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Brandsen, A.

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Appendices

A

Category frequencies

Site type categories frequency overview									
Label	Freq	Label	Freq	Label	Freq	Label	Freq	Label	Freq
xxx	33532								
cthd	1463	bewv.wp	10	idnh	2015	sv.vorg	0	bgv.meg	9
cthd.x	379	bewv.n	0	idnh.x	1074	sv.bsb	0	bgr	1502
cthd.klo	299	bewv.rv	501	idnh.tk	0	gw	169	bgr.gvic	1502
cthd.kpl	24	bewv.stel	4	idnh.tn	128	gw.x	40	infr	7327
cthd.sgmw	0	bewv.bw	0	idnh.br	36	gw.vw	58	infr.x	1248
cthd.kerk	581	bewv.hp	1566	idnh.zp	0	gw.hout	0	infr.weg	1575
cthd.rcp	372	bewv.th	0	idnh.sb	71	gw.ijw	9	infr.dam	53
cthd.oloc	1	bewv.inka	0	idnh.hkb	127	gw.zw	3	infr.werf	0
cthd.temp	2	bewv.sv	0	idnh.bb	5	gw.kw	50	infr.gem	5
bewv	25264	bewv.bext	5872	idnh.ll	112	gw.griw	0	infr.rede	0
bewv.x	15236	bewv.vkm	63	idnh.hb	4	gw.mw	4	infr.per	3766
bewv.lg	89	bewv.tw	388	idnh.m	150	gw.vsw	8	infr.strek	0
bewv.wb	51	bewv.lw	130	idnh.rom	1	bgv	6317	infr.wat	228
bewv.sch	65	apvv	3152	idnh.wam	2	bgv.x	731	infr.dui	221
bewv.vx	815	apvv.x	1415	idnh.wim	1	bgv.gvc	522	infr.vijv	0
bewv.vlp	102	apvv.vw	0	idnh.gp	0	bgv.tpgb	0	infr.kan	273
bewv.lk	0	apvv.vk	166	idnh.pb	227	bgv.gvi	536	infr.slu	103
bewv.ct	0	apvv.vs	6	idnh.vb	312	bgv.gvx	983	infr.kslu	0
bewv.cstl	5	apvv.stel	0	idnh.mb	388	bgv.kh	605	infr.lv	0
bewv.mbh	125	apvv.ek	0	idnh.mbnf	0	bgv.rgv	1	infr.hav	982
bewv.pls	0	apvv.cf	23	idnh.mbf	0	bgv.gvh	2476	infr.kade	1
bewv.kwb	490	apvv.dp	142	idnh.kb	2	bgv.bhv	0	infr.vweg	7
bewv.ht	332	apvv.la	1879	sv	971	bgv.vgv	0	infr.brug	256
bewv.aw	7	apvv.ak	0	sv.x	971	bgv.cjbp	536	infr.dok	0
bewv.dump	0	apvv.tuin	20	sv.obsb	0	bgv.uv	1295	infr.vs	0
bewv.vic	332	apvv.pdek	2	sv.ijz	0	bgv.gx	1221	infr.vrde	1
bewv.kaze	0	wrak	384	sv.h	0	bgv.gv	731	infr.spre	0
bewv.fort	8	wrak.schip	384	sv.lad	0	bgv.vg	163	infr.watw	11
bewv.sk	2470	wrak.vlgtg	5	sv.hijz	0	bgv.dier	131	infr.dij	721

Table A.1: An overview of the frequencies for all site type categories. Main categories are denoted in bold.

Time periods categories frequency overview									
Label	Freq	Label	Freq	Label	Freq	Label	Freq	Label	Freq
paleo	2077	neov	6459	bronsm	8494	romvb	12414	vmec	11767
paleov	1197	neova	6456	bronsma	8397	romm	12427	vmed	12194
paleom	1460	neovb	6445	bronsmb	8312	romma	12381	lme	18832
paleol	1816	neom	6127	bronsl	7910	rommb	12348	lmea	17053
paleola	1732	neoma	6098	ijz	13876	roml	11939	lmeb	18235
paleolb	1816	neomb	5893	ijzv	10356	romla	11921	nt	19833
meso	4290	neol	8954	ijzm	11307	romlb	11850	nta	17511
mesov	3133	neola	8200	ijzl	12033	xme	20593	ntb	17514
mesom	3152	neolb	8947	rom	13299	vme	12642	ntc	18525
mesol	4180	brons	10414	romv	12421	vmea	11645		
neo	9916	bronsv	8380	romva	12275	vmeb	11874		

Table A.2: An overview of the frequencies for all time period categories. Main categories are denoted in bold.



Filter list

Terms used for document filtering	
List name	Terms
genList	notulen, bijlage, meta
rapList	dagrapport, dag_rapport, weekrapport, week_rapport, weekverslag, week_verslag, logboek
pvaList	draaiboek, plan_van_aanpak, pva
omnList	onderzoeksmeldingsnummer, onderzoeksmeldings_nummer, onderzoeks_meldings_nummer
totList	rapList + pvaList + pveList + omnList + genList

Table B.1: An overview of different types of lists and included terms.

Category frequencies test set

Time periods categories frequency overview test set									
Label	Freq	Label	Freq	Label	Freq	Label	Freq	Label	Freq
paleo	13	neov	24	bronsm	15	romvb	25	vmec	30
paleov	7	neova	24	bronsma	14	romm	27	vmed	29
paleom	8	neovb	24	bronsmb	15	romma	27	lme	48
paleol	12	neom	23	bronsl	18	rommb	27	lmea	41
paleola	12	neoma	23	ijz	37	roml	25	lmeb	48
paleolb	12	neomb	23	ijzv	34	romla	25	nt	49
meso	21	neol	26	ijzm	28	romlb	25	nta	42
mesov	17	neola	25	ijzl	30	xme	54	ntb	43
mesom	18	neolb	26	rom	29	vme	30	ntc	39
mesol	20	brons	24	romv	25	vmea	28		
neo	29	bronsv	19	romva	25	vmeb	28		

Table C.1: An overview of the frequencies for all time period categories captured by the reference test set. Main categories are denoted in bold.

Site type categories frequency overview test set									
Label	Freq	Label	Freq	Label	Freq	Label	Freq	Label	Freq
cthd	1	bewv.hp	7	idnh.hkb	2	bgv.x	4	bgr	3
cthd.klo	1	bewv.bext	3	idnh.ll	1	bgv.gvc	2	bgr.gvic	3
bewv	65	apvv	8	idnh.m	1	bgv.gvi	3	infr	19
bewv.x	53	apvv.x	3	idnh.pb	1	bgv.gvx	3	infr.x	1
bewv.vx	1	apvv.cf	1	idnh.vb	2	bgv.kh	1	infr.weg	4
bewv.vlp	1	apvv.la	4	idnh.mb	2	bgv.ghv	6	infr.per	6
bewv.kwb	1	wrak	2	sv	1	bgv.cjbp	3	infr.kan	2
bewv.ht	10	wrak.schip	2	sv.x	1	bgv.uv	4	infr.brug	2
bewv.vic	1	idnh	11	gw	1	bgv.gx	4	infr.dij	5
bewv.sk	4	idnh.x	4	gw.vw	1	bgv.vg	1	xxx	17
bewv.rv	1	idnh.tn	1	bgv	16	bgv.dier	1		

Table C.2: An overview of the F1 scores for the main and sub-categories for site type classification as captured by the reference test set. Sub-categories not present within the reference test set are not included. Again, main categories are denoted in bold.



Curriculum Vitae

Alex Brandsen

PHD CANDIDATE · CODE WRANGLER

Leiden University, Faculty of Archaeology, Einsteinweg 2, 2333CC Leiden, The Netherlands

☎ +31 681 833 764 | ✉ a.brandsen@arch.leidenuniv.nl | 🏠 alexbrandsen.nl | 📱 alexbrandsen | 📺 alex-brandsen | 🐦 @alex_brandsen

"Programming isn't about what you know; it's about what you can figure out." - Chris Pine

Summary

I studied archaeology for my BA and MSc, but always with a focus on digital techniques and web technologies. After my studies I pursued a career in web development, working on front and back end as well as server maintenance and client liaison for six years. I completed a PhD in Digital Archaeology at Leiden University in 2022, researching the use of text mining in archaeological grey literature. I am currently a postdoc in the EXALT project, further building on my PhD research.

I'm a fast learner, tinkerer, and passionate about open science and reproducibility.

Work Experience

Leiden University

Leiden, The Netherlands

POSTDOC

June 2021 - PRESENT

- Further building on my PhD research in the EXALT project
- Creating a multilingual search engine for all available archaeological texts about the Netherlands and surrounding areas
- Developing and teaching courses at BA and MA level

Leiden University

Leiden, The Netherlands

PHD CANDIDATE

May 2017 - May 2021

- Investigating the use of Text Mining techniques to make archaeological excavation reports more accessible
- Using machine learning techniques to perform Named Entity Recognition
- Building an intuitive search UI for archaeologists
- Teaching assistance in various courses (Databases, Text Mining, etc)

Space Creative / The Wrapped Agency

Leeds, United Kingdom

WEB DEVELOPER

Jan 2010 - Apr. 2017

- Developing websites on the Magento eCommerce and Concrete5 CMS platforms, as well as designing and developing custom applications
- Worked on complex projects from initial specification and database design right up to the final stages of responsive testing
- Gained experience in Linux sysadmin & server maintenance, custom (Google) mapping, geographical searches, XML, complex jQuery applications, Photoshop, Inkscape & Illustrator

Impulse Media

York, United Kingdom

FREELANCE WEB DEVELOPER

Sep. 2010 - Dec. 2010

- Mainly working for Impulse Media, developing PHP web applications, converting PSD files to HTML/CSS templates, developing iPhone apps and working with Concrete5 CMS and eCommerce platform Magento

BioArch, University of York

York, United Kingdom

INTERNSHIP: ASSISTENT WEB DEVELOPER

Jan. 2010 - Jun. 2010

- Assisted David Harker in developing SHAARKWeb, a web-based UI that inputs and processes information from users of the NEAAR lab
- Used Object-Oriented PHP, Propel, XHTML and CSS to develop parts of the system; mainly the login system, AJAX dropdown boxes populated by external database queries and programmatically importing MS Excel spreadsheets into the database

Antiquity Journal

York, United Kingdom

INTERNSHIP: ASSISTENT WEB DESIGNER

Oct. 2009 - Dec. 2009

- Created a new Project Gallery Archive homepage

The Open Boek Project, at Rijksdienst voor Cultureel Erfgoed

Amersfoort, The Netherlands

INTERNSHIP: ASSISTANT WEB/SOFTWARE DEVELOPER

Nov. 2008 - Mar. 2008

- Assisted in making the smart index- and search engine 'Open Boek' more user-friendly for archaeologists
- Adapted the system to be able to process Dutch texts as well as English texts
- Gained experience with LaTeX, MySQL, PHP, AWK and Bash-shell scripting

Education

University of York

MSc IN ARCHAEOLOGICAL INFORMATION SYSTEMS

- Grade: 1st Class Distinction
- Major in Archaeological Information Systems
- Main Topics: Web Design, Database Design, Geographical Information Systems & Virtual Reality
- Minor in Zooarchaeology
- Dissertation: Digital Medieval Graffiti; Using online-GIS to display and edit non-geographical data

York, United Kingdom

Sep. 2010

Leiden University

BA IN ARCHAEOLOGY

- Grade: 7.5
- Major in European Prehistory
- Minor in Archaeological Information Systems (Database Design, GIS & Use of Total Station)
- Additional courses: Physical Anthropology
- Thesis Topic: Using Ground Penetrating Radar to assess burial mounds

Leiden, The Netherlands

Sep. 2009

Tabor College, Location Werenfridus

VWO (PRE-UNIVERSITY SECONDARY EDUCATION)

- Specialisation: Economics and Society. Main topics are History and Economics
- Additional course: Computer Science (MS Access, SQL, Java & HTML)

Hoorn, The Netherlands

Jul. 2005

Publications

Brandsen, A, & Lippok, F, 2021. A burning question – Using an intelligent grey literature search engine to change our views on early medieval burial practices in the Netherlands. *Journal of Archaeological Science*, 133. DOI: 10.1016/j.jas.2021.105456

Brandsen, A & Koole, M, 2021. Labelling the Past: Data Set Creation and Multi-label Classification of Dutch Archaeological Excavation Reports. *Language Resources and Evaluation*. DOI: 10.1007/s10579-021-09552-6

Brandsen, A, Verberne, S, Lambers, K & Wansleebe, M, 2020. Creating a Dataset for Named Entity Recognition in the Archaeology Domain. *Proceedings of the 12th Language Resources and Evaluation Conference*, pp.4573-4577. URL: www.aclweb.org/anthology/2020.lrec-1.562

Brandsen, A, Lambers, K, Verberne, S & Wansleebe, M, 2019. User Requirement Solicitation for an Information Retrieval System Applied to Dutch Grey Literature in the Archaeology Domain. *Journal of Computer Applications in Archaeology*, 2(1), pp.21–30. DOI: 10.5334/jcaa.33

Pajmans, H & Brandsen, A, 2010. Searching in Archaeological Texts. Problems and Solutions Using an Artificial Intelligence Approach, *PalArchs Journal of Archaeology of Egypt/Egyptology*, 7(2).

Pajmans, H & Brandsen, A, 2009. What is in a Name: Recognizing Monument Names from Free-Text Monument Descriptions, *Proceedings of the 18th Annual Belgian-Dutch Conference on Machine Learning*. Tilburg centre for Creative Computing, Tilburg.

Selected Presentations

2021	CLIN31 , Can BERT Dig It? Named Entity Recognition for Information Retrieval in the Archaeology Domain	Online
2020	Keeping Archaeology Together , Using Transfer Learning for NER in Dutch Excavation Reports	Online
2020	CLIN30 , BERT-NL: a set of language models pre-trained on the Dutch SoNaR corpus	Utrecht
2019	Machine Learning in Archaeology , Using Machine Learning for NER in Dutch Excavation Reports	Rome
2019	CAA , User Interface Design and Evaluation for Online Professional Search in Dutch Archaeology	Krakow
2019	ICT Open , Brinke-generator - Computer Assisted Assignment of Thesaurus Topics for Scientific Texts	Hilversum
2018	EAA , Utilising Text Mining to Unlock the Hidden Knowledge in Dutch Archaeological Reports	Barcelona
2018	DHBenelux 2018 , Knowledge dissemination and discovery in Dutch excavation data	Amsterdam
2017	DIR2017 , Archaeological Entity Recognition for Information Retrieval in Dutch Archaeological Reports	Hilversum

Committees

2020	Committee member , ARCHON Digital Archaeology Workgroup	Amsterdam
2020	Outreach Officer , CAA NL/FL	Amsterdam
2019	Main organiser , Digital Archaeology Group	Leiden
2019	Committee member , ARCHON Digital Archaeology Workgroup	Leiden
2018	Committee member , Dutch-Belgian Information Retrieval Workshop 2018	Leiden
2018	Committee member , Digital Archaeology Workshops Netherlands-Flanders (DAWN) 2018	Leiden

Glossary

- ABR** *Archeologisch Basisregister*. 33, 52–57, 62, 63, 82, 89, 124
- ADS** Archaeology Data Service. 30, 79
- AGNES** Archaeological Grey-literature Named Entity Search. 3–10, 37, 48, 53, 78, 79, 83, 90, 92–99, 110, 111, 140, 142–146, 148–151, 153, 154, 156, 158–161, 167–171, VI, X
- ALICE** Academic Leiden Interdisciplinary Cluster Environment. 33
- API** Application Programming Interface. 30, 79, 90, 125
- Archis** *Archeologisch Informatiesysteem*, a system for registering and accessing data about archaeological research, finds and monuments in the Netherlands, maintained by the RCE. 87, 94, 95, 141, 150, 151, 153, X
- ARIADNE** Advanced Research Infrastructure for Archaeological Dataset Networking in Europe. 30, 31, 34, 37, 38, 79, 81, 94, 174
- BERT** Bidirectional Encoder Representations from Transformers. 4, 8, 9, 52, 63, 64, 66, 73, 114, 116–121, 123, 126–128, 130, 135–137, 144, 155, 164, 165, 167, 168, 172, 175, XIII
- Bi-LSTM** Bidirectional Long Short Term Memory. 30, 118, 120
- BIO** Beginning, Inside, Outside. 27
- CATCH** Continuous Access To Cultural Heritage. 78
- Corpus** A large collection of texts. It is a body of written or spoken material upon which a linguistic analysis is based. 7, 8, 32, 36, 38, 40, 45, 60, 77, 81, 90, 115, 116, 120, 123, 124, 130, 131, 136, 159, 162, 163, 165, XIII

- CRF** Conditional Random Fields. 8, 30, 42, 43, 45, 76, 80, 82, 90, 114, 116–119, 123, 124, 126, 128, 135, 137, 164, 175
- CSV** Comma Separated Values. 145, 155
- DANS** Data Archiving and Networked Services. 2, 3, 19, 32, 38, 53, 54, 59, 77, 82, 83, 87, 90, 94–97, 115, 125, 140, 144, 153, 167, 169, 171, 173
- Deep Learning** A subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks. These Deep Learning algorithms are more complex and computationally expensive when compared to traditional Machine Learning approaches, but also generally produce better results. 32, 33, 165
- DSRP** Data Science Research Programme. 33, 77, 79
- ElasticSearch** An open source, full-text search engine. Used for all the indexing and retrieval tasks in this project. 76, 82, 83, 97, 116, 125, 126, 130, 145
- EXALT** EXcavating Archaeological LiTerature. 167, 170–172
- F1 Score** The F1 score (or F measure) combines recall and precision to provide an overall evaluation metric. More specifically, it is the harmonic mean of precision and recall. 6, 8, 28, 29, 34, 36, 37, 41–43, 45, 49, 51, 52, 63, 64, 66, 67, 69, 72, 74, 114, 116, 120, 121, 123, 124, 126, 128, 132, 136, 137, 145, 165, 166, 174
- FAIR** Findability, Accessibility, Interoperability, Reusability. 16, 20, 21, 158, 162, 163
- GATE** General Architecture for Text Engineering. 31, 79
- GIS** Geographical Information Systems. 90
- Gold Standard** A test set of human annotated documents describing the desirable system outcome. 31, 34, 82, 88–90
- Grey Literature** Materials and research produced by organisations outside of the traditional commercial or academic publishing and distribution channels. 2, 3, 8, 9, 16–18, 22, 29–32, 36, 48, 76–79, 87, 90, 92, 96, 110, 114, 140–143, 146, 154
- HTTP** Hypertext Transfer Protocol. 82
- IAA** Inter Annotator Agreement. 8, 36–39, 41, 121, 135, 165, 167, 174
- Information Need** A user’s end goal in a specific search session, or a description of the information or the answer they are looking for. 8, 23, 24, 29, 48, 54, 90, 92, 93, 97, 100–104, 115, 116, 125, 137, 146, 148, 149, 154, 156

- IR** Information Retrieval. 22–24, 29–31, 76, 78, 86, 87, 92, 93, 95, 96, 114, 118, 119, 166, 174
- JSON** JavaScript Object Notation. 7, 82, 83, 125, 162
- KB** *Koninklijke Bibliotheek*. 19, 77, 90, 94, 167
- LIACS** Leiden Institute of Advanced Computer Science. 33
- LOD** Linked Open Data. 172
- MEAN** Miscellaneous, Exceptional, Arbitrary, Nonconformist. 162
- Metadata** Data that provides information about other data, often describing certain properties of a data set. 2, 6, 8, 21, 29, 30, 36, 48–50, 52–57, 59, 73, 77, 79, 80, 92, 94, 95, 97, 104, 114, 115, 119, 120, 125, 141, 153, 154, 161, 167, 173
- NER** Named Entity Recognition. 7, 8, 24–31, 33, 34, 36–38, 45, 50, 63, 73, 76, 78–82, 87–90, 97, 104, 114, 116–121, 123, 125, 126, 128, 130–132, 137, 141, 142, 144, 148, 153–155, 165, 166, 168, 171, 172, 174, 175
- NLP** Natural Language Processing. 22, 27, 29, 30, 51–53, 93, 118, 120, 144, 170
- NOaA** *Nationale Onderzoeksagenda Archeologie*. 162
- NWO** *Nederlandse organisatie voor Wetenschappelijk Onderzoek*. 19
- OCR** Optical Character Recognition. 15, 22, 38, 163
- PDF** Portable Document Format. 21, 31, 32, 36, 38, 49, 53, 83, 96, 97, 115, 141, 142, 163, 164, 173
- POS** Part Of Speech. 27, 81
- Precision** An evaluation measure that indicates, out of all the labelled entities, what percentage has been assigned the correct label. 6, 28, 29, 52, 64, 81, 82, 88, 92, 103, 115, 126, 128, 130, 134, 135, 148, 155, 156, 165, 166, 168
- Python** A widely used high-level programming language, used for most of the programming in this project. 81, 164
- RCE** *Rijksdienst voor het Cultureel Erfgoed*. 19, 33, 53, 77, 82, 85, 87, 89, 90, 94, 141, 161
- RDF** Resource Description Framework. 30
- Recall** An evaluation measure that indicates out of all the entities in a text, what percentage have been correctly labelled as an entity. 6, 24, 28, 29, 51, 52, 63, 64, 67, 69, 81, 82, 88, 92, 103, 115, 116, 125, 126, 128–130, 134, 137, 148, 165, 166, 168, 169, XII, XIII

SIKB *Stichting Infrastructuur Kwaliteitsborging Bodembeheer*. 19, 77, 173

SVM Support Vector Machine. 52, 62, 66, 67, 72, 164, 167

Text Mining The process of analysing text to extract information from it. 2, 3, 9, 12, 21, 24, 30, 31, 48, 76–79, 169

TF-IDF Term Frequency - Inverse Document Frequency. 126, 167

UI User Interface. 97, 109–111

XML eXtensible Markup Language. 34, 53–55, 81, 173