

Supplementary Information (SI) for: The current and future uses of machine learning in ecosystem service research.

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SI1. List of Keywords resulting from ‘machine learning’ and ‘ecosystem services’ search.

List of 33 Keywords and Keywords Plus of publications resulting from search string: “machine learning” AND (“ecosystem services” OR “ecosystem service”) frequency of occurrence as Keywords. Classified as being terms relevant to machine learning or not according to the opinion of the review team. y = relevant to machine learning, n = not relevant to machine learning.

Key Word	Frequency	Relevance
Automated content analysis (ACA)	1	y
cloud computing	1	y
Data science	1	y
Pattern recognition	1	y
PATTERN-RECOGNITION	1	y
VARIABLE SELECTION	2	y
CLASSIFICATION	8	y
ALGORITHMS	1	y
Artificial intelligence	1	y
BAYESIAN NETWORKS	4	y
BELIEF NETWORKS	2	y
BIG DATA	4	y
Data driven modelling	1	y
data mining	2	y
DECISION TREE	1	y
DECISION TREE APPROACH	1	y
Knowledge discovery	1	y
Kohonen neural network	1	y
LEARNING ALGORITHMS	1	y
Machine learning	17	y
machine learning classification	1	y
NEURAL-NETWORK	1	y
NEURAL-NETWORKS	1	y
Random forest	4	y
RANDOM FOREST CLASSIFIER	3	y
random forest regression	1	y
RANDOM FORESTS	5	y
REGRESSION TREES	1	y
Support vector machine	5	y
SUPPORT VECTOR REGRESSION	2	y
SVM, support vector machine	1	y
MULTIVARIATE CURVE RESOLUTION	1	y
MULTIVARIATE STATISTICAL-MODELS	1	y
MULTIVARIATE-ANALYSIS	2	y
Decision models	1	n
DISCRIMINANT-ANALYSIS	1	n
partial least squares regression	1	n
PERCEPTIONS	1	n
ACCUMULATION	1	n
ACCURACY	1	n

ADJUSTED VEGETATION INDEX	2	n
Aegean	1	n
Aerial photography	1	n
Agricultural ecosystem	1	n
Agriculture	1	n
AIRBORNE LIDAR	1	n
ALOS PALSAR	1	n
ALPINE GRASSLAND	1	n
ANOPLOPHORA-GLABRIPENNIS	1	n
APPARENT COMPETITION	1	n
AREA	1	n
AREAS	1	n
ARIES	1	n
ASIAN LONGHORNED BEETLE	1	n
BAND	1	n
BATHYMETRY	1	n
Bias	1	n
BIODIVERSITY	4	n
BIODIVERSITY EXPERIMENTS	1	n
BIODIVERSITY HOTSPOTS	1	n
BIOLOGICAL-CONTROL	1	n
BIOMASS	2	n
Biomass change	1	n
BIOSPHERE	1	n
BLUE CARBON	1	n
blue carbon	1	n
BODY-SIZE	2	n
BRAZILIAN AMAZON	1	n
BUILT-UP INDEX	1	n
C-13 CHEMICAL-SHIFTS	1	n
Canopy cover	1	n
CANOPY FRACTIONAL COVER	1	n
CASTRO VERDE	1	n
CELLULAR-AUTOMATA MODELS	1	n
CHANGE	1	n
change detection	1	n
CHINA	4	n
CITIES	1	n
CLIMATE	2	n
CLIMATE-CHANGE	4	n
COASTAL	1	n
COASTAL CHINA	1	n
COASTAL ECOSYSTEMS	1	n
Coastal management	1	n
COLEOPTERA	1	n
COMMUNITY	1	n
COMMUNITY FOOD WEBS	1	n
Conditional inference tree	1	n

CONSEQUENCES	1	n
CONSERVATION	6	n
CONSTRUCTED WETLANDS	1	n
CONTINUOUS FIELDS	2	n
CONUS	1	n
COVER	1	n
COVER CHANGE	1	n
CROPS	1	n
CROSS-VALIDATION	2	n
Cultural ecosystem services	1	n
CYCLE	2	n
Cyclic development	1	n
Cymodocea nodosa	1	n
DEFORESTATION	1	n
DEGRADATION	2	n
Degraded	1	n
DENSITY	1	n
DENSITY-FUNCTIONAL THEORY	1	n
DHAKA CITY	1	n
DIFFERENCE WATER INDEX	1	n
DIGITAL ELEVATION MODELS	1	n
Digital humanities	1	n
DISSOLVED ORGANIC-MATTER	1	n
DIVERSITY	1	n
Driver	1	n
DRIVING FACTORS	1	n
DRIVING FORCES	1	n
DYNAMICS	3	n
ECOLOGICAL NETWORKS	2	n
ECOLOGICAL RESTORATION	1	n
ECOLOGICAL SECURITY PATTERNS	1	n
ECOLOGICAL-QUALITY	1	n
ECOSYSTEM SERVICE	15	n
ECOSYSTEM SERVICE VARIABLES	1	n
ECOSYSTEM SERVICES	16	n
ECOSYSTEMS	1	n
ECOTOURISM	1	n
EFFECT SIZE	1	n
EMISSIONS	2	n
ENCROACHMENT	1	n
ENHANCEMENT	1	n
EnMAP	1	n
EnviroAtlas	1	n
ENVIRONMENTAL CONCERN	1	n
Environmental diagnosis	1	n
Environmental monitoring	1	n
ENVIRONMENTAL PERFORMANCE	1	n
ERS-1 SAR DATA	1	n

EVERGLADES-NATIONAL-PARK	1	n
EVOLUTIONARY HISTORY	1	n
EXPANSION	1	n
EXPERT KNOWLEDGE	2	n
faecal pollution	1	n
FARM-SCALE EVALUATIONS	2	n
Flood	1	n
FOOD-WEB STRUCTURE	1	n
FORAGING HABITAT	1	n
FOREST	2	n
FOREST ABOVEGROUND BIOMASS	1	n
forest and land use mapping	1	n
FOREST BIOMASS	1	n
FORESTS	1	n
FRAMEWORK	3	n
GENERALIST PREDATORS	1	n
GENETICALLY-MODIFIED CROPS	1	n
Geographic information systems	1	n
GEOTEXTILES	1	n
geothermal heat pump	1	n
GIS	2	n
GLOBAL CHANGE	1	n
GLOBAL CLIMATE-CHANGE	1	n
global scale	1	n
Google Earth Engine	4	n
grassland cover	1	n
GRASSLANDS	1	n
grazing	1	n
GREECE	1	n
GREENSPACE	1	n
GROWTH	1	n
Guild approach	1	n
Habitat classification	1	n
HABITAT LOSS	1	n
habitat mapping	1	n
HABITAT STRUCTURE	1	n
HISTORY	1	n
hyperspectral	1	n
HYPERSPECTRAL IMAGERY	2	n
Hyperspectral MAPper dataset	1	n
IKONOS	1	n
image composition	1	n
IMAGE-ANALYSIS	1	n
IMAGERY	5	n
IMAGES	1	n
IMPACT	1	n
INDEX	1	n
INDICATORS	1	n

INFORMATION	1	n
INTEGRATION	2	n
INTENSIFICATION	1	n
INTRAGUILD PREDATION	1	n
INVERTEBRATE ABUNDANCE	1	n
INVERTEBRATE RESPONSES	1	n
KNOWLEDGE	2	n
Land cover	5	n
land use	1	n
Land use change	1	n
LAND-COVER CLASSIFICATION	3	n
Landsat	3	n
LANDSAT-TM DATA	1	n
LANDSCAPE	1	n
landscape change	1	n
LANDSCAPE SUSTAINABILITY	1	n
LANDSCAPES	1	n
LAND-USE	3	n
LAND-USE CHANGE	3	n
LEAF-AREA INDEX	1	n
LEVEL	2	n
Literature review	1	n
LONG-TERM	1	n
Macromolecular profiling	1	n
MANAGEMENT	4	n
Mangrove	1	n
mangroves	1	n
mangroves mapping	1	n
MAPPER	1	n
Mapping	1	n
Marine fish assemblages	1	n
MARINE HABITATS	1	n
Markov chain	1	n
MEADOWS	1	n
Mediterranean seagrasses	1	n
Megacity	1	n
Metabolic profiling	1	n
METROPOLITAN-AREA	1	n
MICROBIAL INTERACTIONS	1	n
MOD44B	1	n
MODEL	1	n
Model integration	1	n
Model validation	1	n
Modeling solutions	1	n
Modelling	1	n
MODIFIED HERBICIDE-TOLERANT	2	n
MOLECULAR-DETECTION	1	n
Multi-sensor	1	n

MULTISENSOR IMAGE FUSION	1	n
Multi-temporal	1	n
MULTITEMPORAL LANDSAT	1	n
NATIONAL SCALE	1	n
Natural factors	1	n
NDWI	1	n
NET PRIMARY PRODUCTION	1	n
NORTH-AMERICA	2	n
NUCLEAR-MAGNETIC-RESONANCE	1	n
Object orientated	1	n
Object-based	1	n
OPPORTUNITIES	1	n
OPTIMIZATION	1	n
ORGANIC-CARBON	1	n
PARASITOID FLIES DIPTERA	1	n
PARTICIPATION	1	n
PATTERN	1	n
PATTERNS	2	n
PEACE-ATHABASCA DELTA	1	n
PEOPLE	2	n
permeable pavement	1	n
PERSPECTIVE	1	n
PERSPECTIVES	1	n
PLACE ATTACHMENT	1	n
POLICY	2	n
POLLINATION NETWORKS	1	n
Portugal	2	n
PORTUGAL	1	n
Posidonia oceanica	1	n
POSIDONIA-OCEANICA	1	n
PRECIPITATION	2	n
PRIORITIES	1	n
PRODUCTS	1	n
PROGRAM	2	n
PROSPECTS	2	n
protected area	1	n
PROTEIN FUNCTION	1	n
QINGHAI-TIBETAN PLATEAU	1	n
QUICKBIRD	1	n
rangeland	1	n
RapidEye	2	n
RATES	1	n
RECONNECTION	1	n
RECREATION	2	n
Recreational ecosystem services	1	n
Red Sea	1	n
REDD	1	n
REFLECTANCE	2	n

REGION	1	n
Regional scale	1	n
regionalization	1	n
remote sensing	1	n
REMOTELY-SENSED DATA	1	n
REMOVAL PERFORMANCE	1	n
RESOURCE-MANAGEMENT	1	n
RIFT-VALLEY	1	n
RISK-ASSESSMENT	1	n
RIVER	1	n
SACRAMENTO	1	n
SAMPLING COMPLETENESS	1	n
SAR	1	n
SATELLITE	1	n
SATELLITE DATA	2	n
SATELLITE IMAGERY	1	n
SCALE	1	n
SCIENCE	4	n
SEA	1	n
seagrass	1	n
Secondary tropical dry forest	1	n
SEDIMENTS	1	n
SEMIARID MEDITERRANEAN		
AGROECOSYSTEMS	1	n
Sentinel-2	1	n
SEQUESTRATION	1	n
SHALLOW WATERS	1	n
shrub encroachment	1	n
SHRUBLAND ECOSYSTEM COMPONENTS	2	n
similarity weighted	1	n
SINGAPORE	1	n
Singapore	1	n
Social factors	1	n
Social media	1	n
SOCIAL-ECOLOGICAL SYSTEMS	1	n
SOIL	1	n
soil carbon	1	n
SOLID-STATE NMR	1	n
SOURCE HEAT-PUMPS	1	n
SOUTHEAST-ASIA	1	n
SPATIAL SCALES	2	n
SPECIES ABUNDANCE	1	n
STABLE-ISOTOPE ANALYSIS	1	n
STAKEHOLDERS	1	n
STAPHYLOCOCCAL PROTEIN-A	1	n
STOCKS	1	n
storm water reuse	1	n
STREET TREES	1	n

sub-pixel mapping	1	n
SURVIVAL	1	n
SUSCEPTIBILITY ASSESSMENT	1	n
SYNERGIES	1	n
SYNTHETIC-APERTURE RADAR	1	n
SYSTEMS	2	n
temporal compositing	1	n
TEMPORAL VARIATION	1	n
THEMATIC	1	n
Thermaikos Gulf	1	n
time series	3	n
TOPOGRAPHY	1	n
TOTAL CORRELATION SPECTROSCOPY	1	n
TRADE-OFFS	1	n
TRAJECTORIES	1	n
TRANSFORMATION	1	n
Tree monitoring	1	n
Tree mortality	1	n
TROPHIC INTERACTIONS	1	n
Typology definition	1	n
UNCERTAINTY	1	n
Uncertainty, Weka	1	n
UNITED-STATES	4	n
URBAN	1	n
Urban ecology	2	n
Urban forest ecosystem services	1	n
Urban forestry	1	n
Urban monitoring	1	n
urban wetlands	1	n
URBANIZATION	3	n
Urbanization Landsat TM	1	n
US	1	n
VARIABLE IMPORTANCE	2	n
VALIDATION	1	n
VALUATION	1	n
VALUES	1	n
VARIABILITY	1	n
VEGETATION	4	n
VEGETATION COVERAGE	1	n
VISITORS	1	n
Volunteered geographic information	1	n
WATER DEPTH	1	n
WATER-QUALITY	1	n
WAVE EXPOSURE	1	n
Waveform LIDAR data	1	n
WEED SEEDBANK	1	n
wetland	1	n
WETLANDS	1	n

wildfire	1	n
YELLOWHAMMERS EMBERIZA-CITRINELLA	1	n
Archives Computational social sciences	1	n
Big literature	1	n
DATA	1	n
Database	1	n
DEEP UNCERTAINTIES	1	n
ETM PLUS	1	n
FEATURE-EXTRACTION	1	n
Feature-level fusion	1	n
GEOBIA	1	n
IMAGING SPECTROMETRY DATA	1	n
Ionian	1	n
LIDAR	1	n
LIDAR DATA	1	n
Modeling problems	1	n
OBIA	1	n
OBJECT-BASED APPROACH	1	n
PHYLOGENETIC ANALYSIS	1	n
Polarimetric SAR	1	n
PREDICTION	1	n
predictive modeling	1	n
Spatial analysis	1	n
Stochastic model	1	n
TEXT ANALYSIS	1	n
TEXTURE ANALYSIS	1	n

SI2. List of all studies reviewed.

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