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IBM Research Report

Semantic Model Vector for ImageCLEF2013

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Abstract. In this research report, we describe the dataset used to train the semantic model vector employed for the ImageCLEF 2013 medical modality visual classification task.

1 Introduction

The medical semantic model vector used for the ImageCLEF 2013 medical modality recognition task [1, 2] is trained from about 26,000 images collected from multiple sources, organized into a hierarchical taxonomy structure of 120 categories of various radiological categories. The images used to train our semantic model vector were acquired from web crawled data, the Image Retrieval in Medical Applications (IRMA) 2009 dataset [3], The Cancer Imaging Archives (TCIA) [4], Cornell University [5], and the Japanese Society of Radiological Technology (JSRT) [6]. Web crawl was performed using the Microsoft Bing search engine, with queries as the semantic concept label (abbreviations expanded). The top 500 results were saved, and cleaned by a human labeler.

Each dimension in the model vector refers to a subcategory over 7 modality domains of CT, X-Ray, ECG, MRI, PET, Ultrasound, and Slide Microscopy. The rest of the dimensions represent subcategories covering body regions (such as chest, arm, leg, head, brain, neck, etc.), views (such as antero-posterior, coronal, sagittal), and disease states (such as pneumothorax) under each modality.

2 Categories & Number of Examples

This section gives a full accounting of the name of each semantic classifier in the semantic model vector, along with the number of positive examples used for training (in parentheses).

CT (10055)
CT_BRAIN (131)
CT_CHEST (9924)
CT_CHEST_LUNGCANCER (92)
CT_CHEST_NORMAL (9690)
CT_CHEST_PNEUMOTHORAX (142)
DX (12995)
DX_APPENDAGE (4650)

DX_APPENDAGE_ARM (2422)
DX_APPENDAGE_ARM_ELBOW (371)
DX_APPENDAGE_ARM_ELBOW_AP (151)
DX_APPENDAGE_ARM_ELBOW_LAT (220)
DX_APPENDAGE_ARM_FOREARM (157)
DX_APPENDAGE_ARM_FOREARM_AP (75)
DX_APPENDAGE_ARM_FOREARM_LAT (82)
DX_APPENDAGE_ARM_HAND (1188)
DX_APPENDAGE_ARM_HAND_FINGER (158)
DX_APPENDAGE_ARM_HAND_WHOLE (798)
DX_APPENDAGE_ARM_HAND_WHOLE_AP (688)
DX_APPENDAGE_ARM_HAND_WHOLE_OBL (110)
DX_APPENDAGE_ARM_HAND_WRIST (232)
DX_APPENDAGE_ARM_HAND_WRIST_AP (114)
DX_APPENDAGE_ARM_HAND_WRIST_LAT (118)
DX_APPENDAGE_ARM_SHOULDER_32 (632)
DX_APPENDAGE_ARM_UPPER (74)
DX_APPENDAGE_LEG (2228)
DX_APPENDAGE_LEG_ANKLE (345)
DX_APPENDAGE_LEG_ANKLE_AP (177)
DX_APPENDAGE_LEG_ANKLE_LAT (168)
DX_APPENDAGE_LEG_FOOT (672)
DX_APPENDAGE_LEG_FOOT_AP (408)
DX_APPENDAGE_LEG_FOOT_LATERAL (122)
DX_APPENDAGE_LEG_FOOT_OBLIQUE (142)
DX_APPENDAGE_LEG_KNEE (829)
DX_APPENDAGE_LEG_KNEE_PATELLA (103)
DX_APPENDAGE_LEG_KNEE_WHOLE (726)
DX_APPENDAGE_LEG_KNEE_WHOLE_AP (442)
DX_APPENDAGE_LEG_KNEE_WHOLE_LAT (284)
DX_APPENDAGE_LEG_LOWER (191)
DX_APPENDAGE_LEG_LOWER_AP (125)
DX_APPENDAGE_LEG_LOWER_LAT (66)
DX_APPENDAGE_LEG_UPPER (191)
DX_APPENDAGE_LEG_UPPER_AP (133)
DX_APPENDAGE_LEG_UPPER_LAT (58)
DX_CRANIUM (1070)
DX_CRANIUM_NOSE (314)
DX_CRANIUM_NOSE_LAT (50)
DX_CRANIUM_NOSE_OCCIPITOFONTAL (264)
DX_CRANIUM_WHOLE (756)
DX_CRANIUM_WHOLE_AP (358)
DX_CRANIUM_WHOLE_FRONTOCCIPITAL (38)
DX_CRANIUM_WHOLE_LAT (360)
DX_HIP_JOINT_AP_ARTIFICIAL (84)

DX_HIP_JOINT_AP_NATURAL (127)
DX_HIP_JOINT_LAT_ARTIFICIAL (21)
DX_HIP_JOINT_LAT_NATURAL (53)
DX_TORSO (7275)
DX_TORSO ABDOMEN (379)
DX_TORSO ABDOMEN AP (204)
DX_TORSO ABDOMEN BARIUMSWALLOW (143)
DX_TORSO ABDOMEN UPPER (32)
DX_TORSO BREAST (262)
DX_TORSO BREAST LEFT (128)
DX_TORSO BREAST LEFT AXIAL (63)
DX_TORSO BREAST LEFT OBL (65)
DX_TORSO BREAST RIGHT (134)
DX_TORSO BREAST RIGHT AXIAL (65)
DX_TORSO BREAST RIGHT OBL (69)
DX_TORSO CHEST (4583)
DX_TORSO CHEST FULL (4583)
DX_TORSO CHEST FULL AP (3728)
DX_TORSO CHEST FULL AP LUNG CANCER (183)
DX_TORSO CHEST FULL AP NORMAL (302)
DX_TORSO CHEST FULL AP PNEUMONIA (204)
DX_TORSO CHEST FULL AP PNEUMOTHORAX (164)
DX_TORSO CHEST FULL AP UNKNOWN (2875)
DX_TORSO CHEST FULL LAT (855)
DX_TORSO CHEST FULL LAT LUNG CANCER (1)
DX_TORSO CHEST FULL LAT NORMAL (18)
DX_TORSO CHEST FULL LAT UNKNOWN (836)
DX_TORSO HIP (643)
DX_TORSO HIP JOINT (285)
DX_TORSO HIP JOINT AP (211)
DX_TORSO HIP JOINT LAT (74)
DX_TORSO HIP PELVIS (358)
DX_TORSO HIP PELVIS ARTIFICIAL (74)
DX_TORSO HIP PELVIS NATURAL (284)
DX_TORSO SPINE (1408)
DX_TORSO SPINE CERVICAL (635)
DX_TORSO SPINE CERVICAL AP (230)
DX_TORSO SPINE CERVICAL LAT (405)
DX_TORSO SPINE LUMBAR (536)
DX_TORSO SPINE LUMBAR AP (288)
DX_TORSO SPINE LUMBAR LAT (248)
DX_TORSO SPINE THORACIC (237)
DX_TORSO SPINE THORACIC AP (117)
DX_TORSO SPINE THORACIC LAT (120)
ECG (904)

ECG_FIBRILLATION (566)
ECG_NORMAL (338)
MR (1042)
MR_APPENDAGE (347)
MR_BRAIN (414)
MR_BRAIN_AXIAL (259)
MR_BRAIN_AXIAL_COLLAGE (103)
MR_BRAIN_AXIAL_SINGLE (156)
MR_BRAIN_SAGITTAL (155)
MR_HIP (100)
MR_KNEE (347)
MR_SPINE (181)
PET (245)
PET_BW (134)
PET_COLOR (111)
SM (334)
SM_BLOODSMEAR (334)
SM_BLOODSMEAR_NORMAL (288)
SM_BLOODSMEAR_SICKLECELL (46)
US (400)
US_CARDIAC (190)
US_FETUS (210)

3 Abbreviations

AP: Anterior-posterior view
BW: Grayscale color spectrum
CT: Computed Tomography
DX: Digital X-Ray
ECG: Electrocardiogram
LAT: Lateral view
MR: Magnetic Resonance
OBL: Oblique
PET: Positron Emission Tomography
SM: Slide Microscopy
US: Ultrasound

References

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