Table 1: The image preprocessing algorithms available in IBEX

Category	Preprocessing Algorithm Name	Comment	Reference
Image Smoothing	Average_Smooth		
	EdgePreserve_Smooth3D	C++ MEX	
	Gaussian_Smooth		11,12,13,14,16
	Gaussian_Smooth3D	C++ MEX	
	Median_Smooth		
	Wiener_Smooth		11
Image Enhancement	AdaptHistEqualization_Enhance3D	C++ MEX	
	HistEqualization_Enhance		
	Sharp_Enhance		
Image Deblur	Blind_Deblur		
	Gaussian_Deblur		
Change Enhancement	Laplacian_Filter		11,12,13,14,16
	Log_Filter		11,12,13,14,16
	XEdge_Enhance		
	YEdge_Enhance		
Resample	Resample_UpDownSample	C++ MEX	9
	Resample_VoxelSize	C++ MEX	9
Miscellaneous	Threshold_Image_Mask		11,15
	Threshold_Mask		11,15
	BitDepthRescale_Range	Change dynamic range	11,15

Table 2: The feature algorithms available in IBEX

Category	Feature Algorithm Name	Comment	Reference
Shape	Volume		7,15
	SurfaceArea		7
	SurfaceAreaDensity		
	Mass	Useful for CT only	7
	Convex		7
	ConvexHullVolume		
	ConvexHullVolume3D		
	MeanBreath		
	Orientation		7
	Roundness		7
	NumberOfObjects		
	NumberOfVoxel		7
	VoxelSize		
IntensityDirect	Kurtosis		7,9,11,15
	Skewness		7,9,11,15
	Range		9
	Percentile		9,15
	Quantile		9
	InterQuartileRange		9
	GlobalEntropy		7,9,11,12,15,
	GlobalUniformity		11,12,13,14,16
	GlobalMax		9,15
	GlobalMin		9,15
	GlobalMean		7,9,11,12,13,15
	GlobalMedian		9,15
	GlobalStd		7,9,11,13,15,
	MeanAbsoluteDeviation		9
	MedianAbsoluteDeviation		
	LocalEntropy/Range/StdMax		
	LocalEntropy/Range/StdMin		
	LocalEntropy/Range/StdMean		
	LocalEntropy/Range/StdMedian		
	LocalEntropy/Range/StdStd		
IntensityHistogram	Kurtosis		
	Skewness		
	Range		
	Percentile		
	PercentileArea		
	Quantile		
	InterQuartileRange		
GrayLevelCooccurenceMatrix25 GrayLevelCooccurenceMatrix3	Contrast	25:=GLCM is computed from all 2D image slices 3:=GLCM is computed from 3D image matrix	7,9,11,15,28
	Correlation		7,9,11,15,28
	Energy		7,9,11,15,28
	Homogeneity		7,9,11,15,28
NeighborIntensityDifference25 NeighborIntensityDifference3	Busyness	25:=NID is computed from all 2D image slices 3:=NID is computed from 3D image matrix	11,23,29
	Coarseness		11,23,29
	Complexity		23,29
	Contrast		11,23,29
	TextureStrength		23,29
GrayLevelRunLengthMatrix25	GrayLevelNonuniformity	25:=RLM is computed from all 2D image slices	7,15,30,31
	HighGrayLevelRunEmpha		7,,30,31
	LongRunEmphasis		7,15,30,31
	LongRunHighGrayLevelEmpha		7,30,31
	LongRunLowGrayLevelEmpha		7,30,31
	LowGrayLevelRunEmpha		7,30,31
	RunLengthNonuniformity		7,15,30,31
	RunPercentage		7,15,30,31
	ShortRunEmphasis		7,15,30,31
	ShortRunHighGrayLevelEmpha		7,30,31
	ShortRunLowGrayLevelEmpha		7,30,31

Reference

1. Chen HY, Yu SL, Chen CH, et al. A five-gene signature and clinical outcome in non-small-cell lung cancer. N Engl J Med. 2007;356(1):11-20.
2. Eisenhauer EA, Therasse P, Bogaerts J, et al. New response evaluation criteria in solid tumours: revised RECIST guideline (version 1.1). Eur J Cancer. 2009;45(2):228-47.
3. Fass L**.** Imaging and cancer: a review. Mol Oncol. 2008;2(2):115-52.
4. Machtay M, Duan F, Siegel BA, et al. Prediction of survival by [18F]fluorodeoxyglucose positron emission tomography in patients with locally advanced non-small-cell lung cancer undergoing definitive chemoradiation therapy: results of the ACRIN 6668/RTOG 0235 trial. J Clin Oncol. 2013;31(30):3823-30.
5. Raz DJ, Ray MR, Kim JY, et al. A multigene assay is prognostic of survival in patients with early-stage lung adenocarcinoma. Clin Cancer Res. 2008;14(17):5565-70.
6. Al-Kadi OS, Watson D**.** Texture analysis of aggressive and nonaggressive lung tumor CE CT images. IEEE Trans Biomed Eng. 2008;55(7):1822-30.
7. Basu S**.** Developing Predictive Models for Lung Tumor Analysis. University of South FloridaFollow; 2012.
8. Cunliffe AR, Al-Hallaq HA, Labby ZE, et al. Lung texture in serial thoracic CT scans: assessment of change introduced by image registration. Med Phys. 2012;39(8):4679-90.
9. Cunliffe AR, Armato SG, 3rd, Fei XM, et al. Lung texture in serial thoracic CT scans: registration-based methods to compare anatomically matched regions. Med Phys. 2013;40(6):061906.
10. Cunliffe AR, Armato SG, Straus C, et al. Lung texture in serial thoracic CT scans: correlation with radiologist-defined severity of acute changes following radiation therapy. Phys Med Biol. 2014;59(18):5387-98.
11. Fried DV, Tucker, S. L., Zhou, S., Liao, Z., Mawlawi, O., Ibbott, G., Court, L. E. **.** Prognostic value and reproducibility of pretreatment CT texture features in stage III Non-Small-Cell lung cancer Int J Radiation Oncol Biol Phys. 2014.
12. Ganeshan B, Abaleke S, Young RC, et al. Texture analysis of non-small cell lung cancer on unenhanced computed tomography: initial evidence for a relationship with tumour glucose metabolism and stage. Cancer Imaging. 2010;10:137-43.
13. Ganeshan B, Goh V, Mandeville HC, et al. Non-small cell lung cancer: histopathologic correlates for texture parameters at CT. Radiology. 2013;266(1):326-36.
14. Ganeshan B, Panayiotou E, Burnand K, et al. Tumour heterogeneity in non-small cell lung carcinoma assessed by CT texture analysis: a potential marker of survival. Eur Radiol. 2012;22(4):796-802.
15. Hunter LA, Krafft S, Stingo F, et al. High quality machine-robust image features: identification in nonsmall cell lung cancer computed tomography images. Med Phys. 2013;40(12):121916.

16. Ravanelli M, Farina D, Morassi M, et al. Texture analysis of advanced non-small cell lung cancer (NSCLC) on contrast-enhanced computed tomography: prediction of the response to the first-line chemotherapy. Eur Radiol. 2013;23(12):3450-5.
17. Segal E, Sirlin CB, Ooi C, et al. Decoding global gene expression programs in liver cancer by noninvasive imaging. Nat Biotechnol. 2007;25(6):675-80.
18. Tan H, Liu T, Wu Y, et al. Evaluation of iron content in human cerebral cavernous malformation using quantitative susceptibility mapping. Invest Radiol. 2014;49(7):498-504.
19. Win T, Miles KA, Janes SM, et al. Tumor heterogeneity and permeability as measured on the CT component of PET/CT predict survival in patients with non-small cell lung cancer. Clin Cancer Res. 2013;19(13):3591-9.
20. Lambin P, Rios-Velazquez E, Leijenaar R, et al. Radiomics: extracting more information from medical images using advanced feature analysis. Eur J Cancer. 2012;48(4):441-6.
21. Kumar V, Gu Y, Basu S, et al. Radiomics: the process and the challenges. Magn Reson Imaging. 2012;30(9):1234-48.
22. Deasy JO, Blanco AI, Clark VH**.** CERR: a computational environment for radiotherapy research. Med Phys. 2003;30(5):979-85.
23. Fang YH, Lin CY, Shih MJ, et al. Development and evaluation of an open-source software package "CGITA" for quantifying tumor heterogeneity with molecular images. Biomed Res Int. 2014;2014:248505.
24. Szczypinski PM, Strzelecki M, Materka A, Klepaczko A**.** MaZda--a software package for image texture analysis. Comput Methods Programs Biomed. 2009;94(1):66-76.
25. Krasner GE, Pope ST**.** A cookbook for using the model-view controller user interface paradigm in Smalltalk-80. J. Object Oriented Program. 1988;1(3):26-49.
26. Xie T, Taneja K, Kale S, Marinov D**.** Towards a Framework for Differential Unit Testing of Object-Oriented Programs. Proceedings of the Second International Workshop on Automation of Software Test: IEEE Computer Society; 2007:5.
27. Mildenberger P, Eichelberg M, Martin E**.** Introduction to the DICOM standard. Eur Radiol. 2002;12(4):920-7.
28. Haralick RM, Shanmuga.K, Dinstein I**.** Textural Features for Image Classification. Ieee Transactions on Systems Man and Cybernetics. 1973;Smc3(6):610-21.
29. Amadasun M, King R**.** Textural features corresponding to textural properties. Systems, Man and Cybernetics, IEEE Transactions on. 1989;19(5):1264-74.
30. Tang XO**.** Texture information in run-length matrices. Ieee Transactions on Image Processing. 1998;7(11):1602-9.
31. Galloway MM**.** Texture analysis using gray level run lengths. Computer Graphics and Image Processing. 1975;4(2):172-9.