequency: Face Forgery Detection by Mining Frequency-aware Clues	2020	DeepFake	0.9862
Detection of Deepfake Videos Using Long Distance Attention	2021	DeepFake	0.9947
Rich Models for Steganalysis of Digital Images	2012	Face2Face	0.7372
Xception: Deep Learning with Depthwise Separable Convolutions	2017	Face2Face	0.8348
FakeCatcher: Detection of Synthetic Portrait Videos using Biological Signals	2019	Face2Face	0.96
Detection of Deepfake Videos Using Long Distance Attention	2021	Face2Face	0.9998
Rich Models for Steganalysis of Digital Images	2012	FaceSwap	0.6893
Learning Spatiotemporal Features with 3D Convolutional Networks	2015	FaceSwap	0.7211
A Deep Learning Approach To Universal Image Manipulation Detection Using A New Convolutional Layer	2016	FaceSwap	0.8252
Xception: Deep Learning with Depthwise Separable Convolutions	2017	FaceSwap	0.9209
FakeCatcher: Detection of Synthetic Portrait Videos using Biological Signals	2019	FaceSwap	0.9575
Thinking in Frequency: Face Forgery Detection by Mining Frequency-aware Clues	2020	FaceSwap	0.9723
Detection of Deepfake Videos Using Long Distance Attention	2021	FaceSwap	0.9827
Rich Models for Steganalysis of Digital Images	2012	NeuralTexture	0.6333
A Deep Learning Approach To Universal Image Manipulation Detection Using A New Convolutional Layer	2016	NeuralTexture	0.7067
Recasting Residual-based Local Descriptors as Convolutional Neural Networks	2017	NeuralTexture	0.78
FakeCatcher: Detection of Synthetic Portrait Videos using Biological Signals	2019	NeuralTexture	0.8912
Detection of Deepfake Videos Using Long Distance Attention	2021	NeuralTexture	0.9325

Model	Area Under Curve Score (AUC)	Source	Year
DSP-FWA	64.6	Exposing DeepFake Videos By Detecting Face Wa	2018
Xception	65.5	FaceForensics++: Learning to Detect Manipulate	2019
Face-XRay	74.2	Face X-ray for More General Face Forgery Detect	2020
SPSL	76.88	Spatial-Phase Shallow Learning: Rethinking Face	2021

Percentage of Correct Keypoints (PC	Paper	Year
0.734	Articulated Pose Estimation by a Graphical Model with Image Dependent Pairwise Relation	2014
0.907	Human pose estimation via Convolutional Part Heatmap Regression	2016
0.939	Knowledge-Guided Deep Fractal Neural Networks for Human Pose Estimation	2017
0.945	Jointly Optimize Data Augmentation and Network Training: Adversarial Data Augmentation	2018
0.948	Toward fast and accurate human pose estimation via soft-gated skip connections	2020
0.995	OmniPose: A Multi-Scale Framework for Multi-Person Pose Estimation	2021

Average MPJP	Source	Year	Type
162.14	Human3.6M: Large Scale Datasets and Predictive Methods for 3D Human Sensing in N	2013	Without Extra Training Data
71.9	Robust Estimation of 3D Human Poses from a Single Image	2014	Without Extra Training Data
52.1	Learning 3D Human Pose from Structure and Motion	2017	Without Extra Training Data
46.8	3D human pose estimation in video with temporal convolutions and semi-supervised t	2018	Without Extra Training Data
31.17	Cross View Fusion for 3D Human Pose Estimation	2019	Without Extra Training Data
26.9	Epipolar Transformers	2020	Without Extra Training Data
22.7	Conditional Directed Graph Convolution for 3D Human Pose Estimation	2021	Without Extra Training Data
20.4	Learnable Triangulation of Human Pose	2019	With Extra Training Data
19	Epipolar Transformers	2020	With Extra Training Data
18.7	TesseTrack: End-to-End Learnable Multi-Person Articulated 3D Pose Tracking	2021	With Extra Training Data

Year	Type	Mean Intersection-Over-Union (mIoU)
2014	With Extra Training Data	0.631
2016	With Extra Training Data	0.784
2017	With Extra Training Data	0.813
2019	With Extra Training Data	0.845
2020	With Extra Training Data	0.859
2021	With Extra Training Data	0.862
2015	Without Extra Training Data	0.716
2016	Without Extra Training Data	0.802
2017	Without Extra Training Data	0.82
2018	Without Extra Training Data	0.827
2019	Without Extra Training Data	0.833
2020	Without Extra Training Data	0.843
2021	Without Extra Training Data	0.831

mean DICE	Paper	Year
0.878	U-Net: Convolutional Networks for Biol	2015
0.8897	Encoder-Decoder with Atrous Separabl	2018
0.9199	ResUNet++: An Advanced Architecture	2019
0.924	DoubleU-Net: A Deep Convolutional Ne	2020
0.942	MSRF-Net: A Multi-Scale Residual Fusic	2021

mean DICE	Paper	Year
0.818	U-Net: Convolutional Networks for Biomedical Image Segmentation	2015
0.897	Encoder-Decoder with Atrous Separable Convolution for Semantic Image Segmentation	2018
0.898	PraNet: Parallel Reverse Attention Network for Polyp Segmentation	2020
0.9217	MSRF-Net: A Multi-Scale Residual Fusion Network for Biomedical Image Segmentation	2021

Year	Dataset	False Non-Match Rate: FMNR
2017	VISA Photos FN	0.2547
2017	MUGSHOT Pho	0.4686
2017	MUGSHOT Pho	0.6387
2017	VISABORDER P	0.3807
2017	BORDER Photo	0.3806
2017	WILD Photos F	0.2252
2018	VISA Photos FN	0.0126
2018	MUGSHOT Pho	0.0089
2018	MUGSHOT Pho	0.0145
2018	VISABORDER P	0.0099
2018	BORDER Photo	0.0284
2018	WILD Photos F	0.032
2019	VISA Photos FN	0.0026
2019	MUGSHOT Pho	0.0027
2019	MUGSHOT Pho	0.0027
2019	VISABORDER P	0.0043
2019	BORDER Photo	0.0084
2019	WILD Photos F	0.0301
2020	VISA Photos FN	0.0022
2020	MUGSHOT Pho	0.0022
2020	MUGSHOT Pho	0.0023
2020	VISABORDER P	0.0035
2020	BORDER Photo	0.0064
2020	WILD Photos F	0.0293
2021	VISA Photos FN	0.0013
2021	MUGSHOT Pho	0.0022
2021	MUGSHOT Pho	0.0021
2021	VISABORDER P	0.0023
2021	BORDER Photo	0.0044
2021	WILD Photos F	0.0297

Model	False Non-Match Rate: FNMR	Masked?	Year
cloudwalk-mt-004	0.0137	Yes	2021
cloudwalk-mt-003	0.0237	Yes	2020
paravision-004	0.0281	Yes	2019
sensetime-005	0.002	No	2021
dahua-006	0.0031	No	2020
didiglobalface-001	0.005	No	2019

Method	Dataset	Accuracy (%)
Private-Asia, R	LFW7	0.995
Private-Asia, R	SLLFW8	0.98
Private-Asia, R	CPLFW10	0.8412
Private-Asia, R	CALFW11	0.9112
Private-Asia, R	MLFW (ours)	0.7485
CASIA-WebFac	LFW7	0.995
CASIA-WebFac	SLLFW8	0.984
CASIA-WebFac	CPLFW10	0.8747
CASIA-WebFac	CALFW11	0.9243
CASIA-WebFac	MLFW (ours)	0.8287
VGGFace2, R5(	LFW7	0.996
VGGFace2, R5(	SLLFW8	0.988
VGGFace2, R5(	CPLFW10	0.9177
VGGFace2, R5(	CALFW11	0.9372
VGGFace2, R5(	MLFW (ours)	0.8502
MS1MV2, R10	LFW7	0.9977
MS1MV2, R10	SLLFW8	0.9965
MS1MV2, R10	CPLFW10	0.925
MS1MV2, R10	CALFW11	0.9583
MS1MV2, R10	MLFW (ours)	0.9013
MS1MV2, R10	LFW7	0.998
MS1MV2, R10	SLLFW8	0.997
MS1MV2, R10	CPLFW10	0.9315
MS1MV2, R10	CALFW11	0.9597
MS1MV2, R10	MLFW (ours)	0.906
MS1MV2, R10	LFW7	0.9982
MS1MV2, R10	SLLFW8	0.9968
MS1MV2, R10	CPLFW10	0.9328
MS1MV2, R10	CALFW11	0.9583
MS1MV2, R10	MLFW (ours)	0.9063

Year	Model	Accuracy (%)
2021	Renaissance	0.7978
2020	GridFeat+MoVie	0.7636
2019	MIL@HDU	0.7526
2018	FAIR A-STAR	0.7241
2017	Adelaide-Teney ACRV MSR	0.69
2016	-	0.6233
2015	-	0.5537

Top-1 Accuracy (%)	Source	Year	Dataset
0.739	Temporal Segment Networks: Towards Good Practices for Deep Action Recognition	2016	Kinetics-400
0.777	Non-local Neural Networks	2017	Kinetics-400
0.798	SlowFast Networks for Video Recognition	2018	Kinetics-400
0.828	Large-scale weakly-supervised pre-training for video action recognition	2019	Kinetics-400
0.836	Omni-sourced Webly-supervised Learning for Video Recognition	2020	Kinetics-400
0.872	Co-training Transformer with Videos and Images Improves Action Recognition	2021	Kinetics-400
0.891	Multiview Transformers for Video Recognition	2022	Kinetics-400
0.786	Rethinking Spatiotemporal Feature Learning: Speed-Accuracy Trade-offs in Video Classification	2017	Kinectics-600
0.818	SlowFast Networks for Video Recognition	2018	Kinectics-600
0.831	Learning Spatio-Temporal Representation with Local and Global Diffusion	2019	Kinectics-600
0.883	Masked Feature Prediction for Self-Supervised Visual Pre-Training	2021	Kinectics-600
0.896	Multiview Transformers for Video Recognition	2022	Kinectics-600
0.5646	Learn to cycle: Time-consistent feature discovery for action recognition	2020	Kinectics-700
0.804	Masked Feature Prediction for Self-Supervised Visual Pre-Training	2021	Kinectics-700
0.822	Multiview Transformers for Video Recognition	2022	Kinectics-700

Year	Mean Average Precision (%)	Source
2016	0.178	ActivityNet: Large Scale Activity Recognition Challenge
2017	0.334	ActivityNet Challenge 2017 Summary
2018	0.385	The ActivityNet Large-Scale Activity Recognition Challenge 2018 Summary
2019	0.397	ActivityNet Temporal Action Localization Results
2020	0.428	ActivityNet Temporal Action Localization Results
2021	0.4467	Task 1 - Temporal Action Localization

Model	Meam Average Precision (mAP50)	Paper	Year	Type
ION	0.557	Inside-Outside Net: Detecting Objects in Context with Sk	2015	Without Extra Training Data
D-RFCN + SNIP (DPN-98 with flip, multi-	0.673	An Analysis of Scale Invariance in Object Detection – SNI	2017	Without Extra Training Data
DCNv2 (ResNet101, multi-scale)	0.679	Deformable ConvNets v2: More Deformable, Better Resu	2018	Without Extra Training Data
CSP-p6 + Mish (multi-scale)	0.729	Mish: A Self Regularized Non-Monotonic Activation Func	2019	Without Extra Training Data
DetectorRS	0.742	Scaled-YOLOv4: Scaling Cross Stage Partial Network	2020	Without Extra Training Data
DyHead (Swim-L, multi scale)	0.771	Dynamic Head: Unifying Object Detection Heads with At	2021	Without Extra Training Data
EfficientDet-D7 (single-scale)	0.724	EfficientDet: Scalable and Efficient Object Detection	2019	With Extra Training Data
GLIP (swim-l, multi-scale)	0.795	Grounded Language-Image Pre-training	2021	With Extra Training Data

Year	Type	Mean Average Precision (mAP50)	Source
2016	YOLO	0.44	YOLO9000: Better, Faster, Stronger
2016	SOTA	0.557	Inside-Outside Net: Detecting Objects in Context with Skip Pooling and Recurrent Neural Networks
2018	YOLO	0.579	YOLOv3: An Incremental Improvement
2018	SOTA	0.679	Deformable ConvNets v2: More Deformable, Better Results
2020	YOLO	0.657	YOLOv4: Optimal Speed and Accuracy of Object Detection
2020	SOTA	0.742	Scaled-YOLOv4: Scaling Cross Stage Partial Network
2021	YOLO	0.724	https://github.com/ultralytics/yolov5/releases
2021	SOTA	0.795	Grounded Language-Image Pre-training

Model	Q->AR	Source	Year
Recognition to Cognition Networks	44	https://visualcommonsense.com/leaderboard/	2018
UNITER-large (ensemble of 10 models)	66.8	UNITER: UNiversal Image-TExt Representation Learning	2019
BLENDER (single model)	70.8	https://visualcommonsense.com/leaderboard/	2020
VLUA (single model)	72	https://visualcommonsense.com/leaderboard/	2021

Model	Score	Year	Source
T5	88.9	2019	SuperGlue Leaderboard
T5 + Meena, Single Model (Meena Team - Google Brain)	90	2020	SuperGlue Leaderboard
Liam Fedus	91	2021	SuperGlue Leaderboard

F1 Score	Dataset	Year	Source
80.383	Squad 1.1	2016	Papers with Code
88.163	Squad 1.1	2017	Papers with Code
93.16	Squad 1.1	2018	Papers with Code
95.08	Squad 1.1	2019	Papers with Code
95.379	Squad 1.1	2020	Papers with Code
95.719	Squad 1.1	2021	Papers with Code
86.122	Squad 2.0	2018	SQuAD 2.0
92.425	Squad 2.0	2019	SQuAD 2.0
93.011	Squad 2.0	2020	SQuAD 2.0
93.214	Squad 2.0	2021	SQuAD 2.0

Dataset	Accuracy	Source
Test Easy	0.7614	ReClor Leaderboard
Test Easy	0.9182	ReClor Leaderboard
Test Hard	0.5393	ReClor Leaderboard
Test Hard	0.6929	ReClor Leaderboard

Model	ROUGE-1	Type	Year	Source
PEGASUS	44.67	With Extra Training Data	2019	PEGASUS: Pre-training with Extracted Gap-sentences for Abstractive Summarization
BigBird Pegasus	46.63	With Extra Training Data	2020	Big Bird: Transformers for Longer Sequences
HAT-BART	46.74	With Extra Training Data	2021	Hierarchical Learning for Generation with Long Source Sequences
Pntr-Gen-Seq2Seq	32.06	Without Extra Training Data	2017	Get To The Point: Summarization with Pointer-Generator Networks
Discourse	35.8	Without Extra Training Data	2018	A Discourse-Aware Attention Model for Abstractive Summarization of Long Documents
ExtSum-LG	43.58	Without Extra Training Data	2019	Extractive Summarization of Long Documents by Combining Global and Local Context
ExtSum-LG+RdLoss	44.01	Without Extra Training Data	2020	Systematically Exploring Redundancy Reduction in Summarizing Long Documents
DeepPyramidion	47.15	Without Extra Training Data	2021	Sparsifying Transformer Models with Trainable Representation Pooling

Model	ROUGE-1	Type	Year	Source
PEGASUS	45.09	With Extra Training Data	2019	PEGASUS: Pre-training with Extracted Gap-sentences for Abstractive Summarization
DANCER PEGASUS	46.34	With Extra Training Data	2020	A Divide-and-Conquer Approach to the Summarization of Long Documents
HAT-BART	48.25	With Extra Training Data	2021	Hierarchical Learning for Generation with Long Source Sequences
Pntr-Gen-Seq2Seq	35.86	Without Extra Training Data	2017	Get To The Point: Summarization with Pointer-Generator Networks
Discourse	38.93	Without Extra Training Data	2018	A Discourse-Aware Attention Model for Abstractive Summarization of Long Documents
ExtSum-LG+MMR-Select+	45.39	Without Extra Training Data	2019	Extractive Summarization of Long Documents by Combining Global and Local Context
DeepPyramidion	47.81	Without Extra Training Data	2021	Sparsifying Transformer Models with Trainable Representation Pooling

Model	Accuracy (%)	Source	Year
CNN-MC	0.881	Convolutional Neural Networks for Sentence Classification	2014
600D ESIM + 3	0.886	Enhanced LSTM for Natural Language Inference	2016
300D Cafe Ens	0.893	Compare, Compress and Propagate: Enhancing Neural Architectures with Alignment Factorization for Natural Language Inference	2017
SJRC (BERT-Lar	0.913	Explicit Contextual Semantics for Text Comprehension	2018
SemBERT	0.919	Semantics-aware BERT for Language Understanding	2019
RoBERTa-large	0.923	Self-Explaining Structures Improve NLP Models	2020
EFL	0.931	Entailment as Few-Shot Learner	2021

Submission	Accuracy (%)	Year	Source
McQueen + Roberta	0.8418	2019	ANLI Leaderboard
DeBERTa	0.897	2020	ANLI Leaderboard
DeBERTa-v3 Data Augmentation & Ensemble	0.9187	2021	ANLI Leaderboard

Model	Accuracy (%)	Paper	Year
TD-LSTM	0.7188	Effective LSTMs for Target-Dependent Sentiment Classification	2015
MemNet	0.7658	Aspect Level Sentiment Classification with Deep Memory Network	2016
RAM	0.7736	Recurrent Attention Network on Memory for Aspect Sentiment Analysis	2017
HAPN	0.7975	Hierarchical Attention Based Position-Aware Network for Aspect-Level Sentiment Analysis	2018
LCF-ATEPC	0.8624	A Multi-task Learning Model for Chinese-oriented Aspect Polarity Classification and Aspect Term Extraction	2019
RGAT+	0.8392	Investigating Typed Syntactic Dependencies for Targeted Sentiment Classification Using Graph Attention Neural Network	2020
LSA+DeBERTa-	0.8864	Back to Reality: Leveraging Pattern-driven Modeling to Enable Affordable Sentiment Dependency Learning	2021

Model	BLEU Score	Source	Year	Type	Dataset
LSTM6 + PosUnk	37.5	Addressing the Rare Word Proble	2014	Without Extra Training Data	English-French
GNMT+RL	39.9	Google's Neural Machine Transla	2016	Without Extra Training Data	English-French
Weighted Transformer (Large)	41.4	Weighted Transformer Network f	2017	Without Extra Training Data	English-French
Transformer Big	43.2	Scaling Neural Machine Translati	2018	Without Extra Training Data	English-French
MUSE	43.5	MUSE: Parallel Multi-Scale Attent	2019	Without Extra Training Data	English-French
Admin	43.8	Understanding the Difficulty of Tr	2020	Without Extra Training Data	English-French
Transformer+R-Drop	43.95	R-Drop: Regularized Dropout for	2021	Without Extra Training Data	English-French
Noisy-back Translation	45.6	Understanding Back-Translation a	2018	With Extra Training Data	English-French
Transformer+BT (ADMIN init)	46.4	Very Deep Transformers for Neur	2020	With Extra Training Data	English-French
RNN Enc-Dec Att	20.9	Effective Approaches to Attentior	2015	Without Extra Training Data	English-German
GNMT+RL	26.3	Google's Neural Machine Transla	2016	Without Extra Training Data	English-German
Weighted Transformer (Large)	28.9	Weighted Transformer Network f	2017	Without Extra Training Data	English-German
Transformer Big + MoS	29.6	Fast and Simple Mixture of Softm	2018	Without Extra Training Data	English-German
Data Diversification Transformer	30.7	Data Diversification: A Simple Str	2019	Without Extra Training Data	English-German
Bert-fused NMT	30.75	Incorporating BERT into Neural M	2020	Without Extra Training Data	English-German
BiBert	31.26	BERT, mBERT, or BiBERT? A Study	2021	Without Extra Training Data	English-German
Noisy back-translation	35	Understanding Back-Translation a	2018	With Extra Training Data	English-German
Transformer Cycle (Rev)	35.14	Lessons on Parameter Sharing ac	2021	With Extra Training Data	English-German

Type	Number of Independent Machine Translation Services	Date	Source
Preview	5	2021-10-01	State of Machine Translation
Commercial	38	2021-10-01	State of Machine Translation
Open Source Pre-trained	3	2021-10-01	State of Machine Translation
Preview	6	2020-07-01	State of Machine Translation
Commercial	28	2020-07-01	State of Machine Translation
Open Source Pre-trained	0	2020-07-01	State of Machine Translation
Preview	3	2019-11-01	State of Machine Translation
Commercial	23	2019-11-01	State of Machine Translation
Open Source Pre-trained	0	2019-11-01	State of Machine Translation
Preview	2	2019-06-01	State of Machine Translation
Commercial	21	2019-06-01	State of Machine Translation
Open Source Pre-trained	0	2019-06-01	State of Machine Translation
Preview	3	2018-12-01	State of Machine Translation
Commercial	18	2018-12-01	State of Machine Translation
Open Source Pre-trained	0	2018-12-01	State of Machine Translation
Preview	1	2018-07-01	State of Machine Translation
Commercial	15	2018-07-01	State of Machine Translation
Open Source Pre-trained	0	2018-07-01	State of Machine Translation
Preview	3	2018-03-01	State of Machine Translation
Commercial	10	2018-03-01	State of Machine Translation
Open Source Pre-trained	0	2018-03-01	State of Machine Translation
Preview	3	2017-11-01	State of Machine Translation
Commercial	9	2017-11-01	State of Machine Translation
Open Source Pre-trained	0	2017-11-01	State of Machine Translation
Preview	1	2017-07-01	State of Machine Translation
Commercial	9	2017-07-01	State of Machine Translation
Open Source Pre-trained	0	2017-07-01	State of Machine Translation
Preview	1	2017-05-01	State of Machine Translation
Commercial	8	2017-05-01	State of Machine Translation
Open Source Pre-trained	0	2017-05-01	State of Machine Translation

Model	Word Error Rate (WER)	Paper	Year	Type	Dataset
Gated ConvNets	4.8	Letter-Based Speech Recogniti	2017	Without Extra	Clean
tdnn + chain + rnnlm rescoring	3.06	Neural Network Language Mo	2018	Without Extra	Clean
Multi-Stream Self-Attention with Dilated 1D Convolutions	2.2	State-of-the-Art Speech Recog	2019	Without Extra	Clean
Multi-Stream CNN with Self-Attentive SRU	1.75	ASAPP-ASR: Multistream CNN	2020	Without Extra	Clean
SpeechStew (1B)	1.7	SpeechStew: Simply Mix All Av	2021	Without Extra	Clean
Deep Speech 2	5.33	Deep Speech 2: End-to-End Sp	2015	With Extra Trai	Clean
Conv + Transformer AM + Psuedo-Labelling	2.03	End-to-end ASR: from Supervis	2019	With Extra Trai	Clean
Conformer + Wav2vec 2.0 + SpecAugment-based Noisy Student Training with Libri-Light	1.4	Pushing the Limits of Semi-Sup	2020	With Extra Trai	Clean
TDNN + pNorm + speed up/down speech	12.5	Papers with Code	2017	Without Extra	Other
tdnn + chain + rnnlm rescoring	7.63	Neural Network Language Mo	2018	Without Extra	Other
Hybrid + transformer LM rescoring	4.85	Transformer-based Acoustic M	2019	Without Extra	Other
Conformer (L)	3.9	Conformer: Convolution-augm	2020	Without Extra	Other
SpeechStew (1B)	3.3	SpeechStew: Simply Mix All Av	2021	Without Extra	Other
Deep Speech 2	13.25	Deep Speech 2: End-to-End Sp	2015	With Extra Trai	Other
Conv + Transformer AM (ConvLM with Transformer Rescoring)	4.11	End-to-end ASR: from Supervis	2019	With Extra Trai	Other
Conformer + Wav2vec 2.0 + SpecAugment-based Noisy Student Training with Libri-Light	2.6	Pushing the Limits of Semi-Sup	2020	With Extra Trai	Other
w2v-BERT XXL	2.5	W2v-BERT: Combining Contras	2021	With Extra Trai	Other

Equal Error Rate (%)	Method	Source	Year
0.078	CNN256D-Embedding	VoxCeleb: a large-scale speaker identification dataset	2017
0.0419	ResNet50	VoxCeleb2: Deep Speaker Recognition	2018
0.0287	Ours + Relation Module	Voxceleb: Large-scale speaker verification in the wild	2019
0.0056	Speech duration QMF	The IDLAB VoxSRC-20 Submission: Large Margin Fine-Tuning and Quality-Awa	2020
0.0042	S1~S9 Fusion	The SpeakIn System for VoxCeleb Speaker Recognition Challange 2021	2021

Date	Model	nDCG@100	Paper
2021	VASP	0.448	Deep Variational Autoencoder with Shallow Parallel Path for Top-N Recommendation (VASP)
2019	H+Vamp Gated	0.445	Enhancing VAEs for Collaborative Filtering: Flexible Priors & Gating Mechanisms
2019	RaCT	0.434	RaCT: Toward Amortized Ranking-Critical Training For Collaborative Filtering
2018	Multi-VAE-PR	0.426	Variational Autoencoders for Collaborative Filtering

Model	Area Under Curve Score (AUC)	Paper	Year
PNN	0.799	Product-based Neural Networks for User Response Prediction	2016
DeepFM	0.801	DeepFM: A Factorization-Machine based Neural Network for CTR Predicti	2017
AutoInt	0.806	AutoInt: Automatic Feature Interaction Learning via Self-Attentive Neural	2018
Fat-DeepFFM	0.81	FAT-DeepFFM: Field Attentive Deep Field-aware Factorization Machine	2019
DeepLight	0.812	DeepLight: Deep Lightweight Feature Interactions for Accelerating CTR Pre	2020
MaskNet	0.813	MaskNet: Introducing Feature-Wise Multiplication to CTR Ranking Models	2021

Model	Mean-Normalized Human Score	Source	Year
Dueling DQN	591.9	Dueling Network Architectures for Deep Reinforcement Learning	2015
QR-DQN-1	915	Distributional Reinforcement Learning with Quantile Regression	2017
R2D2	3374.31	Recurrent Experience Replay in Distributed Reinforcement Learning	2018
MuZero	4996.2	Mastering Atari, Go, Chess and Shogi by Planning with a Learned Model	2019
GDI-H3 (200M	9620.98	GDI: Rethinking What Makes Reinforcement Learning Different From Supervised Lear	2021

Model	Mean-Normalized Sc	Paper
MuZero	0.64	Procedural Generalization by Planning with Self-Supervised World Models
UCB-DrAC+PLR	0.5	Automatic Data Augmentation for Generalization in Reinforcement Learning
PPO	0.28	Leveraging Procedural Generation to Benchmark Reinforcement Learning

Date	Model	Elo
1984	Novag Super Constellation	1631
1985	Mephisto Amsterdam	1827
1986	Mephisto Amsterdam	1827
1987	Mephisto Dallas	1923
1988	Mephisto MM 4 Turbo Kit	1993
1989	Mephisto Portorose	2027
1990	Mephisto Portorose	2138
1991	Mephisto Vancouver	2127
1992	Chess Machine Schröder 3.0	2174
1993	Mephisto Genius 2.0	2235
1995	MChess Pro 5.0	2306
1996	Rebel 8.0	2337
1997	HIARCS 6.0	2418
1998	Fritz 5.0 PB29%	2460
1999	Chess Tiger 12.0 DOS	2594
2000	Fritz 6.0	2607
2001	Chess Tiger 14.0 CB	2709
2002	Deep Fritz 7.0	2759
2003	Shredder 7.04 UCI	2791
2004	Shredder 8.0 CB	2800
2005	Shredder 9.0 UCI	2808
2006	Rybka 1.2	2902
2007	Rybka 2.3.1 Arena	2935
2008	Deep Rybka 3	3238
2009	Deep Rybka 3	3232
2010	Deep Rybka 3	3227
2011	Deep Rybka 4	3216
2012	Deep Rybka 4 x64	3221
2013	Komodo 5.1 MP x64	3241
2014	Komodo 7.0 MP x64	3295
2015	Stockfish 6 MP x64	3334
2016	Komodo 9.1 MP x64	3366
2017	Komodo 11.01 MP x64	3406
2018	Stockfish 9 MP x64	3502
2019	Stockfish 10 MP x64	3529
2020	Stockfish 12 NNUE MP x64	3573
2021	Lc0 0.26.3 Cuda(67362) 3060Ti	3581

Date	Submitter	Hardware	Training Time	Accelerators (#	Source	Task
12.01.2021	NVIDIA	dgxa100_n540	0.35	4320	ML Training v1.1	Image Classification
06.30.2021	Google	Google tpu-v4-	0.23	3456	ML Training v1.0	Image Classification
07.29.2020	Google	Google TPU v3	0.47	4096	ML Training v0.7	Image Classification
06.10.2019	Google	TPUv3.2048	1.3	1024	ML Training v0.6	Image Classification
12.12.2018	NVIDIA	80x DGX-1	6.2	640	ML Training v0.5	Image Classification
12.01.2021	NVIDIA	dgxa100_n128	0.454	1024	ML Training v1.1	Object Detection (light-weight)
06.30.2021	Google	tpu-v4-4096	0.34	2048	ML Training v1.0	Object Detection (light-weight)
07.29.2020	Google	Google TPU v3	0.46	4096	ML Training v0.7	Object Detection (light-weight)
06.10.2019	Google	TPUv3.2048	1.21	1024	ML Training v0.6	Object Detection (light-weight)
12.12.2018	NVIDIA	8x DGX-2h w/	5.6	64	ML Training v0.5	Object Detection (light-weight)
12.01.2021	NVIDIA	dgxa100_n51_	3.242	408	ML Training v1.1	Object Detection (heavy-weight)
06.30.2021	NVIDIA	dgxa100_n34_	3.95	272	ML Training v1.0	Object Detection (heavy-weight)
07.29.2020	Google	Google TPU v3	8.13	512	ML Training v0.7	Object Detection (heavy-weight)
06.10.2019	NVIDIA	12x DGX-2H	18.47	192	ML Training v0.6	Object Detection (heavy-weight)
12.12.2018	NVIDIA	4x DGX-2h	72.1	64	ML Training v0.5	Object Detection (heavy-weight)
12.01.2021	NVIDIA	dgxa100_n14_	0.63	112	ML Training v1.1	Recommendation
06.30.2021	Google	tpu-v4-256	0.64	128	ML Training v1.0	Recommendation
07.29.2020	Google	TPU	1.21	64	ML Training v0.7	Recommendation
12.01.2021	NVIDIA	dgxa100_n224	15.47	1792	ML Training v1.1	Reinforcement Learning
06.30.2021	NVIDIA	dgxa100_n224	15.53	1792	ML Training v1.0	Reinforcement Learning
07.29.2020	NVIDIA	dgxa100_n224	17.07	1792	ML Training v0.7	Reinforcement Learning
06.10.2019	NVIDIA	3x DGX-1	13.57	24	ML Training v0.6	Reinforcement Learning
12.01.2021	NVIDIA	dgxa100_n540	0.226	4320	ML Training v1.1	Language Processing
06.30.2021	Google	tpu-v4-6912	0.29	3456	ML Training v1.0	Language Processing
07.29.2020	Google	TPU	0.39	4096	ML Training v0.7	Language Processing
12.01.2021	NVIDIA	dgxa100_n192	2.375	1536	ML Training v1.1	Speech recognition
06.30.2021	NVIDIA	dgxa100_n192	2.75	1536	ML Training v1.0	Speech recognition
12.01.2021	Azure	nd96amsr_a1(	1.262	768	ML Training v1.1	Image Segmentation
06.30.2021	NVIDIA	dgxa100_n100	3	800	ML Training v1.0	Image Segmentation

Task	Original Time	State-of-the-Art	Scale of Improvement
Image Classification	6.2	0.23	26.95652174
Segmentation	3	1.26	2.380952381
Reinforcement	13.57	15.47	0.8771816419
Object Detection (heavy-weight)	72.1	3.24	22.25308642
Object Detection (light-weight)	5.6	0.34	16.47058824
Language Processing	0.39	0.23	1.695652174
Recommendation	1.21	0.63	1.920634921
Speech Recognition	2.75	2.38	1.155462185

MLPerf Round	Variable	Number of Accelerators
ML Training v0.5	Mean Accelerators	94.24137931
ML Training v0.5	Maximum Number of Accelerators Used	640
ML Training v0.5	Average Accelerators Used by Top System	256
ML Training v0.6	Mean Accelerators	285.8666667
ML Training v0.6	Maximum Number of Accelerators Used	1536
ML Training v0.6	Average Accelerators Used by Top System	566
ML Training v0.7	Mean Accelerators	484.4507042
ML Training v0.7	Maximum Number of Accelerators Used	4096
ML Training v0.7	Average Accelerators Used by Top System	2442.666667
ML Training v1.0	Mean Accelerators	285.6341463
ML Training v1.0	Maximum Number of Accelerators Used	4096
ML Training v1.0	Average Accelerators Used by Top System	1686
ML Training v1.1	Mean Accelerators	337
ML Training v1.1	Maximum Number of Accelerators Used	4320
ML Training v1.1	Average Accelerators Used by Top System	1785

Cost (USD)	Year	Cost
1112.64	2017	1112.64
12.6	2018	12.6
19	2019	19
7.43	2020	7.43
4.59	2021	4.59

Year	Price (in thousands of U.S. Dollars)
2016	50000
2017	45000
2018	33500
2019	26000
2020	26709.45
2021	22200
2022	12845

Year	Price (in thousands of U.S. Dollars)
2017	42000
2018	26000
2019	26000
2020	25458.9
2021	22600

Arm Name	Date	USD Price	Year
da Vinci Research Kit	05/2016	40000	2016
UR5	09/2016	50000	2016
UR10	09/2016	64740	2016
ABB Yumi	1/2017	56500	2017
Barrett Upper-Extremity Rehabilitatic	01/2017	138000	2017
UR 10	12/2017	39000	2017
UR 10	12/2017	39000	2017
Kinova MOVO Mobile Manipulator (w	12/2017	113100	2017
IRB14000(Yumi)	10/2017	64000	2017
Sawyer	08/2017	31200	2017
Universal Robot	01/2017	13200	2017
ABB	01/2017	22600	2017
KUKA, LBR iiwa 14R820	10/2017	86130	2017
Denso Robots	1/2017	45000	2017
Franka Panda arm	11/2018	24000	2018
Tiago	01/2018	56500	2018
TM5 m-700	01/2018	33500	2018
UR5	08/2018	26000	2018
KUKA iiwa	06/2018	68400	2018
Barrett WAM Arm and BHand	09/2018	200000	2018
Universal Robot, UR-5	11/2018	23490	2018
Kinova Arm Gen3	04/2019	40000	2019
Kinova Arm Gen3	04/2019	40000	2019
Kinova Arm Gen3	04/2019	40000	2019
Panda Erika	1/2019	22600	2019
Kinova	1/2019	22600	2019
Franka	09/2019	25200	2019
UR5	06/2019	29600	2019
UR10	10/2019	37000	2019
Kinova Gen 3	05/2019	42000	2019
FANUC LR Mate 200iD/7L	04/2019	21000	2019
Franka-Emika	8/2019	30000	2019
UR5	06/2019	26000	2019
UR5	06/2019	26000	2019
UR3e	11/2019	22500	2019
UR5	8/2019	18000	2019
UR3e	8/2019	18000	2019
KUKA 6iiwa	8/2019	33900	2019
Easy robotics	1/2019	52500	2019
UR5	1/2019	32640	2019
UR3	1/2019	16320	2019
xARM	1/2019	6800	2019

Fetch	3/2019	100000	2019
KUKA LBR IIWA 14 R820	03/2019	10530	2019
Franka Emika Panda	03/2019	27300	2019
Franka Emika Panda	03/2019	27300	2019
Kinova Gen3 w/ Robotiq Gripper + Sp	04/2019	46800	2019
Franka Panda Emika	07/2019	21470	2019
Universal	01/2019	11700	2019
Franka Panda	04/2019	25000	2019
UR5	09/2019	28800	2019
ABB	10/2019	15000	2019
ABB	10/2019	20000	2019
ABB	10/2019	20000	2019
Franka Panda	10/2019	24000	2019
ITRI Robot	01/2019	30000	2019
xArm7 + Gripper + Tool	05/2020	12054	2020
UR3	01/2020	16950	2020
ABB Delta	01/2020	51800	2020
Kuka LBR iiwa R820	09/2020	75000	2020
Kinova Gen3	05/2020	30400	2020
Franka Emika Panda	05/2020	23900	2020
Franka Emika Panda	05/2020	23900	2020
xArm 7	10/2020	10140	2020
Kassow	12/2020	7500	2020
FRANKA emika	5/2020	18000	2020
Franka Emika	02/2020	25458.9	2020
Kinova Gen3 w/ Robotiq Gripper	09/2020	35100	2020
KUKA LBR	10/2020	65000	2020
FRANKA	09/2020	30000	2020
UR16E	10/2020	4483.84	2020
Kinova Jaco2	10/2020	20800	2020
Franka	01/2020	24420	2020
Kuka LBR iiwa	04/2020	45200	2020
Sigma7	04/2020	79100	2020
UR5e	06/2020	27960	2020
UR5e	06/2020	27960	2020
Kinova Gen3	08/2020	31900	2020
Flexiv	09/2021	50000	2021
ABB SCARA	02/2021	22200	2021
UR10e	03/2021	44400	2021
UR5	08/2021	22600	2021
UR5	09/2021	22600	2021
Kinova	5/2021	32700	2021
Franka Emika Panda	06/2021	28000	2021

Franka Emika Panda	10/2021	24500	2021
Franka Emika Panda	10/2021	24500	2021
Wlkata Mirobot	10/2021	1499	2021
Franka Emika	12/2021	24750	2021
UR5	10/2021	18750	2021
KUKA KR4	12/2021	16500	2021
FRANKA emika	12/2021	18000	2021
Kassaw	1/2021	7500	2021
Solo8 quadruped	08/2021	10000	2021
Kinova Gen3 7DoF	07/2021	35000	2021
Kinova Gen3 6DoF	10/2021	32000	2021
WidowX 250	07/2021	2600	2021
Touch X	08/2021	7910	2021
3D Systems Touch	12/2021	2121.6	2021
Kinvoe Gen3 Lite	5/2021	10000	2021
Trossen Robotics Widowx 250	06/2021	2992	2021
Rainbow Robotics RB5	09/2021	19320	2021
Franka Emika	01/2021	17940	2021
Rizon4KG	01/2021	4800	2021
UR10	01/2021	51462.4	2021
UR10	01/2021	51462.4	2021
UR5e	04/2021	29000	2021
AUBO-I5	11/2021	10880	2021
UR5e	08/2021	29500	2021
UR3	07/2021	22560	2021
Meca500	05/2021	15000	2021
UR3	01/2022	14690	2022
Stanley quadrupred	01/2022	11000	2022
HEBI X-Series 7 DoF	1/2022	34452.6	2022
Tiago++	1/2022	164346	2022
Unitree Z1 Arm	02/2022	10000	2022
Niryo	01/2022	7000	2022

Arm Name	Date	USD Price	Year
Universal Robot	01/2017	13200	2017
Kinova MOVO Mobile Manipulator (w/ t	12/2017	113100	2017
UR 10	12/2017	39000	2017
UR 10	12/2017	39000	2017
Sawyer	08/2017	31200	2017
IRB14000(Yumi)	10/2017	64000	2017
ABB Yumi	1/2017	56500	2017
KUKA, LBR iiwa 14R820	10/2017	86130	2017
ABB	01/2017	22600	2017
Denso Robots	1/2017	45000	2017
TM5 m-700	01/2018	33500	2018
KUKA iiwa	06/2018	68400	2018
Franka Panda arm	11/2018	24000	2018
UR5	08/2018	26000	2018
Universal Robot, UR-5	11/2018	23490	2018
Franka Panda	04/2019	25000	2019
KUKA LBR IIWA 14 R820	03/2019	10530	2019
Franka Emika Panda	03/2019	27300	2019
Franka Emika Panda	03/2019	27300	2019
Kinova Gen3 w/ Robotiq Gripper + Spare	04/2019	46800	2019
UR3e	11/2019	22500	2019
Kinova Gen 3	05/2019	42000	2019
FANUC LR Mate 200iD/7L	04/2019	21000	2019
Fetch	3/2019	100000	2019
Franka Panda Emika	07/2019	21470	2019
UR5	1/2019	32640	2019
UR3	1/2019	16320	2019
xARM	1/2019	6800	2019
Franka-Emika	8/2019	30000	2019
Panda Erika	1/2019	22600	2019
Kinova	1/2019	22600	2019
UR5	06/2019	29600	2019
UR10	10/2019	37000	2019
Kinova Arm Gen3	04/2019	40000	2019
Kinova Arm Gen3	04/2019	40000	2019
Kinova Arm Gen3	04/2019	40000	2019
Franka	09/2019	25200	2019
UR5	06/2019	26000	2019
UR5	06/2019	26000	2019
KUKA 6iiwa	8/2019	33900	2019
UR3e	8/2019	18000	2019
UR5	8/2019	18000	2019

Franka Panda	10/2019	24000	2019
Universal	01/2019	11700	2019
UR5	09/2019	28800	2019
Kinova Gen3 w/ Robotiq Gripper	09/2020	35100	2020
Kassow	12/2020	7500	2020
Sigma7	04/2020	79100	2020
Kuka LBR iiwa	04/2020	45200	2020
Franka	01/2020	24420	2020
FRANKA	09/2020	30000	2020
KUKA LBR	10/2020	65000	2020
Kinova Jaco2	10/2020	20800	2020
Franka Emika	02/2020	25458.9	2020
UR3	01/2020	16950	2020
xArm 7	10/2020	10140	2020
UR5e	06/2020	27960	2020
UR5e	06/2020	27960	2020
Kinova Gen3	08/2020	31900	2020
Kinova Gen3	05/2020	30400	2020
Kuka LBR iiwa R820	09/2020	75000	2020
FRANKA emika	5/2020	18000	2020
xArm7 + Gripper + Tool	05/2020	12054	2020
UR16E	10/2020	4483.84	2020
Franka Emika Panda	05/2020	23900	2020
Franka Emika Panda	05/2020	23900	2020
UR10	01/2021	51462.4	2021
UR10	01/2021	51462.4	2021
Franka Emika	01/2021	17940	2021
UR5	10/2021	18750	2021
KUKA KR4	12/2021	16500	2021
Franka Emika	12/2021	24750	2021
Kinvoe Gen3 Lite	5/2021	10000	2021
Trossen Robotics Widowx 250	06/2021	2992	2021
UR10e	03/2021	44400	2021
UR5	08/2021	22600	2021
UR5	09/2021	22600	2021
AUBO-I5	11/2021	10880	2021
Meca500	05/2021	15000	2021
Franka Emika Panda	10/2021	24500	2021
Franka Emika Panda	10/2021	24500	2021
Wlkata Mirobot	10/2021	1499	2021
Rainbow Robotics RB5	09/2021	19320	2021
Flexiv	09/2021	50000	2021
UR3	07/2021	22560	2021

Kinova	5/2021	32700	2021
Franka Emika Panda	06/2021	28000	2021
FRANKA emika	12/2021	18000	2021
Kassaw	1/2021	7500	2021
UR5e	04/2021	29000	2021
Rizon4KG	01/2021	4800	2021
Kinova Gen3 7DoF	07/2021	35000	2021
Kinova Gen3 6DoF	10/2021	32000	2021
WidowX 250	07/2021	2600	2021
UR5e	08/2021	29500	2021

Skill	% of Respondents
Deep Learning	0.67
Reinforcement Learning	0.46