id	Author	paper	DOI	Task	Mode	Application	Summary
28	Sadanandan SK et al. (2016)	Feature augmented deep neural networks for segmentation of cells	http://doi.org/10.1007/978-3-319-46604-0_17	S	BF, FL	CL	**Improved segmentation using hessian (2nd order derivative) and wavelet filtering of the images with raw inputs to a CNN model.**
35	Su H et al. (2015)	Robust Cell Detection and Segmentation in Histopathological Images Using Sparse Reconstruction and Stacked Denoising Autoencoders	https://doi.org/10.1007/978-3-319-24574-4_46	S	BF	T	**Improved brain tumor and lung cancer diagnosis by segmenting and detecting cells using a stacked denoising autoencoder.**
36	Rivenson Y et al. (2017)	Deep learning microscopy: Enhancing resolution, field-of- view and depth-of-field of optical microscopy images using neural networks	http://doi.org/10.1364/CLEO_AT.2018.AM1J.5	P	BF	T	**Enhanced optical microscopy image resolution, depth of field, and field of view without any imaging system modification using a CNN model.**
37	Rivenson Y et al. (2018)	Deep Learning Enhanced Mobile-Phone Microscopy	http://doi.org/10.1021/acsphotonics.8b00146	P	BF	T	**Improved mobile phone-based optical image reconstruction by removing distortions and denoising using the CNN model.**
38	Weigert M et al. (2017)	Content-Aware Image Restoration: Pushing the Limits of Fluorescence Microscopy	https://doi.org/10.1101/236463	P	FL	CL	**Image restoration of several different cells using a U-Net model.**
39	Wang H et al. (2018)	Deep learning achieves super-resolution in fluorescence microscopy	https://doi.org/10.1101/309641	P	FL	SB	**Superresolution reconstruction of low-resolution images into high-resolution images using GAN model.**
40	Ouyang W et al. (2018)	Deep learning massively accelerates super-resolution localization microscopy	http://doi.org/10.1038/nbt.4106	P	FL	SB	**Super-resolution views reconstruction from sparse rapidly acquired localization images and/or widefield images using a CNN model.**
41	Nehme E et al. (2018)	Deep-STORM: Super-resolution single-molecule microscopy by deep learning	http://doi.org/10.1364/OPTICA.5.000458	P	FL	SB	**Ultrafast and Improved superresolution image reconstruction from fluorescent molecules for localization microscopy using a CNN model.**
44	Tellez D et al. (2018)	H and E stain augmentation improves generalization of convolutional networks for histopathological mitosis detection	http://doi.org/10.1117/12.2293048	C,P	BF	T	**Improved classification of HE histological tissue sections by augmenting the image data for a CNN classifier.**
47	Ciresan D et al. (2012)	Deep Neural Networks Segment Neuronal Membranes in Electron Microscopy Images	https://papers.nips.cc/paper/4741-deep-neural-networks-segment-neuronalmembranes-in-electron-microscopy-images	S	EM	CL,SB	**Automated segmentation of neuronal structures in stacks of EM images to map 3D brain structures and connectivity using a pixel-wise CNN classifier.**
48	Ronneberger O et al. (2015)	U-Net: Convolutional Networks for Biomedical Image Segmentation	https://doi.org/10.1007/978-3-319-24574-4_28	S	EM	T,CL	**Improved segmentation of neuronal structures with a U-Net neural network**
49	Çiçek Ö et al. (2016)	3D U-Net: Learning Dense Volumetric Segmentation from Sparse Annotation	https://doi.org/10.1007/978-3-319-46723-8_49	S	FL	SB	**Automated volumetric segmentation using a CNN model to learn from sparsely annotated volumetric images.**
50	Sadanandan K et al. (2017)	Spheroid Segmentation Using Multiscale Deep Adversarial Networks	https://doi.org/10.1109/iccvw.2017.11	S	BF	CL	**Improved segmentation of different types of spheroids cells in bright-field microscopy images using a new multiscale GAN model.**
51	Arbelle A et al. (2017)	Microscopy cell segmentation via adversarial neural networks	https://doi.org/10.1109/isbi.2018.8363657	S	FL	CL	**Automated cell segmentation with limited amount of annotated data using Generative adversarial neural network (GAN) model.**
54	Haering M et al. (2018)	Automated Segmentation of Epithelial Tissue Using Cycle-Consistent Generative Adversarial Networks	https://doi.org/10.1101/311373	S	BF	T	**Automated segmentation using cycle consistent GAN's trained with weakly prepared image - mask pairs.**
58	Hung J et al. (2017)	Applying Faster R-CNN for Object Detection on Malaria Images	http://doi.ieeecomputersociety.org/10.1109/CVPRW.2017.112	C	BF	CL	**Identification and recognition of malaria-infected blood cells stages in brightfield microscopy images using a CNN model.**
59	Ciresan C et al. (2013)	Mitosis Detection in Breast Cancer Histology Images with Deep Neural Networks	https://doi.org/10.1007/978-3-642-40763-5_51	C	BF	T	**Detection of the mitotic tissue in breast histology images using a deep max-pooling pixel-wise CNN classifier.**
61	Mao Y et al. (2015)	A hierarchical convolutional neural network for mitosis detection in phase-contrast microscopy images	http://doi.org/10.1007/978-3-319-46723-8_79	C	BF	CL	**Automated mitosis event detection in time-lapse phase contrast microscopy using Hierarchical CNN model.**
62	Durant J et al. (2016)	Very Deep Convolutional Neural Networks for Morphologic Classification of Erythrocytes	https://doi.org/10.1373/clinchem.2017.276345	C	BF	CL	**Performance evaluation of morphological erythrocytes classification using a CNN classifier.**
63	Fleury D et al. (2018)	Implementation of Regional-CNN and SSD Machine Learning Object Detection Architectures for the Real Time Analysis of Blood Borne Pathogens in Dark Field Microscopy	https://doi.org/10.20944/preprints201807.0119.v1	C	BF	CL	**Comparative investigation of the disparities between Single Shot Detector (SSD), Mobilenet V1 and the Faster R-CNN Inception V2 model.**

67	Wei L et al. (2018)	Neural network control of focal position during time-lapse microscopy of cells	http://doi.org/10.1038/s41598-018-25458-w	P	BF	CLLLLLLLL	**Autofocusing of bright-field and phase-contrast microscopy using a CNN model.**
70	Campanella G et al.	Terabyte-scale Deep Multiple Instance Learning for Classification and Localization in Pathology	https://arxiv.org/abs/1805.06983	C	BF	T	**Improved prostate cancer diagnosis by classifying digital tissue slides on a large scale using deep multiple instance learning-based CNN framework.**
72	Kensert A et al. (2018)	Transfer learning with deep convolutional neural networks for classifying cellular morphological changes	https://doi.org/10.1101/345728	C	FL	CL	**Prediction of cellular phenotypes mechanisms in response to chemical perturbations using a pre-trained CNN classifier.**
73	Pawlowski N et al.	Automating Morphological Profiling with Generic Deep Convolutional Networks	https://doi.org/10.1101%2F085118	C	FL	CL	**Automated feature extraction for morphological profiling using a pre-trained CNN classifier.**
77	Yu X et al. (2018)	Classify epithelium-stroma in histopathological images based on deep transferable network	http://doi.org/10.1111/jmi.12705	C	BF	T	**Unsupervised domain adaptation for epithelium-stroma classification using a pre-trained CNN classifier**
78	Eulenberg P et al. (2017)	Reconstructing cell cycle and disease progression using deep learning	https://doi.org/10.1038/s41467-017-00623-3	C, P	FL	CL	**Automated reconstruction of biological processes from raw images by combining non-linear dimension reduction technique with a CNN model.**
79	Doan M et al. (2018)	Label-free assessment of red blood cell storage lesions by deep learning	https://doi.org/10.1101/256180	C	BF	CL	**Automated red blood cells morphologies characterization using a CNN classifier for label-free imaging flow cytometry.**
80	Dürr O et al. (2016)	Single-Cell Phenotype Classification Using Deep Convolutional Neural Networks	https://doi.org/10.1177/1087057116631284	C	FL	CL	**High-content screening–based phenotype classification using CNN classifiers.**
81	Pärnamaa T et al. (2017)	Accurate classification of protein subcellular localization from high-throughput microscopy images using deep learning	http://doi.org/10.1534/g3.116.033654	C	FL	SB	**Automated detection of the fluorescently-tagged protein cellular compartment in yeast cells using CNN classifier.**
82	Kraus Z et al. (2017)	Automated analysis of high-content microscopy data with deep learning	https://doi.org/10.15252/msb.20177551	C	FL	SB	**Automated classification and localization of protein subcellular structures in yeast cell microscopy images using a localize CNN.**
83	Sommer C et al. (2017)	A Deep Learning And Novelty Detection Framework For Rapid Phenotyping In High-Content Screening	https://doi.org/10.1101/134627	C	FL	CL	**Creation of a deep learning pipeline for analyzing high-content screening data.**
84	Young H et al. (2017)	Real-time Image Processing for Microscopy-based Label-free Imaging Flow Cytometry in a Microfluidic Chip	http://doi.org/10.1038/s41598-017-11534-0	C	FL	CL	**Automated detection of objects in high-throughput microscopy-based label-free IFC in a microfluidic chip using a CNN classifier.**
87	Zhang L et al. (2017)	DeepPap: Deep Convolutional Networks for Cervical Cell Classification.	https://doi.org/10.1109/JBHI.2017.2705583	C	BF	CL	**Improved cervical cell classification using a pre-trained CNN classifier.**
88	Song Y et al. (2016)	Accurate Cervical Cell Segmentation from Overlapping Clumps in Pap Smear Images	https://doi.org/10.1109/tmi.2016.2606380	S	BF	CL	**Automated pre-cancer identification by improved segmentation of cervical cells using a multi-scale CNN for encoding distinct cell appearances.**
90	Cruz-Roa A et al. (2017)	High-throughput adaptive sampling for whole-slide histopathology image analysis (HASHI) via convolutional neural networks: Application to invasive breast cancer detection	https://doi.org/10.1371/journal.pone.0196828	C	BF	T	**Improved invasive breast cancer tissues detection on whole-slide images by combining adaptive sampling method with a CNN classifier.**
91	Litjens G et al. (2016	Deep learning as a tool for increased accuracy and efficiency of histopathological diagnosis	https://doi.org/10.1038/srep26286	C	BF	T	**Improved prostate cancer identification and breast cancer metastasis detection in sentinel lymph nodes using CNN-based classifier.**
92	Veta M et al. (2018)	Predicting breast tumor proliferation from whole-slide images: the TUPAC16 challenge.	https://arxiv.org/abs/1807.08284	C, S	BF	T	**Presents the broad adoption of CNN models for breast cancer tumor proliferation challenge.**
93	Gecer B et al. (2018)	Detection and classification of cancer in whole slide breast histopathology images using deep convolutional networks	https://doi.org/10.1016/j.patcog.2018.07.022	C	BF	T	**Automated classification of whole slide images (WSI) of breast biopsies into five diagnostic categories using a CNN classifier.**
94	Bejnordi E et al. (2017)	Context-aware stacked convolutional neural networks for classification of breast carcinomas in whole-slide histopathology images	https://doi.org/10.1117/1.jmi.4.4.044504	C	BF	T	**Breast cancer tissue classification by stacking two CNN's for improved feature learning of cellular details and global tissue structures.**
95	Bejnordi B et al. (2018)	Using deep convolutional neural networks to identify and classify tumor-associated stroma in diagnostic breast biopsies	http://doi.org/10.1038/s41379-018-0073-z	C	BF	T	**Mammographic abnormalities identification in digital images of benign and malignant HE-stained tissue sections using CNN models.**
96	Bychkov D et al. (2018)	Deep learning based tissue analysis predicts outcome in colorectal cancer	https://doi.org/10.1038/s41598-018-21758-3	C	BF	T	**Colorectal cancer patient outcome prediction from the tumor tissue images using CNN- and RNN-based classifiers.**

98	Qaiser T et al. (2018)	HER2 challenge contest: a detailed assessment of automated HER2 scoring algorithms in whole slide images of breast cancer tissues	https://doi.org/10.1111/his.13333	P,C	BF	T	**Benchmark for performance comparison of invasive breast carcinoma tissues stained with both HE and IHC for HER2 scoring using CNN models.**
99	Sirinukunwattana K et al. (2017)	Gland segmentation in colon histology images: The glas challenge contest	https://doi.org/10.1016/j.media.2016.08.008	S	BF	T	**A comprehensive overview of methods applied for segmenting the gland in colon histology images challenge contest.**
100	Akram SU et al. (2017)	Cell segmentation proposal network for microscopy image analysis	http://doi.org/10.1007/978-3-319-46976-8_3	C, S	FL,BF	CL	**Automated detection and segmentation for tracking cells in time-lapse images using regional CNN model.**
101	Wang M et al. (2018)	Multicell migration tracking within angiogenic networks by deep learning-based segmentation and augmented Bayesian filtering	http://doi.org/10.1117/1.JMI.5.2.024005	S	BF	CL	**Automated cell detection by combining CNN with backward Kalman filtering for tracking.**
102	Phan H et al. (2017)	An unsupervised long short-term memory neural network for event detection in cell videos	https://arxiv.org/abs/1709.02081	C	BF	CL	**Automated unsupervised cell event detection and classification in cell video sequences using convolutional recurrent neural networks.**
104	Kimmel J et al. (2018)	Deep convolutional and recurrent neural networks for cell motility discrimination and prediction	https://doi.org/10.1101/159202	C	FL, BF	CL	**Classification of different motility behaviors of cells in cultures using 3D CNN and RNN along with autoencoders for unsupervised learning.**
105	Wang C et al. (2017)	vU-net: accurate cell edge segmentation in time-lapse fluorescence live cell images based on convolutional neural network	https://doi.org/10.1101/191858	S	FL	CL	**Reconstruction of cell edges in time-lapse imagery by integrating a pre-trained encoder and a U-Net model.**
106	Su Y-T et al. (2017)	Spatiotemporal Joint Mitosis Detection Using CNN-LSTM Network in Time-Lapse Phase Contrast Microscopy Images	http://doi.org/10.1109/ACCESS.2017.2745544	C	BF	CL	**Detection of mitotic events in patch sequences by combining CNN and RNN.**
107	Tellez D et al. (2018)	Whole-Slide Mitosis Detection in H&E Breast Histology Using PHH3 as a Reference to Train Distilled Stain-Invariant Convolutional Networks	https://doi.org/10.1109/tmi.2018.2820199	C	BF	T	**Automated detection of mitotic figures in breast cancer tissue sections using a CNN classifier.**
108	Sadanandan K et al. (2017)	Automated Training of Deep Convolutional Neural Networks for Cell Segmentation	https://doi.org/10.1038/s41598-017-07599-6	S	FL	CL	**Automated segmentation of cells with training done with flurescent proteins enabled over the last frame.**
121	Ishaq O et al. (2017)	Deep Fish: Deep Learningâ€"Based Classification of Zebrafish Deformation for High-Throughput Screening	https://doi.org/10.1177/1087057116667894	C	BF	O	**Improved high-throughput classification of whole-body zebrafish deformations in multi-fish microwell plates using a CNN classifier.**
126	Mobadersany P et al. (2018)	Predicting cancer outcomes from histology and genomics using convolutional networks	https://doi.org/10.1101/198010	C	BF	T	**Automated patient outcome prediction from digital pathology images by combining traditional survival models with a CNN classifier.**
128	Turkki R et al. (2016)	Antibody-supervised deep learning for quantification of tumor-infiltrating immune cells in hematoxylin and eosin stained breast cancer samples	https://doi.org/10.4103/2153-3539.189703	C	BF	T	**Improved quantification of immune cell-rich areas in HE-stained image samples using a CNN classifier.**
131	Xie Y et al. (2015)	Deep Voting and Structured Regression for Microscopy Image Analysis	http://doi.org/10.1016/B978-0-12-810408-8.00009-2	C	FL	CL	**Automated nucleus centroids localization for voting confidence of overlapping cells using a CNN-based structured regression model.**
138	Arteta C et al.	HTX: a tool for the exploration and visualization of high-throughput image assays	https://doi.org/10.1101/204016	P	BF, FL	T,CL,SB	**Interactive visualizing of image-based assays based on visual similarities between the samples for improved exploration of large microscopy datasets.**
139	Arvaniti E et al.	Automated Gleason grading of prostate cancer tissue microarrays via deep learning	https://doi.org/10.1038/s41598-018-30535-1	C	BF	T	**Automated Gleason grading of prostate cancer tissue microarrays with H&E staining using a patch-based CNN classifier.**
140	Aubreville M et al.	Deep learning-based detection of motion artifacts in probe-based confocal laser endomicroscopy images	http://doi.org/10.1007/s11548-018-1836-1	C	BF	T	**Motion artifacts detection of epithelial tissue from the oral cavity and the vocal folds by fine-tuning a pre-trained CNN classifier.**
141	Awan R et al.	Context-Aware Learning Using Transferable Features for Classification of Breast Cancer Histology Images	https://doi.org/10.1007/978-3-319-93000-8_89	C	BF	T	**Breast cancer tissue classification using the encoded representation of a patch-based CNN within an SVM classifier.**
142	Bajic B et al.	Denoising of short exposure transmission electron microscopy images for ultrastructural enhancement	http://doi.org/10.1109/ISBI.2018.8363721	P	EM	SB	**Automated denoising of short-exposure high-resolution TEM images of cilia using a multi-stream CNN model.**
143	Baltissen D et al.	Comparison of segmentation methods for tissue microscopy images of glioblastoma cells	http://doi.org/10.1109/ISBI.2018.8363601	S	FL	CL	**Automated glioblastoma cell nuclei segmentation in tissue microscopy images using atrous spatial pyramid pooling (ASPP) for a CNN model.**
144	Bekkers EJ et al.	Roto-Translation Covariant Convolutional Networks for Medical Image Analysis	http://arxiv.org/abs/1804.03393v3	S	EM, FL	T,CL	**Improved segmentation in histopathology, retinal imaging, and electron microscopy images using a CNN model trained without any augmentations.**

145	Bentaieb A et al.	Multi-loss convolutional networks for gland analysis in microscopy	http://doi.org/10.1109/ISBI.2016.7493349	C, S	BF	T,CL	**Colon adenocarcinomas segmentation and classification using a single CNN framework for automated cancer tissue analysis.**
146	Boyd N et al.	DeepLoco: Fast 3D Localization Microscopy Using Neural Networks	https://doi.org/10.1101/267096	C	FL	SB	**Automated estimation of fluorophores number and locations in a single frame of super-resolution microscopy using a CNN model.**
147	Bozkurt A et al.	A Multiresolution Convolutional Neural Network with Partial Label Training for Annotating Reflectance Confocal Microscopy Images of Skin	http://arxiv.org/abs/1802.02213v2	S	BF	T	**Automated annotations of morphological patterns using U-Net architecture for improved skin cancer diagnosis in reflectance confocal microscopy.**
148	Bozkurt A et al.	Delineation of Skin Strata in Reflectance Confocal Microscopy Images with Recurrent Convolutional Networks	http://doi.org/10.1109/CVPRW.2017.108	C	BF	T	**Skin strata tissue classification in RCM image sequences using a recurrent CNN.**
149	Buggenthin F et al.	Prospective identification of hematopoietic lineage choice by deep learning	http://doi.org/10.1038/nmeth.4182	C	BF	CL	**Hematopoietic cell lineage choice prediction using a patch-based CNN classifier and a recurrent neural network (RNN) for cellular movement.**
150	Buniatyan D et al.	Deep Learning Improves Template Matching by Normalized Cross Correlation	http://arxiv.org/abs/1705.08593v1	C	EM		**Improved robustness of template matching by preprocessing images using a siamese CNN trained to maximize the contrast between NCC values.**
151	Caicedo C et al.	Weakly supervised learning of single-cell feature embeddings	https://doi.org/10.1101/293431	P	FL	CL	**Automated downstream single cell analysis for replicating the treatment condition using a weakly supervised CNN model.**
152	Caicedo JC et al.	Evaluation of Deep Learning Strategies for Nucleus Segmentation in Fluorescence Images	https://doi.org/10.1101/335216	S	FL	CL	**Improved segmentation of cell nuclei in a large manually annotated dataset using a U-Net architecture.**
153	Calderon CP et al.	Deep Convolutional Neural Network Analysis of Flow Imaging Microscopy Data to Classify Subsivible Particles in Protein Formulations	http://doi.org/10.1016/j.xphs.2017.12.008	C	BF	SB	**Process conditions prediction for therapeutic protein formulations by encoding the morphological features of subcellular structures using a CNN.**
154	Cao G et al.	A hybrid Cnn-Rf method for electron microscopy images segmentation	http://doi.org/10.4172/1662-100X.1000114	S	EM	CL	**Automated segmentation of neuronal structures for 3d brain tissue reconstruction by combining hybrid CNN with Random Forest classifier.**
155	Carneiro G et al.	Weakly-supervised structured output learning with flexible and latent graphs using high-order loss functions	http://doi.org/10.1109/ICCV.2015.81	P	BF, FL	T	**Estimation of the number and proportion of classes of microcirculatory supply units (MCSU) using a weakly annotated dataset for a CNN model.**
156	Carneiro G et al.	Automatic Quantification of Tumour Hypoxia from Multi-Modal Microscopy Images Using Weakly-Supervised Learning Methods	http://doi.org/10.1109/TMI.2017.2677479	P	BF,FL	T	**Improved validation of hypoxia-modified therapies to measure tumor hypoxia by classifying annotations using a weakly-supervised CNN model.**
157	Castilla C et al.	Segmentation of actin-stained 3D fluorescent cells with filopodial protrusions using convolutional neural networks	http://doi.org/10.1109/ISBI.2018.8363605	S	FL	CL	**Automated segmentation of actin-stained cells in volumetric confocal microscopy images using a CNN model.**
158	Chang Y-H et al.	Human induced pluripotent stem cell region recognition in microscopy images using Convolutional Neural Networks	http://doi.org/10.1109/EMBC.2017.8037747	C	BF	CL	**Automated classification and recognition of induced pluripotent stem (iPS) cell regions behaviour using a CNN for aiding iPS cell culture.**
159	Chen L et al.	Deep Learning in Label-free Cell Classification	https://doi.org/10.1038/srep21471	C	BF	CL	**Improved phenotypic diagnosis by label-free cell classification in high-throughput quantitative imaging using a CNN classifier.**
160	Chen J et al.	Neuron segmentation using deep complete bipartite networks	http://doi.org/10.1007/978-3-319-66185-8_3	S	FL	CL	**Automatic segmentation of neuronal cells using a instance-wise annotations for a pixel-wise complete bipartite networks (CB-Net) model.**
161	Cheng H et al.	Deep-learning-assisted Volume Visualization	http://doi.org/10.1109/TVCG.2018.2796085	P	EM	SB	**Improved high-dimensional feature interactions for volume visualization based on the high-dimensional CNN features spectral methods.**
162	Cheng H-C et al.	Volume segmentation using convolutional neural networks with limited training data	http://doi.org/10.1109/ICIP.2017.8296349	S	EM	SB	**Improved segmentation in volumetric microscopy images using factorized convolutions and online feature-level augmentations for a 3D CNN model.**
163	Chowdhury A et al.	A computational study on convolutional feature combination strategies for grade classification in colon cancer using fluorescence microscopy data	http://doi.org/10.1117/12.2255687	C	BF	T	**Automated colon cancer grade classification using the encoded representations of a pre-trained CNN within a linear SVM classifier.**

164	Chowdhury A et al.	Blood vessel characterization using virtual 3D models and convolutional neural networks in fluorescence microscopy	http://doi.org/10.1109/ISBI.2017.7950599	C	FL	T	**Automated characterization of microvessel morphology in micrographs of brain tissue sections using a CNN classifier for facile quantitative analysis.**
165	Chowdhury A et al.	Active deep learning reduces annotation burden in automatic cell segmentation	https://doi.org/10.1101/211060	S	FL, BF	CL	**Automated Cell segmentation using active learning for training a CNN model to reduce annotation burden.**
166	Christiansen EM et al.	In Silico Labeling: Predicting Fluorescent Labels in Unlabeled Images	http://doi.org/10.1016/j.cell.2018.03.040	C	BF	SB	**Multiple fluorescent labels prediction from transmitted-light images of unlabeled fixed or live biological cells using a CNN-based in silico labeling (ISL).**
167	Coudray N et al.	Classification and Mutation Prediction from Non-Small Cell Lung Cancer Histopathology Images using Deep Learning	https://doi.org/10.1101/197574	C	BF	T	**Classification of the whole-slide lung cell tissue images and prediction of mutated genes in lung adenocarcinoma using CNN-based classifiers.**
168	Cruz-Roa A et al.	Accurate and reproducible invasive breast cancer detection in whole-slide images: A Deep Learning approach for quantifying tumor extent	https://doi.org/10.1038/srep46450	C	BF	T	**Detection of invasive ductal breast carcinoma tissue images using a CNN classifier for automated tumor extent assessment.**
169	Delahunt CB et al.	Automated microscopy and machine learning for expert-level malaria field diagnosis	http://doi.org/10.1109/GHTC.2015.7344002	C, P	BF	T	**Low-cost automated digital microscope for improved detection of malaria infectious diseases using CNN classifier.**
170	Delas Peñas K et al.	Analysis of Convolutional Neural Networks and Shape Features for Detection and Identification of Malaria Parasites on Thin Blood Smears	http://doi.org/10.1007/978-3-319-75420-8_45	C	BF	T	**Improved malaria diagnosis using shape features with a CNN-based classifier.**
171	Deng F et al.	Rich feature hierarchies for cell detecting under phase contrast microscopy images	http://doi.org/10.1109/ICICIP.2015.7388195	C	BF	T	**Automated detection of cells in phase contrast microscopy images using modified region-based CNN classifier.**
172	Diederich B et al.	Using machine-learning to optimize phase contrast in a low-cost cellphone microscope	http://doi.org/10.1371/journal.pone.0192937	P	BF	T	**Real-time applications for a cellphone microscope to learn a relationship between samples and its optimal light source shapes by a CNN model.**
173	Dong B et al.	Deep learning for automatic cell detection in wide-field microscopy zebrafish images	http://doi.org/10.1109/ISBI.2015.7163986	C	BF	CL	**Automated detection of tyrosine hydroxylase-containing cells in larval zebrafish brain wide-field microscopy images using a CNN classifier.**
174	Dorkenwald S et al.	Automated synaptic connectivity inference for volume electron microscopy	http://doi.org/10.1038/nmeth.4206	C	EM	CL,SB	**Automated identification of different cell types to infer a richly annotated synaptic connectivity by combining CNN and random forest classifier.**
175	Drozdzal M et al.	Learning normalized inputs for iterative estimation in medical image segmentation	http://doi.org/10.1016/j.media.2017.11.005	S	BF	SB	**Automated workflow for segmentation by combing fully CNN with fully convolutional residual networks (FC-ResNets).**
176	Fabijańska A et al.	Segmentation of corneal endothelium images using a U-Net-based convolutional neural network	http://doi.org/10.1016/j.artmed.2018.04.004	S	BF	O	**Improved diagnosis of corneal endothelium by analyzing the size and shape of the endothelial cells in specular microscopy images using a CNN model.**
177	Fakhry A et al.	Residual Deconvolutional Networks for Brain Electron Microscopy Image Segmentation	http://doi.org/10.1109/TMI.2016.2613019	S	EM	T	**Improved segmentation using a multi-stream residual CNN that capture full-resolution features and contextual information of EM images.**
178	Fan M et al.	Global probabilistic models for enhancing segmentation with convolutional networks	http://doi.org/10.1109/ISBI.2018.8363794	S	FL	CL	**Efficient cell segmentations by enforcing prior shape constraints through combined global probabilistic model and a CNN model.**
179	Fredericksen MA et al.	Three-dimensional visualization and a deep-learning model reveal complex fungal parasite networks in behaviorally manipulated ants	http://doi.org/10.1073/pnas.1711673114	S	EM	CL	**Identification of a microbial parasite adaptation in the body of its coevolved and manipulated host using CNN models.**
180	Fu C et al.	Three Dimensional Fluorescence Microscopy Image Synthesis and Segmentation	http://arxiv.org/abs/1801.07198v2	S	FL	CL	**Improved characterization and analysis of 3D microscopy images by nuclei segmentation using spatially constrained cycle-consistent GAN model.**
181	Fu C et al.	Nuclei segmentation of fluorescence microscopy images using convolutional neural networks	http://doi.org/10.1109/ISBI.2017.7950617	S	FL	CL,T	**Automated segmentation and counting of the nucleus in volumetric images using a CNN model and a watershed technique.**
182	Funke J et al.	Large Scale Image Segmentation with Structured Loss based Deep Learning for Connectome Reconstruction	http://doi.org/10.1109/TPAMI.2018.2835450	S	EM	T	**Automated prediction of affinities between voxels, followed by iterative region agglomeration using a 3D U-Net architecture.**

183	Galal S et al.	Candy Cane: Breast Cancer Pixel-Wise Labeling with Fully Convolutional Densenets	http://doi.org/10.1007/978-3-319-93000-8_93	S, C	BF,FL	T,CL	**Automated pixel-wise labeling of whole-slide images into normal tissue, benign lesion, in situ carcinoma and invasive carcinoma using a CNN model**
184	Godinez WJ et al.	A multi-scale convolutional neural network for phenotyping high-content cellular images	http://doi.org/10.1093/bioinformatics/btx069	C	FL	CL	**Automated classification of cells into phenotypes using only the images' pixel intensity values for a multi-scale CNN classifier.**
185	Goldsborough P et al.	CytoGAN: Generative Modeling of Cell Images	https://doi.org/10.1101/227645	C	FL	CL	**Morphological profiling of human cultured cells in fluorescence microscopy images using GAN model.**
186	Goltsev Y et al.	Deep profiling of mouse splenic architecture with CODEX multiplexed imaging.	https://doi.org/10.1101/203166	C	FL	CL,T	**Single-cell antigen quantification to overlay morphological features with lymphoid tissue characterization at cellular levels using a CNN model.**
187	Gopakumar G et al.	Cytopathological image analysis using deep-learning networks in microfluidic microscopy	http://doi.org/10.1364/JOSAA.34.000111	C	FL	CL	**Cytopathologic analysis by classifying three unlabeled, unstained leukemia cell lines (K562, MOLT, and HL60) using a CNN classifier.**
188	Górriz M et al.	Leishmaniasis parasite segmentation and classification using deep learning	http://doi.org/10.1007/978-3-319-94544-6_6	S, C	BF	CL,SCL	**Automated segmentation of Leishmania parasites and classification into promastigotes, amastigotes, and adhered parasites using U-Net model.**
189	Gupta A et al.	Convolutional neural networks for false positive reduction of automatically detected cilia in low magnification TEM images	http://doi.org/10.1007/978-3-319-59126-1_34	C	EM	SCL	**Improved detection of cilia using a CNN classifier for eliminating false-positives identified by a template matching method.**
190	Güven G et al.	Nanoparticle detection from TEM images with deep learning [GEM görüntülerinden derin öğrenme ile nanoparçacik tespiti]	http://doi.org/10.1109/SIU.2018.8404468	C	EM	T,SCL	**Automated detection of magnetite particles on TEM images using a CNN classifier.**
191	Haberl M et al.	CDeep3M - Plug-and-Play cloud based deep learning for image segmentation of light electron and X-ray microscopy	https://doi.org/10.1101/353425	S	BF,FL,EM		**A pre-configured publicly available cloud-based framework on Amazon Web Services for image segmentation using CNN model.**
192	Haft-Javaherian M et al.	Deep convolutional neural networks for segmenting 3D in vivo multiphoton images of vasculature in Alzheimer disease mouse models	http://arxiv.org/abs/1801.00880v2	S	FL	T,CL	**Automated analysis of volumetric in vivo vessels image segmentation using a CNN model.**
193	Hagita K et al.	Super-resolution for asymmetric resolution of FIB-SEM 3D imaging using AI with deep learning	http://doi.org/10.1038/s41598-018-24330-1	P	EM	CL	**Super-resolution reconstruction of asymmetric 3D images to restore the depth resolution to achieve symmetric resolution using a CNN model.**
194	Hay EA et al.	Performance of convolutional neural networks for identification of bacteria in 3D microscopy datasets	https://doi.org/10.1101/273318	C	FL	CL	**Classification of bacteria and non-bacterial objects in larval zebrafish intestines light sheet fluorescence images using a 3D CNN classifier.**
195	Heinrich L et al.	Deep learning for isotropic super-resolution from non-isotropic 3d electron microscopy	http://doi.org/10.1007/978-3-319-66185-8_16	P	EM	T,SCL	**Improved superresolution of 3D electron microscopy images using a CNN model.**
196	HernÃ¡ndez CX et al.	Using Deep Learning for Segmentation and Counting within Microscopy Data	http://arxiv.org/abs/1802.10548v1	S	BF	CL	**Improved identification of possible failure cases by incorporating uncertainty of a CNN classifier for U2OS cells.**
197	Hershko* E et al.	Multicolor localization microscopy by deep learning	http://arxiv.org/abs/1807.01637v1	C, P	FL	CL	**Automated designing of phase-modulating elements for improved color differentiation between species using CNN models.**
198	Ho DJ et al.	Nuclei detection and segmentation of fluorescence microscopy images using three dimensional convolutional neural networks	http://doi.org/10.1109/ISBI.2018.8363606	S, C	FL	CL	**Simultaneous detection and segmentation of cell nuclei in fluorescence microscopy images using a 3D CNN model.**
199	Holmström O et al.	Point-of-care mobile digital microscopy and deep learning for the detection of soil-transmitted helminths and Schistosoma haematobium	http://doi.org/10.1080/16549716.2017.1337325	C	BF	CL	**Automated detection and classification of helminths in the mobile-phone microscopy images using CNN classifier.**
200	Hou L et al.	Sparse Autoencoder for Unsupervised Nucleus Detection and Representation in Histopathology Images	https://arxiv.org/abs/1704.00406v2	C, S	BF	T	**Unsupervised simultaneous nucleus detection and segmentation in histopathology tissue images using a sparse convolutional autoencoder.**
201	Hu C et al.	Cerebral vessels segmentation for light-sheet microscopy image using convolutional neural networks	http://doi.org/10.1117/12.2254714	S	FL	O	**Automatic and robust segmentation of cerebral micro-vessels structures in mouse cerebrovascular light-sheet microscopy images using a CNN model.**

202	Huang GB et al.	Deep and Wide Multiscale Recursive Networks for Robust Image Labeling	http://arxiv.org/abs/1310.0354v3	C, P	EM	T,SCL	**Improved image labeling performance for connectomic reconstruction of neural circuitry from 3d EM data using a multiscale recursive CNN model.**
203	Huttunen MJ et al.	Automated classification of multiphoton microscopy images of ovarian tissue using deep learning	http://doi.org/10.1117/1.JBO.23.6.066002	C	FL	T	**Robust classification of unstained, reproductive tissues in multiphoton microscopy images using CNN classifiers.**
204	Ishikawa Y et al.	Brain tumor classification of microscopy images using deep residual learning	http://doi.org/10.1117/12.2242711	C	BF	CL	**Improved segmentation of cell regions from astrocytes and classification of brain tumors using CNN models.**
205	Işil Ç et al.	Resolution enhancement of wide-field interferometric microscopy by coupled deep autoencoders	http://doi.org/10.1364/AO.57.002545	P	BF	SCL	**Improved resolution of L-shaped nanostructures images using a coupled autoencoders.**
206	Ito E et al.	Virus Particle Detection by Convolutional Neural Network in Transmission Electron Microscopy Images	http://doi.org/10.1007/s12560-018-9335-7	C	EM	SCL	**Automated localization of virus particles in TEM images using the probability maps generated by a CNN model.**
207	Januszewski M et al.	High-precision automated reconstruction of neurons with flood-filling networks	http://doi.org/10.1038/s41592-018-0049-4	P, S	EM	SCL	**Automated tracing of neurons in a dataset obtained by serial block-face electron microscopy of a zebra finch brain using flood-filling CNN model.**
208	Jiang B et al.	Convolutional neural networks in automatic recognition of trans-differentiated neural progenitor cells under bright-field microscopy	http://doi.org/10.1109/IMCCC.2015.33	C	BF	CL	**Automated pre-processing and classification of neural progenitor cells and non-neural progenitor cells using a novel CNN-based recognition system.**
209	Jiang S et al.	Transform- and multi-domain deep learning for single-frame rapid autofocusing in whole slide imaging	http://doi.org/10.1364/BOE.9.001601	P	BF	T	**Focal position prediction using a CNN for improved autofocusing performance under incoherent Kohler illumination, partially coherent illumination.**
210	Jimenez-Carretero D et al.	Tox_(R)CNN: Deep Learning-Based Nuclei Profiling tool For Drug Toxicity Screening	https://doi.org/10.1101/334557	C	FL	CL	**Toxicity prediction from images of pre-treated DAPI-stained cells using a CNN classifier.**
211	Jo Y et al.	Holographic deep learning for rapid optical screening of anthrax spores	http://doi.org/10.1126/sciadv.1700606	C	BF	CL	**Diagnosis of Listeria monocytogenes by classifying living cells using a CNN classifier for the label-free screening in holographic microscopy images**
212	Judd N et al.	A pilot study for distinguishing chromophobe renal cell carcinoma and oncocytoma using second harmonic generation imaging and convolutional neural network analysis of collagen fibrillar structure	http://doi.org/10.1117/12.2288088	C	BF	T	**Classification of kidney tumor tissue images acquired with collagen matrix using a CNN classifier to distinguish collagen structure-based entities.**
213	Kandaswamy C et al.	High-Content Analysis of Breast Cancer Using Single-Cell Deep Transfer Learning	https://doi.org/10.1177/1087057115623451	C	FL	CL	**Classification of compounds in the chemical mechanisms of action for identifying cell phenotype affecting substances using a CNN classifier.**
214	Kannan S et al.	Segmentation of Glomeruli Within Trichrome Images Using Deep Learning	https://doi.org/10.1101/345579	C, S	BF	T	**Automated detection and segmentation of the glomeruli within digitized kidney biopsy images using a CNN.**
215	Kassim YM et al.	Microvasculature segmentation of arterioles using deep CNN	http://doi.org/10.1109/ICIP.2017.8296347	S	FL	T	**Robust segmentations of microvasculature tissues from epifluorescence microscopy imagery of mice dura mater using a CNN framework.**
216	Kaur P et al.	Hybrid deep learning for Reflectance Confocal Microscopy skin images	http://doi.org/10.1109/ICPR.2016.7899844	C	FL	T	**Identifying human skin disorders in confocal microscopy images of tissues using texton-based feature vectors as input for a CNN.**
217	Khan A et al.	Deep convolutional neural networks for human embryonic cell counting	http://doi.org/10.1007/978-3-319-46604-0_25	C	BF	CL	**Automated cell counting in time-lapse microscopy images of developing human embryos using a CNN classifier.**
218	Khobragade N et al.	Multi-class segmentation of neuronal electron microscopy images using deep learning	http://doi.org/10.1117/12.2293940	S	EM	CL	**Multi-class segmentation of Drosophila third instar larva ventral nerve cord images using a pixel-wise Bayesian SegNet classifier.**
219	Khoshdeli M et al.	Feature-Based Representation Improves Color Decomposition and Nuclear Detection Using a Convolutional Neural Network	http://doi.org/10.1109/TBME.2017.2711529	C	FL, BF	CL	**Improved color decomposition (CD) and subsequent nuclear detection in multiple imaging modalities using a CNN classifier.**
220	Khosravi P et al.	Deep Convolutional Neural Networks Enable Discrimination of Heterogeneous Digital Pathology Images	https://doi.org/10.1101/197517	C	FL, BF	T	**Classification of different histopathology images across different cancer subtypes by fine-tuning pre-trained CNN's.**
221	Klibisz A et al.	Fast, simple calcium imaging segmentation with fully convolutional networks	http://doi.org/10.1007/978-3-319-67558-9_33	S	FL	CL	**Examine neuron activity as a series of images by segmenting fluorescence microscopy time-lapse images using a U-Net architecture.**

222	Kose K et al.	A multiresolution deep learning framework for automated annotation of reflectance confocal microscopy images	http://doi.org/10.1364/MICROSCOPY.2018.MTh2A.1	P	FL	CL	**Automated annotation of morphological patterns to aid skin cancer diagnosis using a multiresolution nested convolutional autoencoder.**
223	Kraus Z et al.	Classifying and segmenting microscopy images with deep multiple instance learning	http://doi.org/10.1093/bioinformatics/btw252	C, S	FL	CL	**Classification and segmentation of mammalian and yeast cells using only microscopy image annotations for multiple instance learning of CNN.**
224	Kwak JT et al.	Nuclear Architecture Analysis of Prostate Cancer via Convolutional Neural Networks	http://doi.org/10.1109/ACCESS.2017.2747838	C	BF	T	**Improved prostate cancer diagnosis by identifying epithelial nuclear seeds in prostate tissue specimen samples using a CNN classifier.**
225	Kwok S et al.	Multiclass Classification of Breast Cancer in Whole-Slide Images	http://doi.org/10.1007/978-3-319-93000-8_106	C	BF	T	**Improved breast cancer tissue diagnosis by classifying HE stained WSI images through a patch-based CNN classifier.**
226	Laine RF et al.	Structured illumination microscopy combined with machine learning enables the high throughput analysis and classification of virus structure	https://doi.org/10.1101/266551	C	BF	CL	**Fast quality assessment of oncolytic virotherapy and vaccine development for high throughput viral production using a pre-trained CNN classifier.**
227	Lee G-G et al.	Stem cell detection based on Convolutional Neural Network via third harmonic generation microscopy images	http://doi.org/10.1109/ICOT.2017.8336085	C	BF	CL,T	**Improved tissue diagnosis by classifying basal cells and stem cells using a CNN classifier to detect stem cells in the stratum basale.**
228	Leena Silvoster M et al.	Enhanced CNN based electron microscopy image segmentation	http://doi.org/10.2478/cait-2012-0014	S	EM	T	**Improved segmentation of ventral nerve cord in EM images using perceptual grouping via a graph cut and its combinations with CNN.**
229	Li H et al.	A Hierarchical Convolutional Neural Network for vesicle fusion event classification	http://doi.org/10.1016/j.compmedimag.2017.04.003	C	FL	CL	**Automated classification and tracking of vesicle fusion events in fluorescence microscopy image sequences using a novel hierarchical CNN.**
230	Li Hen et al.	Cell Dynamic Morphology Classification Using Deep Convolutional Neural Networks	https://doi.org/10.1002/cyto.a.23490	C	BF	CL	**Mouse lymphocytes cell dynamic morphology classification using a CNN classifier**
231	Li R et al.	Deep Learning Segmentation of Optical Microscopy Images Improves 3-D Neuron Reconstruction	http://doi.org/10.1109/TMI.2017.2679713	S	BF	CL	**Improved voxel-wise segmentation of volumetric neuronal microscopy images using a novel 3D CNN.**
232	Li Y et al.	DLBI: Deep learning guided Bayesian inference for structure reconstruction of super-resolution fluorescence microscopy	http://doi.org/10.1093/bioinformatics/bty241	P	FL	SB	**Time-series analysis and visualization of subcellular structures using a bayesian multi-scale CNN.**
233	Liang L et al.	A deep learning approach to estimate chemically-treated collagenous tissue nonlinear anisotropic stress-strain responses from microscopy images	http://doi.org/10.1016/j.actbio.2017.09.025	C	FL	T	**GLBP tissue elastic properties prediction in non-invasive second harmonic generation (SHG) images of collagen networks using CNN classifier.**
234	Liu K et al.	Fast 3D cell tracking with wide-field fluorescence microscopy through deep learning	http://arxiv.org/abs/1805.05139v2	C	FL	CL	**Prediction of 3D locations from a single 2D fluorescence microscopy image by cascading two CNN's for in vivo 3D tracking of multiple blood cells.**
235	López YP et al.	Automatic classification of light field smear microscopy patches using Convolutional Neural Networks for identifying Mycobacterium Tuberculosis	http://doi.org/10.1109/DISTRA.2017.8229512	C	BF	CL	**Identification of Mycobacterium tuberculosis by classifying light field smear microscopy images using augmented input patches for a CNN classifier.**
236	Lu A et al.	Learning unsupervised feature representations for single cell microscopy images with paired cell inpainting	https://doi.org/10.1101/395954	C	FL	CL	**Improved phenotypic classification for both yeast and human cells using an unsupervised CNN classifier.**
237	Maitin-Shepard J et al.	Combinatorial Energy Learning for Image Segmentation	http://arxiv.org/abs/1506.04304v3	S	EM	T	**Segmentation of neuropil tissues using a CNN to model the conditional energy of a segmentation output.**
238	Marsh JN et al.	Deep Learning Global Glomerulosclerosis in Transplant Kidney Frozen Sections	https://doi.org/10.1101/292789	C	BF	T,CL	**Automated identification and classification of glomeruli in frozen donor kidney section biopsies whole-slide images using a CNN model**
239	Matuszewski DJ et al.	Minimal annotation training for segmentation of microscopy images	http://doi.org/10.1109/ISBI.2018.8363599	S	EM	CL	**Improved segmentation of viruses in EM images with minimal annotation using a U-Net model.**
240	Mesbah R et al.	Deep convolutional encoder-decoder for myelin and axon segmentation	http://doi.org/10.1109/IVCNZ.2016.7804455	S	BF	SB	**Automated segmentation of myelin and axon from mouse spinal cord microscopy images using CNN and Convolutional autoencoder.**
241	Mishra M et al.	Structure-based assessment of cancerous mitochondria using deep networks	http://doi.org/10.1109/ISBI.2016.7493327	C	EM	SB	**Automated quantitative assessment of mitochondria structures isolated from liver tumor cell lines using a CNN classifier.**
242	Murthy V et al.	Center-Focusing Multi-task {CNN} with Injected Features for Classification of Glioma Nuclear Images	https://doi.org/10.1109%2Fwacv.2017.98	C	BF	CL	**Automated shapes and attributes classification of a glioma cell nucleus using a CNN classifier.**

243	Naito T et al.	Identification and segmentation of myelinated nerve fibers in a cross-sectional optical microscopic image using a deep learning model	http://doi.org/10.1016/j.jneumeth.2017.08.014	S	BF	T	**Automated nerve fiber identification and segmentation using CNN model.**
244	Nanni L et al.	Bioimage Classification with Handcrafted and Learned Features	http://doi.org/10.1109/TCBB.2018.2821127	C	BF,FL	CL,SB	**Generic bioimage classification method for a wide range of cell and subcellular classification problems using a CNN model.**
245	Nazeri K et al.	Two-Stage Convolutional Neural Network for Breast Cancer Histology Image Classification	http://doi.org/10.1007/978-3-319-93000-8_81	C	BF	T	**Automated detection and classification of breast tissue in microscopy images using multiple patch-based CNN classifiers.**
246	Nguyen T et al.	A deep-learning approach for high-speed Fourier ptychographic microscopy	http://doi.org/10.1364/3D.2018.JTh3A.6	P	BF	CL	**Automated reconstruction of dynamic live cells video sequence captured using a computational microscopy technique using a CNN model.**
247	Nguyen T et al.	Deep learning bi-telecentric digital holographic microscopy for aberration compensation applied to cancer cells	http://doi.org/10.1364/DH.2017.Tu2A.5	P	BF	CL	**Automated background area detection for residual phase aberration compensation using a CNN model.**
248	Nie W-Z et al.	3D Convolutional Networks-Based Mitotic Event Detection in Time-Lapse Phase Contrast Microscopy Image Sequences of Stem Cell Populations	http://doi.org/10.1109/CVPRW.2016.171	C	BF	CL	**Automated mitotic event detection of stem cell populations in time-lapse phase contrast microscopy images using a CNN classifier.**
249	Niioka H et al.	Classification of C2C12 cells at differentiation by convolutional neural network of deep learning using phase contrast images	http://doi.org/10.1007/s13577-017-0191-9	C	BF	CL	**Automated cellular differentiation recognition of myogenic C2C12 cell line with phase contrast microscopy using a CNN classifier.**
250	Nishimoto S et al.	Predicting the future direction of cell movement with convolutional neural networks	https://doi.org/10.1101/388033	C	BF	CL	**Automated cell migration prediction from a single image patch of a cell at a particular time using multiple CNN's.**
251	Nyawira I et al.	Understanding neural pathways in zebrafish through deep learning and high resolution electron microscope data	http://doi.org/10.1145/3219104.3229285	S	EM	SB	**Automated segmentation of high-resolution scanning electron microscope (SEM) image data using a CNN model.**
252	Ounkomol C et al.	Three dimensional cross-modal image inference: label-free methods for subcellular structure prediction	https://doi.org/10.1101/216606	C	FL, BF	SB	**Automated prediction of fluorescently labeled structures in live cells solely from 3D brightfield microscopy images using CNN classifier.**
253	Ounkomol C et al.	Label-free prediction of three-dimensional fluorescence images from transmitted light microscopy	https://doi.org/10.1101/289504	C	FL	CL	**Prediction of 3D fluorescence directly from transmitted light images using a CNN classifier for generating multi-structure, integrated images.**
254	Oztel I et al.	Mitochondria segmentation in electron microscopy volumes using deep convolutional neural network	http://doi.org/10.1109/BIBM.2017.8217827	S	EM	SB	**Automated segmentation of mitochondria in the CA1 hippocampus region of brain tissue from electron microscopy images using CNN model.**
255	Öztürk Ş et al.	A convolutional neural network model for semantic segmentation of mitotic events in microscopy images	http://doi.org/10.1007/s00521-017-3333-9	S	BF, EM	CL	**Improved mitosis segmentation using CNN model for Semantic segmentation.**
256	Pahariya G et al.	High precision automated detection of labeled nuclei in terabyte-scale whole-brain volumetric image data of mouse	https://doi.org/10.1101/252247	C	FL	CL	**Automated mitosis detection by aggregating data using CNN via additional crowdsourcing layer (AggNet).**
257	Pan X et al.	Cell detection in pathology and microscopy images with multi-scale fully convolutional neural networks	http://doi.org/10.1007/s11280-017-0520-7	C	BF,FL	CL	**Automated density map regression to robustly detect the nuclei in pathology and microscopy images using a novel multi-scale CNN classifier.**
258	Panicker RO et al.	Automatic detection of tuberculosis bacilli from microscopic sputum smear images using deep learning methods	http://doi.org/10.1016/j.bbe.2018.05.007	C	BF	CL	**Automated detection of tuberculosis (TB) bacilli from microscopic sputum smear images using a CNN classifier.**
259	Penas KED et al.	Malaria Parasite Detection and Species Identification on Thin Blood Smears Using a Convolutional Neural Network	http://doi.org/10.1109/CHASE.2017.51	C	BF	SB	**Automated detection of malaria parasites in thin blood smears images using a CNN classifier.**
260	Pitkäaho T et al.	Performance of autofocus capability of deep convolutional neural networks in digital holographic microscopy	http://doi.org/10.1364/DH.2017.W2A.5	P	BF	CL	**Automated focusing of digital holograms of microscopic objects using a CNN mdoel.**
261	Qiao H et al.	GPU-based deep convolutional neural network for tomographic phase microscopy with ℓ1 fitting and regularization	http://doi.org/10.1117/1.JBO.23.6.066003	P	O	CL	**Improve the performance of phase tomography using a CNN model.**

262	Qiu Y et al.	Applying deep learning technology to automatically identify metaphase chromosomes using scanning microscopic images: An initial investigation	http://doi.org/10.1117/12.2217418	C	FL	SB	**Identification of chromosomes metaphase sub-cellular structures using a CNN classifier.**
263	Quan TM et al.	FusionNet: A deep fully residual convolutional neural network for image segmentation in connectomics	http://arxiv.org/abs/1612.05360v2	S	EM	T,CL	**Automated segmentation of neuronal structures in connectomics data using a CNN model.**
264	Quay M et al.	Designing deep neural networks to automate segmentation for serial block-face electron microscopy	http://doi.org/10.1109/ISBI.2018.8363603	S	EM	CL,SB	**Automated segmentation of a human platelet tissue sample in serial block-face electron microscopy images using an ensemble of CNN model.**
265	Quinn JA et al.	Deep Convolutional Neural Networks for Microscopy-Based Point of Care Diagnostics	http://arxiv.org/abs/1608.02989v1	C	BF	CL	**Automated diagnosis of malaria in thick blood smears, tuberculosis in sputum samples, and intestinal parasite eggs using a CNN model.**
266	Rajasekaran K et al.	An accurate perception method for low contrast bright field microscopy in heterogeneous microenvironments	http://doi.org/10.3390/app7121327	C	BF	SB	**Automated perceiving of shapes for optical tweezers-based robotic manipulation using a CNN classifier.**
267	Rakhlin A et al.	Deep Convolutional Neural Networks for Breast Cancer Histology Image Analysis	http://doi.org/10.1007/978-3-319-93000-8_83	C	BF	T	**Automated classification of breast cancer tissues in histology images using a CNN classifier.**
268	Rao Q et al.	Automatically segmenting and reconstructing neurons in SEM images	http://doi.org/10.1109/ICMA.2016.7558857	S	EM	CL	**Neuronal boundary detection and segmentation using membrane detection probability map (MDPM) generated by a CNN model.**
269	Rao Q et al.	Deep learning and shapes similarity for joint segmentation and tracing single neurons in SEM images	http://doi.org/10.1117/12.2254284	S	EM	CL	**Automated neuronal membranes detection from Tape-collecting Ultra Microtome Scanning Electron Microscopy (ATUM-SEM) using a CNN model.**
270	Ravì D et al.	Effective deep learning training for single-image super-resolution in endomicroscopy exploiting video-registration-based reconstruction	http://doi.org/10.1007/s11548-018-1764-0	P	FL	CL	**Improved image superresolution reconstruction using a novel synthetic data generation approach to train the exemplar-based CNN model.**
271	Raza SEA et al.	Micro-Net: A unified model for segmentation of various objects in microscopy images	http://arxiv.org/abs/1804.08145v1	S	FL, BF	CL, SB	**Automated segmentation of cells, nuclei, and glands in fluorescence microscopy and histology images using a multi-resolution CNN model.**
272	Raza SEA et al.	MIMO-Net: A multi-input multi-output convolutional neural network for cell segmentation in fluorescence microscopy images	http://doi.org/10.1109/ISBI.2017.7950532	S	FL	CL	**Automated cell segmentation in fluorescence microscopy images using multiple-input-multiple-output CNN model.**
273	Rempfler M et al.	Tracing cell lineages in videos of lens-free microscopy	http://doi.org/10.1016/j.media.2018.05.009	C	BF	CL	**Automated detection and tracking of cells in LFM images using a CNN model and probabilistic model based on moral lineage tracing.**
274	Ren J et al.	Adversarial Domain Adaptation for Classification of Prostate Histopathology Whole-Slide Images	https://arxiv.org/abs/1806.01357	C	BF	T	**Improved classification for automated Gleason grading of prostate histopathology tissue Whole-Slide Images using adversarial domain adaptation.**
275	Rezaeilouyeh H et al.	Microscopic medical image classification framework via deep learning and shearlet transform	http://doi.org/10.1117/1.JMI.3.4.044501	C	BF	T	**Automated cancer tissue diagnosis using magnitude and phase of shearlet coefficients as additional input for a CNN classifier.**
276	Rivenson Y et al.	Phase recovery and holographic image reconstruction using deep learning in neural networks	https://doi.org/10.1038/lsa.2017.141	P	BF	T	**Improved phase retrieval and holographic image reconstruction of blood, Pap smears, and tissue sections using a cascaded multi-scale CNN model.**
277	Rivenson Y et al.	Toward a Thinking Microscope: Deep Learning in Optical Microscopy and Image Reconstruction	http://arxiv.org/abs/1805.08970v1	P	BF	T	**Automated microscopic image reconstruction of lung, kidney, and breast tissue sections using a CNN model.**
278	Rivenson Y et al.	PhaseStain: Digital staining of label-free quantitative phase microscopy images using deep learning	http://arxiv.org/abs/1807.07701v1	P	BF	T	**Virtual staining for brightfield microscopy images of skin, kidney, and liver tissue sections using a generative adversarial network (GAN) model.**
279	Robitaille L et al.	Learning to Become an Expert: Deep Networks Applied To Super-Resolution Microscopy	http://arxiv.org/abs/1803.10806v1	P	STED	T	**An automated quantitative quality measure of neuronal structures in super-resolution microscopy images using a CNN model.**
280	Roels J et al.	Convolutional neural network pruning to accelerate membrane segmentation in electron microscopy	http://doi.org/10.1109/ISBI.2017.7950600	S	EM	SB	**Improved membrane segmentation of mitochondria and endoplasmic reticula by optimizing a CNN model.**
281	Romo-Bucheli D et al.	A deep learning based strategy for identifying and associating mitotic activity with gene expression derived risk categories in estrogen receptor positive breast cancers	https://doi.org/10.1002/cyto.a.23065	C	BF	T	**Improved mitotic figures identification from breast cancer tissue whole slides images using a CNN classifier.**
282	Sabbaghi S et al.	A deep bag-of-features model for the classification of melanomas in dermoscopy images	http://doi.org/10.1109/EMBC.2016.7590962	C	BF	CL	**Classification of cancer and non-cancer skin regions using a stacked sparse auto-encoder with SIFT and color descriptors.**

283	Sailem H et al.	Discovery of Rare Phenotypes in Cellular Images Using Weakly Supervised Deep Learning	http://doi.org/10.1109/ICCVW.2017.13	P	FL	CL	**Automated labeling of genetically weak perturbed cells phenotypes using a weakly supervised CNN to identify rare events location.**
284	Saponaro P et al.	DeepXScope: Segmenting Microscopy Images with a Deep Neural Network	http://doi.org/10.1109/CVPRW.2017.117	S	FL	T	**Automated segmenting of the fungal pathogen and cell boundaries and stomata of the host plant tissues using a CNN model.**
285	Schaumberg AJ et al.	DeepScope: Nonintrusive Whole Slide Saliency Annotation and Prediction from Pathologists at the Microscope	https://doi.org/10.1101/097246	C	BF	T	**Creation of whole-slide image saliency maps to facilitate manual annotation process using a pre-trained CNN classifier.**
286	Schaumberg AJ et al.	H&E-stained Whole Slide Image Deep Learning Predicts SPOP Mutation State in Prostate Cancer	https://doi.org/10.1101/064279	C	BF	T	**Prediction of a genetic mutation (SPOP) in whole slide images of prostate cancer tissues using a CNN classifier.**
287	Schaumberg AJ et al.	Large-Scale Annotation of Histopathology Images from Social Media	https://doi.org/10.1101/396663	C	BF	T	**Classification of several tissue types from a dataset created from images shared by pathologists on twitter using pre-trained CNN classifiers.**
288	Schubert P et al.	Learning cellular morphology with neural networks	https://doi.org/10.1101/364034	S	EM	SB	**Automated reconstruction and detection of cellular fragments in volumetric brain tissue images by multi-view CNN model.**
289	Shahbazi A et al.	Flexible Learning-Free Segmentation and Reconstruction for Sparse Neuronal Circuit Tracing	https://doi.org/10.1101/278515	S	EM	CL	**Creation of a learning-free method for sparse segmentation and reconstruction of neural volumes using a CNN model.**
290	Sheikhzadeh F et al.	Automatic labeling of molecular biomarkers of immunohistochemistry images using fully convolutional networks	http://doi.org/10.1371/journal.pone.0190783	C	BF	T	**Automated detection and classification of molecular biomarkers of tissues using a CNN classifier.**
291	Shen W et al.	Multi-stage Multi-recursive-input Fully Convolutional Networks for Neuronal Boundary Detection	http://arxiv.org/abs/1703.08493v2	S	EM	T	**Identification of cortical connectivity by improved mouse piriform cortex image segmentation using a multi-stage multi-recursive CNN model.**
292	Shkolyar A et al.	Automatic detection of cell divisions (mitosis) in live-imaging microscopy images using Convolutional Neural Networks	http://doi.org/10.1109/EMBC.2015.7318469	C	BF	CL	**Semi-automated workflow for cell divisions detection in live-imaging microscopy by classifying mitosis candidates using a CNN classifier.**
293	Sibley AR et al.	Simultaneous segmentation and classification of multichannel immuno-fluorescently labeled confocal microscopy images using deep convolutional neural networks	http://doi.org/10.1117/12.2292934	S,C	FL	T	**Automated segmentation and classification of dendritic cell types for application to cell membrane immunofluorescent stains using a CNN model.**
294	Singh SP et al.	Machine learning based classification of cells into chronological stages using single-cell transcriptomics.	https://doi.org/10.1101/303214	C	FL	CL	**Detection of premature aging in cells using a CNN classifier to provide a window for preventive therapies against age-related diseases.**
295	Sirinukunwattana K et al.	Locality Sensitive Deep Learning for Detection and Classification of Nuclei in Routine Colon Cancer Histology Images	https://doi.org/10.1109/tmi.2016.2525803	C	BF	T	**Per-pixel likelihood prediction for improved nuclei detection in colon cancer histology images using a novel spatially constrained CNN classifier.**
296	Smith KP et al.	Automated interpretation of blood culture gram stains by use of a deep convolutional neural network	http://doi.org/10.1128/JCM.01521-17	C	BF	T	**Automated image acquisition and classification of Gram stain using a CNN classifier.**
297	Song Y et al.	Accurate segmentation of cervical cytoplasm and nuclei based on multiscale convolutional network and graph partitioning	http://doi.org/10.1109/TBME.2015.2430895	S	BF	CL	**Accurate segmentation of cervical cells of Cervical Cytoplasm and Nuclei using a multiscale CNN and graph-partitioning-based method.**
298	Stegmaier J et al.	Cell segmentation in 3D confocal images using supervoxel merge-forests with CNN-based hypothesis selection	http://doi.org/10.1109/ISBI.2018.8363598	S	FL	T	**Automated segmentation of cell plants (meristem) clusters in volumetric microscopy images using a novel super-voxel CNN model.**
299	Suleymanova I et al.	A deep convolutional neural network approach for astrocyte detection	https://doi.org/10.1101/241505	C	BF	CL	**Fast and fully automated software for assessing the number of astrocytes using a CNN classifier.**
300	tefko MÅ et al.	Design Principles for Autonomous Illumination Control in Localization Microscopy	https://doi.org/10.1101/295519	S	FL	SB	**Automated molecule density estimation by fluorescence spot segmentation and counting using a CNN model.**
301	Thierbach K et al.	Combining Deep Learning and Active Contours Opens The Way to Robust Automated Analysis of Brain Cytoarchitectonics	https://doi.org/10.1101/297689	S	FL	CL	**Improved segmentation of neural cell bodies from volumetric light-sheet microscopy using a CNN model.**
302	Tokuoka Y et al.	Convolutional Neural Network-Based Instance Segmentation Algorithm to Acquire Quantitative Criteria of Early Mouse Development	https://doi.org/10.1101/324186	S	FL	CL	**Creation of a deep learning pipeline that segments each nucleus and adds different labels to the detected objects.**

303	Tschopp F et al.	Efficient convolutional neural networks for pixelwise classification on heterogeneous hardware systems	http://doi.org/10.1109/ISBI.2016.7493487	C	EM	T	**Transformation of a classification CNN to a segmentation NN to increase speed of predictions.**
304	Van Valen DA et al.	Deep Learning Automates the Quantitative Analysis of Individual Cells in Live-Cell Imaging Experiments	http://doi.org/10.1371/journal.pcbi.1005177	S	BF	CL	**Improved bacterial and mammalian cells nuclei segmentation in fluorescent and phase images of the cytoplasms using CNN model.**
305	Vicar T et al.	Label-free nuclear staining reconstruction in quantitative phase images using deep learning	http://doi.org/10.1007/978-981-10-9035-6_43	P	BF, FL	CL, T	**Created artificial, fluorescence-like nuclei labeling from label-free images using CNNs.**
306	Vu QD et al.	Micro and Macro Breast Histology Image Analysis by Partial Network Re-use	http://doi.org/10.1007/978-3-319-93000-8_102	C, S	BF	T	**Improved classification and segmentation of breast cancer images by combining architectural components and weights of a CNN model.**
307	Wang C et al.	Edge Detection of Cryptic Lamellipodia Assisted by Deep Learning	https://doi.org/10.1101/181263	C	FL	CL	**Automated edges detection in time-lapse collective cell migration movies by combining traditional analysis methods with CNN models.**
308	Wang F et al.	DeepPicker: A deep learning approach for fully automated particle picking in cryo-EM	http://doi.org/10.1016/j.jsb.2016.07.006	C	EM	SB	**Improved classifications of target particles from multiple molecular complexes using an iterative CNN-based workflow.**
309	Wang Q et al.	Accurate and high throughput cell segmentation method for mouse brain nuclei using cascaded convolutional neural network	http://doi.org/10.1007/978-3-319-67434-6_7	S	FL	CL	**Improved segmentation by passing the probability map from one CNN as input to a subsequent CNN together with the original images.**
310	Wang Y et al.	Stem cell motion-tracking by using deep neural networks with multi-output	http://doi.org/10.1007/s00521-017-3291-2	C	BF	CL	**Automated mitosis detection and cell tracking using a CNN model with multiple outputs and a particle filter based sampling scheme.**
311	Wen C et al.	Deep-learning-based flexible pipeline for segmenting and tracking cells in 3D image time series for whole brain imaging	https://doi.org/10.1101/385567	C	FL	CL	**Pixel-wise classification of cells using a 3D U-Net model, followed by watershed cell segmentation, and tracking using a feed-forward network.**
312	Weng S et al.	Combining deep learning and coherent anti-Stokes Raman scattering imaging for automated differential diagnosis of lung cancer	http://doi.org/10.1117/1.JBO.22.10.106017	C	BF	T	**Classification of lung cancer tissue using pre-trained CNN classifiers.**
313	Wieslander H et al.	Deep Convolutional Neural Networks for Detecting Cellular Changes Due to Malignancy	https://doi.org/10.1109/iccvw.2017.18	C	BF	CL	**Improved classification of oral and cervical cancer cells using pre-trained CNN models.**
314	Wollmann T et al.	Deep residual Hough voting for mitotic cell detection in histopathology images	http://doi.org/10.1109/ISBI.2017.7950533	C	BF	CL	**Improved mitotic cell detection by combining the ResNet classifier with Hough voting method.**
315	Wollmann T et al.	Multi-channel deep transfer learning for nuclei segmentation in glioblastoma cell tissue images	http://doi.org/10.1007/978-3-662-56537-7_83	S	FL	CL	**Automated cell segmentation by combining atrous spatial pyramid pooling with a pre-trained U-Net model.**
316	Wu J et al.	Unsupervised single-particle deep clustering via statistical manifold learning	http://arxiv.org/abs/1604.04539v2	C	EM	SB	**Unsupervised single-particle clustering using a manifold learning algorithm for deep learning model.**
317	Xiao C et al.	Deep contextual residual network for electron microscopy image segmentation in connectomics	http://doi.org/10.1109/ISBI.2018.8363597	S	EM	CL, T	**Improved segmentation performance by utilizing multilevel contextual cues in a spatially efficient residual CNN model.**
318	Xiao C et al.	An effective fully deep convolutional neural networks for mitochondria segmentation based on ATUM-SEM	http://doi.org/10.1117/12.2293291	S	EM	SB	**Robust mitochondrial segmentation by fusing multiple pre-trained CNN models.**
319	Xiao C et al.	Effective automated pipeline for 3D reconstruction of synapses based on deep learning	http://doi.org/10.1186/s12859-018-2232-0	C	EM	T	**Automated localization and detection of synapses using adapted faster region-CNN model.**
320	Xie Y et al.	Beyond Classification: Structured Regression for Robust Cell Detection Using Convolutional Neural Network	https://doi.org/10.1007/978-3-319-24574-4_43	C	BF	CL	**Automated detection of cells through encoded topological information using a final structured regression layer of a CNN classifier.**
321	Xie W et al.	Microscopy cell counting and detection with fully convolutional regression networks	http://doi.org/10.1080/21681163.2016.1149104	C	FL	CL	**Automated cell counting and detection using fully convolutional regression networks to estimate density maps**
322	Xu M et al.	A deep convolutional neural network for classification of red blood cells in sickle cell anemia	http://doi.org/10.1371/journal.pcbi.1005746	C	BF	CL	**Classification of individual red blood cells images using a patch-based CNN classifier.**
323	Xu YKT et al.	Deep learning for high-throughput quantification of oligodendrocyte ensheathment: a UNet architecture to extract multiple morphological parameters from individual cells	https://doi.org/10.1101/389932	S	BF, FL	SB	**Improved myelin segmentation within cells using a UNet architecture.**
324	Xue Y et al.	A novel framework to integrate convolutional neural network with compressed sensing for cell detection	http://doi.org/10.1109/ICIP.2017.8296696	C	BF	CL	**Automated detection and localization of cells by combining compressed-sensing based output encoding with CNN classifier.**
325	Yang L et al.	BoxNet: Deep Learning Based Biomedical Image Segmentation Using Boxes Only Annotation	https://arxiv.org/abs/1806.00593	S	BF, EM	CL, T	**Improved localization of structures by combining weakly supervised deep learning box annotation and grid search for a CNN model.**

326	Yi F et al.	Automated red blood cells extraction from holographic images using fully convolutional neural networks	http://doi.org/10.1364/BOE.8.004466	S	BF	CL	**Integration of FCN with marker-controlled watershed segmentation on red blood cells.**
327	Yoo I et al.	ssEMnet: Serial-section electron microscopy image registration using a spatial transformer network with learned features	http://doi.org/10.1007/978-3-319-67558-9_29	P	EM	T	**Automated image alignment by combining a spatial transformer network and a convolutional autoencoder.**
328	Yu C et al.	Acral melanoma detection using a convolutional neural network for dermoscopy images	http://doi.org/10.1371/journal.pone.0193321	C	BF	T	**Automated detection of acral melanoma in dermoscopy images using pre-trained CNN classifiers.**
329	Yu H et al.	Phenotypic Antimicrobial Susceptibility Testing with Deep Learning Video Microscopy	http://doi.org/10.1021/acs.analchem.8b01128	C	BF	CL	**Pathogen concentrations determination in static images containing single cell features of bacteria using a CNN classifier.**
330	Yu L et al.	Automated Melanoma Recognition in Dermoscopy Images via Very Deep Residual Networks	http://doi.org/10.1109/TMI.2016.2642839	C	BF	T	**Segmentation and classification of melanoma in dermoscopy images by integrating a very deep CNN with a very deep residual CNN classifier.**
331	Yuan Y et al.	Automatic Skin Lesion Segmentation Using Deep Fully Convolutional Networks with Jaccard Distance	http://doi.org/10.1109/TMI.2017.2695227	S	BF	T	**Improved skin lesion segmentation by combining Jaccard distance based loss function with a CNN for imbalanced foreground and background pixels.**
332	Zaimi A et al.	AxonDeepSeg: Automatic axon and myelin segmentation from microscopy data using convolutional neural networks	http://doi.org/10.1038/s41598-018-22181-4	S	EM	SB	**An open-source software package for axon and myelin segmentation of microscopic images using an adapted U-Net model.**
333	Zeng T et al.	DeepEM3D: approaching human-level performance on 3D anisotropic EM image segmentation	http://doi.org/10.1093/bioinformatics/btx188	S	EM	SB	**Improved volumetric neurite segmentation using a hybrid 3D-2D CNN model accounting for anisotropy.**
334	Zhang H et al.	High-throughput high-resolution Generated Adversarial Network Microscopy	http://arxiv.org/abs/1801.07330v1	P	BF, FL	T, CL, SB	**Super-resolution reconstruction from a large field of view by combining GANs with wide-field light images.**
335	Zhou Y et al.	Cell mitosis detection using deep neural networks	http://doi.org/10.1016/j.knosys.2017.08.016	C	BF	CL	**Automatic identification of potential mitosis events using a CNN model and false-positive reduction using a 3D-CNN classifier.**
336	Zhou Z et al.	DeepNeuron: an open deep learning toolbox for neuron tracing	http://doi.org/10.1186/s40708-018-0081-2	C	BF	CL	**Improved detection and tracing of neurons in different image conditions using a DeepNeuron within CNN modules.**
337	Zhu R.	An Extended Type Cell Detection and Counting Method based on FCN	http://doi.org/10.1109/BIBE.2017.00-79	C	BF, EM	CL	**Automated counting and detection of cells by utilizing a CNN model.**
338	Zhu Y et al.	A deep convolutional neural network approach to single-particle recognition in cryo-electron microscopy	http://doi.org/10.1186/s12859-017-1757-y	C	EM	SB	**Single-particle recognition from noisy cryo-EM micrographs using a recursively trained CNN classifier.**