Web genre classification with methods for structured output prediction[1]

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Abstract

This is the supplementary information for the paper. It contains all of the results obtained with the experimental evaluation using single tree models.

Keywords: web genre classification; hierarchy construction; hierarchical multi-label classification

1. Complete results using single tree models

Acknowledgments

We acknowledge the financial support of the European Commission through the grant ICT-2013-612944 MAESTRA.

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Table 1: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *Hamming loss* where smaller value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.105	0.11	0.089	0.087	0.084	0.088	0.088	0.081	0.013	0.013	0.013	0.013	0.013	0.012	0.014	0.013	0.092	0.078
TFIDFSrf	0.097	0.092	0.081	0.083	0.082	0.086	0.109	0.096	0.011	0.011	0.01	0.012	0.01	0.01	0.012	0.01	0.102	0.083
Struc	0.101	0.115	0.107	0.109	0.105	0.114	0.108	0.092	0.014	0.014	0.015	0.014	0.014	0.014	0.015	0.014	0.092	0.102
Pres	0.119	0.117	0.092	0.102	0.096	0.102	0.118	0.093	0.04	0.04	0.036	0.037	0.04	0.04	0.036	0.033	0.092	0.104
Context	0.097	0.091	0.091	0.092	0.092	0.1	0.091	0.094	0.074	0.074	0.066	0.066	0.065	0.065	0.065	0.063	0.089	0.087
PV_R	0.105	0.109	0.109	0.113	0.115	0.11	0.109	0.109	0.013	0.012	0.012	0.012	0.012	0.011	0.013	0.011	0.091	0.103
PV_C	0.125	0.114	0.1	0.1	0.103	0.105	0.095	0.095	0.011	0.01	0.01	0.01	0.01	0.01	0.012	0.01	0.091	0.097
PV_Gl_R	0.093	0.096	0.106	0.103	0.126	0.113	0.097	0.121	0.013	0.012	0.012	0.012	0.011	0.011	0.013	0.012	0.091	0.105
PV_Gl_C	0.11	0.109	0.128	0.093	0.12	0.093	0.106	0.136	0.012	0.011	0.011	0.011	0.011	0.011	0.012	0.011	0.091	0.102
Ngrams	0.089	0.105	0.095	0.094	0.091	0.091	0.095	0.092	0.014	0.014	0.013	0.013	0.013	0.013	0.014	0.014	0.091	0.086
SPIRIT																		
BOWSrf	0.1	0.101	0.1	0.102	0.103	0.103	0.101	0.103	0.012	0.011	0.014	0.012	0.012	0.012	0.016	0.014	0.109	0.109
TFIDFSrf	0.1	0.105	0.107	0.104	0.103	0.103	0.101	0.105	0.011	0.01	0.011	0.011	0.011	0.01	0.012	0.011	0.109	0.114
Struc	0.104	0.106	0.106	0.097	0.104	0.104	0.109	0.105	0.012	0.011	0.012	0.012	0.012	0.011	0.013	0.011	0.114	0.119
Pres	0.103	0.118	0.109	0.109	0.107	0.107	0.103	0.107	0.047	0.048	0.045	0.045	0.047	0.048	0.044	0.052	0.144	0.11
Context	0.113	0.113	0.13	0.107	0.109	0.109	0.11	0.106	0.082	0.082	0.083	0.084	0.082	0.083	0.085	0.088	0.129	0.136
PV_R	0.119	0.119	0.112	0.108	0.11	0.116	0.11	0.108	0.011	0.01	0.012	0.011	0.01	0.011	0.013	0.012	0.108	0.126
PV_C	0.118	0.117	0.117	0.115	0.111	0.111	0.114	0.113	0.011	0.01	0.012	0.011	0.01	0.01	0.013	0.012	0.117	0.128
PV_Gl_R	0.126	0.117	0.125	0.128	0.122	0.122	0.125	0.118	0.011	0.01	0.012	0.011	0.01	0.01	0.013	0.012	0.136	0.13
PV_Gl_C	0.123	0.124	0.116	0.115	0.115	0.116	0.122	0.115	0.011	0.01	0.013	0.011	0.01	0.01	0.013	0.012	0.129	0.129
Ngrams	0.117	0.115	0.116	0.119	0.122	0.108	0.115	0.118	0.016	0.014	0.017	0.014	0.014	0.015	0.015	0.013	0.113	0.12

Table 2: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *accuracy* where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.105	0.11	0.089	0.087	0.084	0.088	0.088	0.081	0.013	0.013	0.013	0.013	0.013	0.012	0.014	0.013	0.092	0.078
TFIDFSrf	0.097	0.092	0.081	0.083	0.082	0.086	0.109	0.096	0.011	0.011	0.01	0.012	0.01	0.01	0.012	0.01	0.102	0.083
Struc	0.101	0.115	0.107	0.109	0.105	0.114	0.108	0.092	0.014	0.014	0.015	0.014	0.014	0.014	0.015	0.014	0.092	0.102
Pres	0.119	0.117	0.092	0.102	0.096	0.102	0.118	0.093	0.04	0.04	0.036	0.037	0.04	0.04	0.036	0.033	0.092	0.104
Context	0.097	0.091	0.091	0.092	0.092	0.1	0.091	0.094	0.074	0.074	0.066	0.066	0.065	0.065	0.065	0.063	0.089	0.087
PV_R	0.105	0.109	0.109	0.113	0.115	0.11	0.109	0.109	0.013	0.012	0.012	0.012	0.012	0.011	0.013	0.011	0.091	0.103
PV_C	0.125	0.114	0.1	0.1	0.103	0.105	0.095	0.095	0.011	0.01	0.01	0.01	0.01	0.01	0.012	0.01	0.091	0.097
PV_Gl_R	0.093	0.096	0.106	0.103	0.126	0.113	0.097	0.121	0.013	0.012	0.012	0.012	0.011	0.011	0.013	0.012	0.091	0.105
PV_Gl_C	0.11	0.109	0.128	0.093	0.12	0.093	0.106	0.136	0.012	0.011	0.011	0.011	0.011	0.011	0.012	0.011	0.091	0.102
Ngrams	0.089	0.105	0.095	0.094	0.091	0.091	0.095	0.092	0.014	0.014	0.013	0.013	0.013	0.013	0.014	0.014	0.091	0.086
SPIRIT																		
BOWSrf	0.1	0.101	0.1	0.102	0.103	0.103	0.101	0.103	0.012	0.011	0.014	0.012	0.012	0.012	0.016	0.014	0.109	0.109
TFIDFSrf	0.1	0.105	0.107	0.104	0.103	0.103	0.101	0.105	0.011	0.01	0.011	0.011	0.011	0.01	0.012	0.011	0.109	0.114
Struc	0.104	0.106	0.106	0.097	0.104	0.104	0.109	0.105	0.012	0.011	0.012	0.012	0.012	0.011	0.013	0.011	0.114	0.119
Pres	0.103	0.118	0.109	0.109	0.107	0.107	0.103	0.107	0.047	0.048	0.045	0.045	0.047	0.048	0.044	0.052	0.144	0.11
Context	0.113	0.113	0.13	0.107	0.109	0.109	0.11	0.106	0.082	0.082	0.083	0.084	0.082	0.083	0.085	0.088	0.129	0.136
PV_R	0.119	0.119	0.112	0.108	0.11	0.116	0.11	0.108	0.011	0.01	0.012	0.011	0.01	0.011	0.013	0.012	0.108	0.126
PV_C	0.118	0.117	0.117	0.115	0.111	0.111	0.114	0.113	0.011	0.01	0.012	0.011	0.01	0.01	0.013	0.012	0.117	0.128
PV_Gl_R	0.126	0.117	0.125	0.128	0.122	0.122	0.125	0.118	0.011	0.01	0.012	0.011	0.01	0.01	0.013	0.012	0.136	0.13
PV_Gl_C	0.123	0.124	0.116	0.115	0.115	0.116	0.122	0.115	0.011	0.01	0.013	0.011	0.01	0.01	0.013	0.012	0.129	0.129
Ngrams	0.117	0.115	0.116	0.119	0.122	0.108	0.115	0.118	0.016	0.014	0.017	0.014	0.014	0.015	0.015	0.013	0.113	0.12

Table 3: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *precision* where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.243	0.256	0.314	0.323	0.311	0.323	0.294	0.302	0.886	0.892	0.889	0.888	0.894	0.895	0.88	0.89	0.086	0.341
TFIDFSrf	0.186	0.218	0.306	0.339	0.341	0.335	0.244	0.312	0.902	0.901	0.91	0.893	0.905	0.908	0.897	0.917	0.147	0.326
Struc	0.159	0.16	0.224	0.221	0.242	0.213	0.177	0.197	0.876	0.878	0.878	0.885	0.886	0.882	0.873	0.885	0.086	0.176
Pres	0.188	0.165	0.185	0.23	0.205	0.23	0.187	0.183	0.666	0.656	0.691	0.678	0.661	0.653	0.666	0.7	0.086	0.204
Context	0.212	0.194	0.273	0.266	0.265	0.25	0.237	0.264	0.398	0.401	0.394	0.401	0.403	0.403	0.412	0.395	0.12	0.183
PV_R	0.17	0.166	0.199	0.196	0.199	0.196	0.157	0.2	0.886	0.891	0.896	0.894	0.897	0.899	0.884	0.897	0.093	0.188
PV_C	0.184	0.142	0.194	0.188	0.2	0.211	0.181	0.2	0.902	0.908	0.912	0.91	0.912	0.912	0.899	0.91	0.093	0.23
PV_Gl_R	0.114	0.119	0.181	0.185	0.164	0.182	0.181	0.174	0.887	0.891	0.891	0.896	0.893	0.897	0.879	0.89	0.093	0.175
PV_Gl_C	0.165	0.174	0.184	0.158	0.19	0.158	0.219	0.183	0.898	0.904	0.911	0.911	0.909	0.91	0.9	0.906	0.093	0.201
Ngrams	0.194	0.258	0.28	0.272	0.248	0.236	0.212	0.259	0.881	0.882	0.894	0.884	0.886	0.885	0.868	0.878	0.093	0.309
SPIRIT																		
BOWSrf	0.631	0.622	0.591	0.616	0.612	0.594	0.587	0.614	0.938	0.948	0.926	0.943	0.946	0.948	0.914	0.932	0.611	0.51
TFIDFSrf	0.628	0.607	0.574	0.602	0.6	0.6	0.591	0.601	0.948	0.946	0.946	0.943	0.94	0.946	0.94	0.943	0.611	0.48
Struc	0.577	0.569	0.581	0.61	0.579	0.579	0.56	0.577	0.944	0.944	0.946	0.942	0.942	0.943	0.943	0.946	0.574	0.468
Pres	0.505	0.556	0.549	0.549	0.549	0.547	0.538	0.549	0.772	0.777	0.784	0.779	0.781	0.765	0.791	0.752	0.525	0.464
Context	0.538	0.537	0.485	0.552	0.543	0.545	0.537	0.545	0.635	0.636	0.628	0.627	0.633	0.631	0.621	0.6	0.455	0.414
PV_R	0.477	0.501	0.537	0.558	0.55	0.535	0.543	0.56	0.944	0.948	0.934	0.94	0.946	0.942	0.931	0.932	0.555	0.411
PV_C	0.533	0.532	0.532	0.541	0.536	0.535	0.512	0.532	0.943	0.949	0.947	0.949	0.951	0.949	0.935	0.938	0.548	0.418
PV_Gl_R	0.528	0.535	0.529	0.524	0.535	0.535	0.529	0.557	0.945	0.953	0.941	0.948	0.951	0.951	0.936	0.937	0.416	0.395
PV_Gl_C	0.486	0.5	0.536	0.536	0.536	0.534	0.518	0.536	0.941	0.946	0.937	0.944	0.947	0.946	0.932	0.94	0.46	0.419
Ngrams	0.512	0.53	0.544	0.534	0.512	0.495	0.553	0.542	0.913	0.924	0.904	0.925	0.921	0.922	0.918	0.933	0.549	0.444

Table 4: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *recall* where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.29	0.298	0.281	0.283	0.276	0.29	0.258	0.269	0.91	0.917	0.92	0.919	0.919	0.921	0.905	0.914	0.062	0.397
TFIDFSrf	0.256	0.27	0.271	0.295	0.306	0.299	0.311	0.343	0.906	0.903	0.951	0.899	0.907	0.908	0.9	0.954	0.106	0.396
Struc	0.221	0.23	0.264	0.254	0.277	0.269	0.232	0.215	0.91	0.918	0.916	0.932	0.924	0.927	0.916	0.93	0.062	0.234
Pres	0.233	0.199	0.167	0.232	0.189	0.234	0.254	0.184	0.739	0.725	0.756	0.728	0.733	0.72	0.72	0.734	0.062	0.276
Context	0.187	0.152	0.242	0.246	0.231	0.277	0.202	0.255	0.521	0.521	0.447	0.462	0.459	0.458	0.468	0.443	0.093	0.189
PV_R	0.179	0.185	0.221	0.238	0.242	0.221	0.222	0.222	0.911	0.921	0.926	0.925	0.927	0.931	0.91	0.924	0.067	0.251
PV_C	0.262	0.208	0.181	0.198	0.207	0.221	0.179	0.204	0.919	0.931	0.936	0.935	0.936	0.939	0.921	0.937	0.067	0.299
PV_Gl_R	0.137	0.142	0.165	0.161	0.229	0.198	0.164	0.221	0.913	0.925	0.92	0.927	0.925	0.933	0.909	0.924	0.067	0.23
PV_Gl_C	0.213	0.223	0.275	0.148	0.264	0.148	0.222	0.296	0.924	0.935	0.933	0.939	0.937	0.941	0.923	0.933	0.067	0.256
Ngrams	0.195	0.281	0.27	0.243	0.249	0.23	0.214	0.267	0.912	0.915	0.923	0.919	0.916	0.921	0.896	0.92	0.067	0.378
SPIRIT																		
BOWSrf	0.577	0.624	0.534	0.585	0.587	0.579	0.529	0.593	0.936	0.949	0.953	0.943	0.946	0.95	0.946	0.94	0.601	0.545
TFIDFSrf	0.576	0.629	0.551	0.593	0.582	0.58	0.53	0.599	0.958	0.95	0.956	0.957	0.954	0.962	0.949	0.958	0.601	0.526
Struc	0.536	0.539	0.561	0.534	0.536	0.536	0.534	0.552	0.945	0.951	0.944	0.952	0.95	0.951	0.939	0.947	0.561	0.5
Pres	0.428	0.584	0.524	0.524	0.501	0.505	0.431	0.501	0.821	0.79	0.824	0.804	0.827	0.799	0.814	0.769	0.702	0.421
Context	0.497	0.497	0.555	0.439	0.445	0.443	0.433	0.409	0.675	0.684	0.654	0.673	0.682	0.668	0.654	0.637	0.529	0.593
PV_R	0.526	0.522	0.543	0.524	0.507	0.532	0.538	0.529	0.945	0.953	0.956	0.958	0.951	0.948	0.958	0.953	0.456	0.469
PV_C	0.511	0.524	0.555	0.554	0.487	0.492	0.556	0.509	0.962	0.963	0.962	0.962	0.966	0.963	0.954	0.957	0.519	0.451
PV_Gl_R	0.528	0.468	0.566	0.566	0.577	0.577	0.566	0.53	0.966	0.955	0.963	0.947	0.955	0.951	0.96	0.952	0.58	0.449
PV_Gl_C	0.51	0.53	0.552	0.549	0.549	0.551	0.573	0.549	0.955	0.958	0.949	0.958	0.955	0.957	0.95	0.954	0.554	0.468
Ngrams	0.484	0.475	0.586	0.566	0.583	0.456	0.593	0.574	0.929	0.941	0.914	0.933	0.94	0.934	0.946	0.949	0.471	0.49

Table 5: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced k-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is F_1 *score* where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.264	0.276	0.296	0.302	0.292	0.306	0.275	0.285	0.897	0.904	0.904	0.904	0.907	0.908	0.892	0.902	0.072	0.367
TFIDFSrf	0.216	0.241	0.287	0.315	0.322	0.316	0.274	0.326	0.904	0.902	0.93	0.896	0.906	0.908	0.898	0.935	0.123	0.357
Struc	0.185	0.189	0.243	0.237	0.258	0.238	0.201	0.206	0.893	0.898	0.897	0.908	0.904	0.904	0.894	0.907	0.072	0.201
Pres	0.208	0.18	0.175	0.231	0.197	0.232	0.215	0.184	0.701	0.689	0.722	0.702	0.695	0.685	0.692	0.717	0.072	0.235
Context	0.199	0.171	0.257	0.256	0.247	0.263	0.218	0.26	0.451	0.453	0.419	0.43	0.429	0.429	0.438	0.417	0.105	0.186
PV_R	0.175	0.175	0.209	0.215	0.218	0.208	0.184	0.21	0.898	0.906	0.911	0.909	0.912	0.915	0.897	0.911	0.078	0.215
PV_C	0.216	0.169	0.187	0.193	0.203	0.216	0.18	0.202	0.91	0.919	0.924	0.922	0.924	0.925	0.91	0.923	0.078	0.26
PV_Gl_R	0.125	0.129	0.173	0.172	0.191	0.19	0.172	0.195	0.9	0.908	0.905	0.911	0.909	0.915	0.894	0.907	0.078	0.199
PV_Gl_C	0.186	0.195	0.221	0.153	0.221	0.153	0.22	0.226	0.911	0.919	0.922	0.925	0.922	0.925	0.911	0.92	0.078	0.225
Ngrams	0.194	0.269	0.275	0.257	0.249	0.233	0.213	0.263	0.896	0.898	0.908	0.901	0.901	0.903	0.882	0.899	0.078	0.34
SPIRIT																		
BOWSrf	0.603	0.623	0.561	0.6	0.599	0.587	0.557	0.603	0.937	0.949	0.939	0.943	0.946	0.949	0.93	0.936	0.606	0.527
TFIDFSrf	0.601	0.617	0.562	0.598	0.591	0.59	0.559	0.6	0.953	0.948	0.951	0.95	0.947	0.954	0.944	0.951	0.606	0.502
Struc	0.556	0.554	0.57	0.57	0.557	0.557	0.547	0.564	0.944	0.948	0.945	0.947	0.946	0.947	0.941	0.946	0.567	0.484
Pres	0.464	0.57	0.536	0.536	0.524	0.525	0.478	0.524	0.796	0.784	0.803	0.791	0.803	0.782	0.802	0.76	0.601	0.441
Context	0.517	0.516	0.517	0.489	0.489	0.489	0.48	0.467	0.654	0.659	0.641	0.649	0.657	0.649	0.637	0.618	0.489	0.488
PV_R	0.501	0.512	0.54	0.541	0.528	0.533	0.541	0.544	0.945	0.95	0.945	0.949	0.948	0.945	0.944	0.942	0.501	0.438
PV_C	0.522	0.528	0.543	0.547	0.51	0.513	0.533	0.52	0.952	0.956	0.954	0.956	0.959	0.956	0.944	0.947	0.533	0.434
PV_Gl_R	0.528	0.499	0.547	0.544	0.556	0.556	0.547	0.543	0.955	0.954	0.951	0.948	0.953	0.951	0.948	0.944	0.484	0.42
PV_Gl_C	0.498	0.514	0.544	0.543	0.543	0.542	0.544	0.543	0.948	0.952	0.943	0.951	0.951	0.952	0.941	0.947	0.502	0.442
Ngrams	0.497	0.501	0.564	0.55	0.545	0.475	0.572	0.557	0.921	0.933	0.909	0.929	0.93	0.928	0.932	0.941	0.507	0.466

Table 6: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *subset accuracy* where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.101	0.11	0.176	0.179	0.171	0.182	0.157	0.163	0.766	0.775	0.77	0.774	0.776	0.785	0.76	0.775	0.04	0.173
TFIDFSrf	0.075	0.086	0.176	0.198	0.186	0.194	0.091	0.156	0.811	0.807	0.815	0.785	0.809	0.812	0.793	0.829	0.069	0.141
Struc	0.047	0.048	0.07	0.079	0.082	0.068	0.046	0.067	0.763	0.764	0.747	0.765	0.764	0.762	0.756	0.761	0.04	0.066
Pres	0.069	0.043	0.093	0.104	0.101	0.104	0.061	0.074	0.445	0.437	0.469	0.465	0.434	0.423	0.474	0.493	0.04	0.071
Context	0.107	0.103	0.153	0.148	0.149	0.122	0.129	0.142	0.181	0.18	0.211	0.21	0.216	0.214	0.224	0.209	0.069	0.073
PV_R	0.075	0.061	0.055	0.056	0.049	0.055	0.023	0.055	0.78	0.79	0.795	0.788	0.794	0.797	0.78	0.794	0.044	0.075
PV_C	0.062	0.044	0.099	0.09	0.087	0.105	0.077	0.1	0.804	0.812	0.82	0.816	0.82	0.819	0.799	0.817	0.044	0.089
PV_Gl_R	0.045	0.038	0.072	0.083	0.034	0.062	0.086	0.039	0.784	0.79	0.785	0.795	0.796	0.799	0.774	0.79	0.044	0.063
PV_Gl_C	0.055	0.055	0.045	0.077	0.045	0.077	0.098	0.021	0.799	0.8	0.808	0.807	0.806	0.805	0.793	0.799	0.044	0.073
Ngrams	0.102	0.113	0.167	0.168	0.137	0.141	0.108	0.141	0.762	0.765	0.779	0.768	0.77	0.771	0.754	0.761	0.044	0.127
SPIRIT																		
BOWSrf	0.288	0.274	0.264	0.261	0.261	0.262	0.254	0.257	0.84	0.848	0.829	0.848	0.843	0.848	0.803	0.826	0.26	0.227
TFIDFSrf	0.288	0.262	0.235	0.251	0.27	0.268	0.265	0.251	0.867	0.866	0.866	0.86	0.855	0.865	0.855	0.858	0.26	0.211
Struc	0.255	0.252	0.264	0.295	0.264	0.264	0.241	0.27	0.853	0.855	0.853	0.851	0.852	0.854	0.845	0.853	0.235	0.177
Pres	0.251	0.207	0.281	0.281	0.275	0.275	0.243	0.275	0.525	0.511	0.53	0.533	0.518	0.497	0.533	0.471	0.189	0.2
Context	0.19	0.191	0.138	0.25	0.237	0.238	0.24	0.267	0.313	0.316	0.313	0.296	0.315	0.309	0.291	0.292	0.096	0.052
PV_R	0.194	0.204	0.216	0.251	0.255	0.237	0.233	0.248	0.861	0.867	0.848	0.861	0.863	0.86	0.85	0.855	0.271	0.14
PV_C	0.227	0.218	0.203	0.226	0.234	0.237	0.197	0.224	0.855	0.867	0.858	0.86	0.872	0.862	0.842	0.852	0.247	0.152
PV_Gl_R	0.206	0.213	0.193	0.193	0.197	0.197	0.193	0.235	0.865	0.873	0.856	0.86	0.868	0.869	0.849	0.852	0.052	0.126
PV_Gl_C	0.182	0.189	0.217	0.217	0.217	0.217	0.197	0.217	0.857	0.864	0.846	0.862	0.868	0.862	0.836	0.847	0.098	0.15
Ngrams	0.223	0.247	0.238	0.241	0.207	0.237	0.243	0.243	0.813	0.829	0.806	0.826	0.826	0.818	0.815	0.835	0.268	0.169

Table 7: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *micro precision* where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.248	0.24	0.315	0.324	0.339	0.319	0.308	0.357	0.899	0.9	0.891	0.894	0.899	0.903	0.896	0.902	0.13	0.41
TFIDFSrf	0.265	0.293	0.358	0.356	0.362	0.34	0.241	0.304	0.938	0.939	0.904	0.928	0.942	0.943	0.933	0.91	0.147	0.384
Struc	0.226	0.196	0.232	0.219	0.244	0.214	0.209	0.262	0.889	0.885	0.876	0.879	0.885	0.88	0.878	0.877	0.13	0.229
Pres	0.187	0.174	0.23	0.227	0.229	0.228	0.196	0.238	0.695	0.694	0.722	0.731	0.697	0.697	0.736	0.772	0.13	0.246
Context	0.224	0.229	0.282	0.281	0.274	0.26	0.257	0.276	0.453	0.453	0.513	0.507	0.514	0.522	0.519	0.537	0.176	0.273
PV_R	0.193	0.185	0.201	0.197	0.196	0.199	0.204	0.201	0.906	0.906	0.909	0.904	0.907	0.907	0.908	0.912	0.14	0.233
PV_C	0.184	0.179	0.211	0.22	0.22	0.218	0.231	0.24	0.925	0.92	0.921	0.918	0.922	0.919	0.915	0.918	0.14	0.278
PV_Gl_R	0.201	0.196	0.178	0.187	0.168	0.181	0.208	0.172	0.907	0.902	0.906	0.907	0.908	0.906	0.903	0.902	0.14	0.216
PV_Gl_C	0.198	0.207	0.184	0.219	0.197	0.219	0.215	0.181	0.912	0.908	0.916	0.91	0.912	0.909	0.911	0.906	0.14	0.239
Ngrams	0.266	0.251	0.282	0.267	0.296	0.275	0.246	0.297	0.889	0.888	0.894	0.889	0.891	0.889	0.893	0.882	0.14	0.359
SPIRIT																		
BOWSrf	0.558	0.546	0.561	0.545	0.543	0.541	0.556	0.539	0.956	0.955	0.927	0.952	0.954	0.954	0.914	0.942	0.515	0.517
TFIDFSrf	0.556	0.528	0.522	0.537	0.543	0.542	0.558	0.531	0.951	0.958	0.95	0.946	0.946	0.949	0.948	0.948	0.515	0.492
Struc	0.539	0.528	0.528	0.577	0.539	0.538	0.517	0.531	0.955	0.951	0.956	0.945	0.951	0.951	0.954	0.955	0.493	0.47
Pres	0.558	0.479	0.518	0.518	0.527	0.525	0.563	0.527	0.778	0.795	0.791	0.805	0.779	0.784	0.808	0.775	0.414	0.515
Context	0.496	0.495	0.433	0.53	0.518	0.52	0.515	0.54	0.631	0.633	0.637	0.625	0.63	0.63	0.624	0.612	0.434	0.418
PV_R	0.47	0.471	0.5	0.518	0.51	0.486	0.51	0.521	0.961	0.958	0.94	0.947	0.958	0.956	0.93	0.944	0.522	0.439
PV_C	0.473	0.481	0.479	0.489	0.505	0.504	0.492	0.499	0.943	0.951	0.941	0.948	0.951	0.95	0.934	0.942	0.478	0.429
PV_Gl_R	0.445	0.479	0.452	0.442	0.462	0.462	0.452	0.476	0.94	0.961	0.938	0.958	0.957	0.962	0.933	0.945	0.416	0.422
PV_Gl_C	0.455	0.452	0.486	0.487	0.487	0.487	0.465	0.487	0.951	0.954	0.944	0.948	0.956	0.954	0.937	0.945	0.435	0.431
Ngrams	0.477	0.487	0.485	0.474	0.464	0.525	0.49	0.479	0.931	0.934	0.934	0.94	0.932	0.935	0.922	0.939	0.498	0.465

Table 8: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *micro recall* where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.276	0.294	0.272	0.275	0.274	0.277	0.25	0.267	0.9	0.911	0.91	0.909	0.911	0.914	0.892	0.906	0.064	0.383
TFIDFSrf	0.25	0.267	0.266	0.288	0.297	0.292	0.294	0.338	0.9	0.899	0.946	0.891	0.901	0.902	0.891	0.949	0.109	0.383
Struc	0.21	0.228	0.256	0.247	0.268	0.264	0.221	0.204	0.899	0.911	0.906	0.924	0.916	0.921	0.903	0.921	0.064	0.223
Pres	0.233	0.198	0.159	0.216	0.181	0.22	0.247	0.176	0.724	0.71	0.75	0.715	0.718	0.704	0.718	0.724	0.064	0.265
Context	0.183	0.149	0.235	0.239	0.227	0.269	0.192	0.25	0.511	0.512	0.434	0.449	0.442	0.445	0.457	0.433	0.089	0.178
PV_R	0.177	0.183	0.21	0.224	0.23	0.21	0.213	0.21	0.901	0.914	0.921	0.918	0.922	0.928	0.898	0.918	0.069	0.234
PV_C	0.251	0.196	0.18	0.195	0.209	0.217	0.176	0.194	0.91	0.926	0.931	0.928	0.933	0.935	0.909	0.931	0.069	0.278
PV_Gl_R	0.13	0.141	0.161	0.158	0.221	0.194	0.158	0.213	0.905	0.921	0.914	0.921	0.923	0.931	0.897	0.918	0.069	0.215
PV_Gl_C	0.209	0.223	0.264	0.149	0.258	0.149	0.22	0.292	0.911	0.926	0.925	0.93	0.931	0.935	0.909	0.925	0.069	0.24
Ngrams	0.185	0.283	0.267	0.234	0.253	0.222	0.203	0.267	0.905	0.91	0.916	0.913	0.91	0.916	0.893	0.913	0.069	0.366
SPIRIT																		
BOWSrf	0.533	0.586	0.5	0.547	0.55	0.547	0.496	0.551	0.932	0.943	0.95	0.938	0.939	0.942	0.945	0.934	0.568	0.518
TFIDFSrf	0.531	0.592	0.513	0.558	0.551	0.548	0.498	0.559	0.954	0.949	0.952	0.953	0.952	0.959	0.944	0.954	0.568	0.502
Struc	0.502	0.504	0.534	0.506	0.505	0.505	0.499	0.526	0.941	0.949	0.938	0.948	0.946	0.948	0.932	0.943	0.513	0.477
Pres	0.399	0.549	0.487	0.487	0.465	0.468	0.389	0.465	0.813	0.775	0.811	0.789	0.811	0.785	0.797	0.755	0.677	0.398
Context	0.444	0.443	0.502	0.386	0.391	0.39	0.383	0.358	0.643	0.651	0.618	0.638	0.649	0.633	0.622	0.606	0.48	0.546
PV_R	0.498	0.5	0.507	0.501	0.478	0.509	0.503	0.503	0.943	0.951	0.953	0.957	0.949	0.946	0.959	0.952	0.422	0.448
PV_C	0.472	0.488	0.514	0.521	0.454	0.46	0.523	0.476	0.958	0.959	0.954	0.954	0.961	0.959	0.95	0.953	0.501	0.43
PV_Gl_R	0.486	0.432	0.52	0.523	0.528	0.528	0.52	0.481	0.965	0.951	0.959	0.941	0.95	0.947	0.956	0.951	0.528	0.426
PV_Gl_C	0.474	0.495	0.522	0.519	0.519	0.522	0.54	0.519	0.953	0.955	0.944	0.955	0.953	0.954	0.946	0.948	0.513	0.454
Ngrams	0.451	0.441	0.562	0.544	0.56	0.408	0.568	0.55	0.93	0.943	0.917	0.933	0.94	0.933	0.943	0.945	0.425	0.465

Table 9: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced k-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *micro* F_1 where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.261	0.264	0.292	0.297	0.303	0.297	0.276	0.306	0.9	0.905	0.9	0.901	0.905	0.909	0.894	0.904	0.086	0.396
TFIDFSrf	0.257	0.279	0.305	0.318	0.327	0.314	0.265	0.32	0.919	0.918	0.924	0.909	0.921	0.922	0.911	0.929	0.125	0.383
Struc	0.218	0.21	0.244	0.232	0.255	0.236	0.215	0.23	0.894	0.898	0.891	0.901	0.9	0.9	0.89	0.898	0.086	0.226
Pres	0.207	0.185	0.188	0.222	0.202	0.224	0.219	0.203	0.709	0.702	0.736	0.723	0.707	0.701	0.727	0.747	0.086	0.255
Context	0.201	0.18	0.256	0.258	0.248	0.265	0.22	0.262	0.48	0.481	0.47	0.477	0.475	0.48	0.486	0.479	0.118	0.215
PV_R	0.185	0.184	0.205	0.21	0.212	0.204	0.208	0.206	0.903	0.91	0.915	0.911	0.915	0.917	0.903	0.915	0.093	0.233
PV_C	0.213	0.187	0.194	0.207	0.214	0.217	0.2	0.215	0.917	0.923	0.926	0.923	0.927	0.927	0.912	0.924	0.093	0.278
PV_Gl_R	0.157	0.164	0.169	0.171	0.191	0.187	0.18	0.19	0.906	0.912	0.91	0.914	0.915	0.918	0.9	0.91	0.093	0.216
PV_Gl_C	0.203	0.215	0.217	0.177	0.223	0.177	0.218	0.223	0.912	0.917	0.92	0.92	0.922	0.922	0.91	0.916	0.093	0.24
Ngrams	0.218	0.266	0.274	0.25	0.273	0.245	0.222	0.281	0.897	0.899	0.904	0.901	0.901	0.902	0.893	0.897	0.093	0.362
SPIRIT																		
BOWSrf	0.545	0.565	0.529	0.546	0.546	0.544	0.524	0.545	0.944	0.949	0.939	0.945	0.946	0.948	0.929	0.938	0.54	0.517
TFIDFSrf	0.543	0.558	0.518	0.547	0.547	0.545	0.526	0.545	0.953	0.953	0.951	0.949	0.949	0.954	0.946	0.951	0.54	0.497
Struc	0.52	0.516	0.531	0.539	0.522	0.521	0.508	0.528	0.948	0.95	0.947	0.947	0.948	0.949	0.943	0.949	0.503	0.473
Pres	0.466	0.512	0.502	0.502	0.494	0.495	0.46	0.494	0.795	0.785	0.801	0.797	0.795	0.785	0.803	0.765	0.514	0.449
Context	0.468	0.467	0.465	0.447	0.446	0.446	0.44	0.431	0.637	0.642	0.627	0.631	0.639	0.631	0.623	0.609	0.456	0.474
PV_R	0.484	0.485	0.503	0.51	0.493	0.497	0.507	0.512	0.952	0.955	0.946	0.952	0.953	0.951	0.944	0.948	0.467	0.444
PV_C	0.473	0.484	0.496	0.504	0.478	0.481	0.507	0.487	0.951	0.955	0.947	0.951	0.956	0.954	0.942	0.948	0.49	0.429
PV_Gl_R	0.464	0.454	0.484	0.479	0.492	0.492	0.484	0.478	0.952	0.956	0.949	0.949	0.954	0.954	0.944	0.948	0.465	0.424
PV_Gl_C	0.464	0.473	0.503	0.503	0.503	0.504	0.5	0.503	0.952	0.955	0.944	0.951	0.954	0.954	0.942	0.946	0.471	0.442
Ngrams	0.463	0.463	0.52	0.507	0.507	0.459	0.526	0.512	0.93	0.938	0.926	0.937	0.936	0.934	0.932	0.942	0.459	0.465

Table 10: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *macro precision* where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.176	0.191	0.229	0.279	0.289	0.269	0.205	0.311	0.916	0.917	0.908	0.914	0.915	0.92	0.917	0.919	0.013	0.439
TFIDFSrf	0.202	0.259	0.309	0.31	0.341	0.318	0.196	0.379	0.947	0.948	0.919	0.944	0.95	0.953	0.948	0.921	0.054	0.419
Struc	0.109	0.124	0.173	0.16	0.184	0.169	0.066	0.164	0.898	0.894	0.885	0.887	0.893	0.886	0.888	0.885	0.013	0.224
Pres	0.113	0.076	0.196	0.215	0.214	0.217	0.183	0.131	0.726	0.722	0.736	0.737	0.724	0.726	0.747	0.79	0.013	0.278
Context	0.198	0.061	0.319	0.324	0.324	0.33	0.196	0.383	0.509	0.51	0.537	0.536	0.533	0.547	0.548	0.549	0.062	0.374
PV_R	0.114	0.085	0.067	0.097	0.071	0.067	0.135	0.067	0.914	0.912	0.918	0.912	0.915	0.913	0.913	0.918	0.014	0.235
PV_C	0.151	0.127	0.191	0.227	0.164	0.24	0.125	0.179	0.93	0.925	0.926	0.923	0.927	0.923	0.923	0.922	0.014	0.29
PV_Gl_R	0.078	0.076	0.046	0.043	0.091	0.093	0.046	0.063	0.914	0.907	0.913	0.911	0.915	0.91	0.907	0.906	0.014	0.207
PV_Gl_C	0.134	0.121	0.089	0.085	0.083	0.085	0.157	0.084	0.92	0.913	0.922	0.914	0.919	0.913	0.916	0.913	0.014	0.243
Ngrams	0.168	0.18	0.281	0.224	0.302	0.257	0.188	0.282	0.904	0.902	0.907	0.904	0.907	0.903	0.905	0.903	0.014	0.4
SPIRIT																		
BOWSrf	0.17	0.167	0.163	0.167	0.168	0.187	0.179	0.254	0.958	0.958	0.942	0.956	0.958	0.955	0.94	0.955	0.135	0.267
TFIDFSrf	0.17	0.197	0.169	0.205	0.191	0.189	0.177	0.272	0.925	0.928	0.924	0.921	0.923	0.924	0.926	0.924	0.135	0.253
Struc	0.138	0.164	0.139	0.15	0.14	0.14	0.185	0.153	0.938	0.936	0.938	0.931	0.934	0.934	0.943	0.957	0.117	0.202
Pres	0.167	0.12	0.15	0.15	0.131	0.131	0.109	0.131	0.754	0.787	0.755	0.764	0.779	0.756	0.711	0.72	0.109	0.162
Context	0.065	0.065	0.09	0.065	0.08	0.08	0.076	0.054	0.619	0.62	0.616	0.614	0.623	0.61	0.606	0.611	0.059	0.157
PV_R	0.156	0.137	0.152	0.178	0.144	0.145	0.188	0.181	0.943	0.942	0.929	0.931	0.939	0.94	0.923	0.854	0.123	0.191
PV_C	0.115	0.129	0.123	0.128	0.133	0.166	0.132	0.132	0.862	0.866	0.862	0.865	0.866	0.864	0.864	0.863	0.117	0.2
PV_Gl_R	0.106	0.117	0.113	0.109	0.116	0.116	0.113	0.112	0.953	0.967	0.952	0.965	0.965	0.968	0.948	0.954	0.059	0.181
PV_Gl_C	0.138	0.117	0.129	0.129	0.129	0.164	0.12	0.129	0.855	0.856	0.853	0.854	0.857	0.856	0.846	0.859	0.122	0.192
Ngrams	0.139	0.124	0.127	0.125	0.162	0.16	0.129	0.15	0.952	0.953	0.954	0.961	0.954	0.952	0.95	0.959	0.111	0.249

Table 11: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *macro recall* where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.204	0.217	0.206	0.207	0.206	0.214	0.185	0.195	0.883	0.897	0.896	0.898	0.897	0.902	0.878	0.894	0.029	0.399
TFIDFSrf	0.204	0.206	0.206	0.229	0.236	0.233	0.238	0.273	0.893	0.892	0.933	0.884	0.894	0.893	0.885	0.935	0.057	0.404
Struc	0.13	0.147	0.159	0.152	0.175	0.169	0.127	0.129	0.878	0.892	0.889	0.911	0.897	0.904	0.884	0.902	0.029	0.214
Pres	0.169	0.106	0.111	0.162	0.127	0.167	0.16	0.132	0.734	0.715	0.748	0.721	0.722	0.712	0.727	0.703	0.029	0.201
Context	0.11	0.071	0.175	0.178	0.165	0.203	0.124	0.183	0.497	0.498	0.454	0.453	0.455	0.455	0.461	0.452	0.066	0.161
PV_R	0.108	0.114	0.122	0.139	0.147	0.125	0.146	0.122	0.868	0.885	0.895	0.9	0.895	0.905	0.874	0.897	0.032	0.233
PV_C	0.172	0.138	0.132	0.148	0.149	0.173	0.114	0.142	0.887	0.907	0.913	0.918	0.916	0.919	0.895	0.917	0.032	0.282
PV_Gl_R	0.067	0.077	0.086	0.082	0.151	0.119	0.076	0.135	0.875	0.896	0.888	0.903	0.896	0.908	0.876	0.898	0.032	0.196
PV_Gl_C	0.129	0.144	0.169	0.084	0.16	0.084	0.138	0.18	0.888	0.907	0.906	0.919	0.911	0.918	0.893	0.908	0.032	0.229
Ngrams	0.125	0.195	0.207	0.171	0.203	0.178	0.135	0.219	0.901	0.908	0.905	0.911	0.907	0.913	0.894	0.91	0.032	0.387
SPIRIT																		
BOWSrf	0.177	0.202	0.163	0.19	0.186	0.192	0.166	0.199	0.785	0.79	0.794	0.781	0.786	0.788	0.786	0.753	0.197	0.268
TFIDFSrf	0.177	0.219	0.172	0.203	0.195	0.193	0.165	0.206	0.802	0.8	0.799	0.798	0.8	0.804	0.787	0.799	0.197	0.265
Struc	0.161	0.167	0.171	0.163	0.159	0.159	0.175	0.169	0.797	0.801	0.794	0.799	0.798	0.799	0.774	0.789	0.153	0.211
Pres	0.13	0.175	0.169	0.169	0.161	0.164	0.104	0.161	0.547	0.512	0.531	0.52	0.525	0.518	0.534	0.486	0.235	0.131
Context	0.108	0.108	0.136	0.085	0.091	0.09	0.087	0.077	0.345	0.348	0.336	0.349	0.345	0.337	0.356	0.344	0.123	0.159
PV_R	0.17	0.171	0.16	0.162	0.153	0.173	0.161	0.16	0.786	0.79	0.79	0.791	0.788	0.781	0.778	0.734	0.11	0.198
PV_C	0.142	0.15	0.16	0.164	0.141	0.147	0.157	0.149	0.764	0.765	0.765	0.764	0.766	0.766	0.741	0.738	0.155	0.194
PV_Gl_R	0.144	0.127	0.161	0.163	0.161	0.161	0.161	0.141	0.789	0.777	0.782	0.765	0.772	0.769	0.76	0.716	0.143	0.181
PV_Gl_C	0.147	0.152	0.173	0.172	0.172	0.175	0.173	0.172	0.753	0.755	0.743	0.748	0.754	0.75	0.74	0.723	0.142	0.207
Ngrams	0.152	0.143	0.184	0.187	0.201	0.128	0.185	0.191	0.783	0.79	0.779	0.783	0.79	0.788	0.784	0.79	0.107	0.22

Table 12: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *macro* F_1 where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.177	0.176	0.194	0.192	0.202	0.206	0.17	0.209	0.897	0.905	0.9	0.904	0.904	0.909	0.895	0.904	0.018	0.415
TFIDFSrf	0.189	0.203	0.223	0.232	0.239	0.237	0.187	0.271	0.918	0.918	0.924	0.912	0.92	0.921	0.914	0.926	0.037	0.41
Struc	0.104	0.111	0.126	0.11	0.142	0.125	0.077	0.12	0.885	0.89	0.885	0.897	0.893	0.893	0.883	0.891	0.018	0.218
Pres	0.118	0.063	0.109	0.138	0.115	0.149	0.126	0.12	0.725	0.711	0.738	0.722	0.712	0.711	0.732	0.734	0.018	0.198
Context	0.101	0.051	0.189	0.189	0.174	0.207	0.118	0.193	0.493	0.495	0.486	0.483	0.484	0.488	0.493	0.486	0.06	0.199
PV_R	0.086	0.084	0.078	0.093	0.091	0.08	0.12	0.078	0.886	0.895	0.904	0.904	0.902	0.907	0.89	0.905	0.019	0.233
PV_C	0.134	0.117	0.129	0.139	0.125	0.166	0.104	0.134	0.906	0.914	0.918	0.92	0.92	0.92	0.907	0.919	0.019	0.285
PV_Gl_R	0.057	0.066	0.055	0.052	0.098	0.084	0.048	0.079	0.89	0.898	0.898	0.905	0.902	0.907	0.888	0.9	0.019	0.199
PV_Gl_C	0.093	0.111	0.106	0.065	0.099	0.065	0.104	0.094	0.9	0.908	0.912	0.915	0.913	0.914	0.903	0.909	0.019	0.234
Ngrams	0.116	0.156	0.203	0.16	0.209	0.177	0.112	0.22	0.902	0.904	0.905	0.906	0.906	0.907	0.899	0.905	0.019	0.39
SPIRIT																		
BOWSrf	0.165	0.171	0.159	0.173	0.165	0.178	0.165	0.189	0.851	0.854	0.847	0.847	0.852	0.852	0.841	0.821	0.158	0.266
TFIDFSrf	0.165	0.195	0.164	0.192	0.182	0.18	0.164	0.197	0.847	0.848	0.846	0.843	0.845	0.848	0.84	0.845	0.158	0.257
Struc	0.148	0.156	0.152	0.155	0.148	0.147	0.171	0.154	0.852	0.853	0.85	0.849	0.851	0.852	0.838	0.852	0.129	0.205
Pres	0.137	0.142	0.152	0.152	0.142	0.142	0.099	0.142	0.577	0.568	0.568	0.562	0.574	0.557	0.573	0.541	0.148	0.14
Context	0.081	0.081	0.101	0.069	0.077	0.077	0.073	0.059	0.377	0.379	0.374	0.383	0.374	0.367	0.398	0.385	0.079	0.111
PV_R	0.153	0.15	0.147	0.157	0.142	0.156	0.149	0.156	0.846	0.848	0.84	0.842	0.845	0.842	0.829	0.777	0.102	0.194
PV_C	0.126	0.136	0.137	0.142	0.134	0.144	0.133	0.137	0.803	0.806	0.804	0.805	0.806	0.805	0.789	0.787	0.13	0.189
PV_Gl_R	0.121	0.118	0.131	0.131	0.132	0.132	0.131	0.124	0.839	0.84	0.834	0.832	0.836	0.836	0.817	0.782	0.082	0.18
PV_Gl_C	0.131	0.127	0.147	0.146	0.146	0.152	0.141	0.146	0.792	0.794	0.785	0.788	0.794	0.791	0.78	0.772	0.109	0.198
Ngrams	0.138	0.127	0.149	0.148	0.166	0.134	0.151	0.155	0.847	0.851	0.846	0.851	0.851	0.85	0.844	0.854	0.098	0.226

Table 13: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *one-error* where smaller value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.718	0.715	0.674	0.663	0.66	0.665	0.694	0.663	0.022	0.021	0.024	0.022	0.021	0.02	0.027	0.018	0.864	0.615
TFIDFSrf	0.73	0.697	0.643	0.628	0.628	0.64	0.691	0.634	0.017	0.018	0.013	0.017	0.014	0.013	0.019	0.012	0.853	0.644
Struc	0.803	0.785	0.742	0.745	0.736	0.756	0.776	0.749	0.025	0.023	0.029	0.024	0.024	0.025	0.027	0.023	0.864	0.782
Pres	0.8	0.81	0.775	0.771	0.778	0.77	0.782	0.768	0.173	0.183	0.15	0.17	0.175	0.182	0.167	0.125	0.864	0.731
Context	0.774	0.782	0.712	0.711	0.722	0.704	0.747	0.709	0.454	0.448	0.456	0.455	0.457	0.451	0.444	0.453	0.832	0.726
PV_R	0.805	0.803	0.796	0.794	0.79	0.799	0.812	0.796	0.012	0.011	0.012	0.013	0.01	0.011	0.012	0.01	0.857	0.79
PV_C	0.798	0.818	0.785	0.782	0.78	0.776	0.784	0.764	0.01	0.01	0.013	0.01	0.009	0.009	0.011	0.011	0.857	0.726
PV_Gl_R	0.822	0.816	0.817	0.814	0.819	0.812	0.812	0.818	0.019	0.017	0.02	0.016	0.017	0.017	0.018	0.018	0.857	0.801
PV_Gl_C	0.796	0.793	0.795	0.787	0.781	0.787	0.777	0.796	0.013	0.012	0.013	0.012	0.01	0.011	0.013	0.015	0.857	0.77
Ngrams	0.726	0.717	0.705	0.725	0.705	0.72	0.755	0.696	0.03	0.03	0.027	0.028	0.028	0.029	0.031	0.03	0.857	0.634
SPIRIT																		
BOWSrf	0.356	0.353	0.377	0.357	0.36	0.36	0.382	0.359	0.009	0.009	0.009	0.009	0.008	0.009	0.016	0.015	0.367	0.495
TFIDFSrf	0.359	0.363	0.379	0.362	0.365	0.365	0.382	0.362	0.009	0.009	0.009	0.013	0.012	0.009	0.008	0.009	0.367	0.495
Struc	0.386	0.393	0.397	0.369	0.404	0.404	0.414	0.406	0.011	0.009	0.012	0.012	0.01	0.009	0.009	0.008	0.406	0.533
Pres	0.417	0.391	0.397	0.397	0.411	0.411	0.401	0.411	0.106	0.111	0.09	0.094	0.104	0.106	0.073	0.12	0.443	0.477
Context	0.445	0.447	0.445	0.445	0.445	0.445	0.445	0.445	0.269	0.265	0.273	0.272	0.274	0.27	0.282	0.313	0.452	0.455
PV_R	0.443	0.462	0.458	0.409	0.418	0.424	0.47	0.438	0.006	0.004	0.005	0.004	0.004	0.004	0.006	0.004	0.447	0.572
PV_C	0.434	0.441	0.443	0.438	0.441	0.443	0.441	0.441	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.011	0.452	0.572
PV_Gl_R	0.468	0.468	0.455	0.455	0.443	0.443	0.455	0.462	0.009	0.007	0.007	0.008	0.008	0.006	0.006	0.007	0.445	0.597
PV_Gl_C	0.468	0.462	0.43	0.431	0.431	0.431	0.45	0.431	0.004	0.006	0.007	0.007	0.004	0.006	0.006	0.006	0.443	0.573
Ngrams	0.454	0.457	0.468	0.467	0.46	0.458	0.46	0.46	0.018	0.017	0.022	0.016	0.018	0.016	0.018	0.018	0.44	0.563

Table 14: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *coverage* where smaller value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	6.365	6.532	5.639	5.697	5.615	5.799	5.961	5.626	0.386	0.384	0.39	0.385	0.385	0.385	0.389	0.385	8.829	6.687
TFIDFSrf	6.777	6.617	5.944	5.493	5.334	5.82	6.075	5.696	0.37	0.371	0.365	0.373	0.365	0.363	0.372	0.363	8.55	7.126
Struc	6.917	6.791	6.748	6.865	6.708	6.895	6.899	6.681	0.386	0.383	0.391	0.38	0.386	0.387	0.386	0.382	8.829	8.463
Pres	7.149	7.357	6.94	6.712	6.817	6.552	7.063	6.831	0.802	0.853	0.708	0.827	0.853	0.88	0.784	0.636	8.829	7.258
Context	7.381	7.674	6.858	6.684	6.927	6.526	7.171	6.747	2.774	2.765	2.733	2.814	2.717	2.792	2.683	2.718	8.185	7.321
PV_R	7.024	7.221	7.124	7.122	6.924	7.146	6.988	7.117	0.365	0.365	0.364	0.363	0.365	0.363	0.366	0.36	8.865	9.024
PV_C	7.011	7.156	6.6	6.554	6.562	6.632	6.787	6.329	0.359	0.358	0.363	0.361	0.358	0.36	0.362	0.361	8.865	8.747
PV_Gl_R	7.831	7.844	7.342	7.376	6.976	7.135	7.607	7.021	0.369	0.368	0.372	0.367	0.37	0.37	0.375	0.371	8.865	9.625
PV_Gl_C	6.585	6.674	6.546	6.501	6.425	6.499	6.702	6.514	0.366	0.364	0.365	0.364	0.361	0.362	0.366	0.366	8.865	9.214
Ngrams	6.353	6.209	6.053	6.094	5.971	6.174	6.526	5.837	0.395	0.397	0.387	0.39	0.393	0.393	0.395	0.392	8.865	7.076
SPIRIT																		
BOWSrf	2.45	2.427	2.518	2.487	2.448	2.485	2.644	2.462	0.591	0.59	0.591	0.589	0.589	0.589	0.606	0.601	2.577	4.739
TFIDFSrf	2.462	2.644	2.618	2.53	2.56	2.618	2.644	2.533	0.595	0.594	0.599	0.601	0.599	0.594	0.594	0.593	2.577	4.923
Struc	2.427	2.499	2.482	2.353	2.393	2.389	2.611	2.421	0.592	0.589	0.595	0.595	0.594	0.589	0.592	0.587	2.485	4.718
Pres	2.628	2.596	2.603	2.599	2.61	2.586	2.675	2.65	0.828	0.835	0.809	0.839	0.811	0.844	0.789	0.911	2.672	3.315
Context	2.651	2.668	2.647	2.665	2.655	2.64	2.674	2.687	1.504	1.519	1.525	1.508	1.545	1.579	1.513	1.6	2.711	2.915
PV_R	2.936	2.773	2.652	2.609	2.623	2.672	2.668	2.648	0.587	0.585	0.588	0.589	0.587	0.586	0.593	0.588	2.691	4.976
PV_C	2.742	2.875	2.559	2.611	2.586	2.624	2.603	2.62	0.589	0.59	0.591	0.588	0.588	0.591	0.591	0.6	2.643	5.896
PV_Gl_R	2.833	2.857	2.733	2.732	2.723	2.723	2.723	2.735	0.589	0.585	0.589	0.589	0.585	0.584	0.589	0.588	2.726	5.454
PV_Gl_C	2.925	2.77	2.495	2.484	2.474	2.511	2.601	2.475	0.581	0.584	0.587	0.588	0.586	0.584	0.59	0.585	2.672	5.855
Ngrams	2.662	2.64	2.583	2.543	2.579	2.597	2.565	2.604	0.612	0.604	0.616	0.609	0.608	0.604	0.606	0.6	2.709	5.811

Table 15: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *ranking loss* where smaller value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.279	0.287	0.245	0.245	0.243	0.252	0.258	0.242	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.404	0.287
TFIDFSrf	0.298	0.289	0.259	0.234	0.228	0.253	0.264	0.245	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.391	0.31
Struc	0.31	0.302	0.298	0.306	0.297	0.306	0.306	0.296	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.404	0.381
Pres	0.323	0.336	0.311	0.298	0.304	0.291	0.316	0.305	0.02	0.022	0.016	0.02	0.022	0.023	0.02	0.013	0.404	0.321
Context	0.334	0.348	0.306	0.297	0.31	0.289	0.322	0.3	0.11	0.11	0.108	0.111	0.107	0.11	0.105	0.107	0.372	0.326
PV_R	0.318	0.328	0.323	0.324	0.313	0.325	0.315	0.323	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.407	0.407
PV_C	0.317	0.324	0.293	0.291	0.289	0.293	0.305	0.28	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.407	0.384
PV_Gl_R	0.356	0.358	0.334	0.336	0.314	0.323	0.346	0.317	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.407	0.435
PV_Gl_C	0.294	0.299	0.292	0.291	0.286	0.291	0.3	0.29	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.407	0.414
Ngrams	0.279	0.271	0.264	0.267	0.259	0.27	0.289	0.253	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.407	0.301
SPIRIT																		
BOWSrf	0.116	0.113	0.119	0.116	0.113	0.115	0.124	0.114	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.123	0.252
TFIDFSrf	0.117	0.124	0.125	0.118	0.119	0.122	0.125	0.118	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.123	0.263
Struc	0.115	0.119	0.118	0.111	0.113	0.113	0.126	0.115	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.12	0.252
Pres	0.126	0.125	0.124	0.124	0.126	0.124	0.13	0.128	0.016	0.016	0.014	0.016	0.015	0.016	0.013	0.02	0.131	0.169
Context	0.129	0.131	0.129	0.129	0.129	0.128	0.129	0.13	0.058	0.058	0.059	0.057	0.06	0.062	0.058	0.065	0.131	0.143
PV_R	0.146	0.138	0.128	0.124	0.127	0.128	0.129	0.127	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.131	0.272
PV_C	0.134	0.143	0.124	0.126	0.125	0.128	0.127	0.126	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.131	0.33
PV_Gl_R	0.141	0.143	0.135	0.135	0.134	0.134	0.134	0.134	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.132	0.302
PV_Gl_C	0.144	0.137	0.121	0.121	0.12	0.121	0.127	0.12	0	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.129	0.327
Ngrams	0.131	0.13	0.128	0.127	0.128	0.128	0.127	0.13	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.132	0.327

Table 16: The performance of the different machine learning tasks applied on the different features using single tree models. The hierarchy construction method are abbreviated as follows: balanced *k*-means clustering (BkM), predictive clustering tree (PCT), clustering with complete linkage (CL), clustering with single linkage (SL), random (RND) and manual (MAN). The evaluation measure is *average precision* where larger value means better result.

	HMC								HSC								MLC	SC
20-genres	CL	SL	B2M	B3M	B4M	PCT	RND	MAN	CL	SL	B2M	B3M	B4M	PCT	RND	MAN		
BOWSrf	0.404	0.402	0.444	0.45	0.453	0.446	0.424	0.451	0.986	0.986	0.984	0.986	0.986	0.986	0.984	0.987	0.284	0.494
TFIDFSrf	0.392	0.41	0.454	0.473	0.478	0.459	0.423	0.464	0.99	0.99	0.992	0.989	0.992	0.992	0.989	0.993	0.295	0.468
Struc	0.349	0.354	0.378	0.375	0.383	0.367	0.358	0.379	0.985	0.986	0.983	0.986	0.985	0.985	0.985	0.986	0.284	0.347
Pres	0.34	0.327	0.362	0.375	0.365	0.378	0.355	0.366	0.881	0.873	0.9	0.881	0.876	0.871	0.886	0.917	0.284	0.39
Context	0.344	0.33	0.395	0.398	0.387	0.407	0.364	0.398	0.648	0.65	0.647	0.646	0.648	0.648	0.656	0.648	0.314	0.388
PV_R	0.341	0.338	0.345	0.348	0.35	0.343	0.344	0.344	0.993	0.993	0.993	0.993	0.993	0.993	0.992	0.994	0.288	0.336
PV_C	0.347	0.335	0.356	0.362	0.363	0.367	0.355	0.377	0.994	0.994	0.992	0.994	0.995	0.994	0.993	0.993	0.288	0.387
PV_Gl_R	0.309	0.31	0.323	0.325	0.331	0.329	0.319	0.329	0.99	0.99	0.989	0.991	0.99	0.99	0.989	0.989	0.288	0.314
PV_Gl_C	0.35	0.351	0.353	0.359	0.361	0.359	0.353	0.352	0.992	0.993	0.992	0.993	0.994	0.993	0.992	0.991	0.288	0.344
Ngrams	0.393	0.398	0.421	0.41	0.42	0.413	0.379	0.43	0.982	0.982	0.984	0.983	0.983	0.983	0.981	0.982	0.288	0.471
SPIRIT																		
BOWSrf	0.716	0.718	0.707	0.713	0.716	0.715	0.697	0.713	0.994	0.995	0.994	0.994	0.995	0.995	0.99	0.991	0.697	0.601
TFIDFSrf	0.715	0.705	0.702	0.71	0.709	0.707	0.697	0.71	0.994	0.994	0.993	0.991	0.992	0.994	0.994	0.994	0.697	0.59
Struc	0.705	0.7	0.692	0.71	0.696	0.696	0.681	0.693	0.994	0.995	0.993	0.993	0.994	0.995	0.994	0.996	0.689	0.57
Pres	0.679	0.689	0.69	0.69	0.682	0.684	0.678	0.682	0.929	0.927	0.938	0.932	0.932	0.926	0.946	0.914	0.66	0.631
Context	0.659	0.658	0.661	0.66	0.661	0.661	0.662	0.662	0.803	0.804	0.802	0.802	0.797	0.797	0.796	0.777	0.658	0.651
PV_R	0.658	0.658	0.66	0.68	0.676	0.676	0.656	0.667	0.996	0.997	0.996	0.996	0.997	0.997	0.995	0.997	0.662	0.544
PV_C	0.664	0.654	0.674	0.672	0.669	0.669	0.668	0.67	0.996	0.996	0.996	0.996	0.996	0.995	0.995	0.993	0.658	0.527
PV_Gl_R	0.641	0.642	0.653	0.652	0.658	0.658	0.653	0.653	0.995	0.996	0.995	0.995	0.996	0.996	0.996	0.995	0.661	0.525
PV_Gl_C	0.642	0.648	0.675	0.675	0.676	0.674	0.663	0.676	0.997	0.996	0.996	0.996	0.997	0.996	0.996	0.996	0.664	0.526
Ngrams	0.66	0.66	0.661	0.659	0.662	0.661	0.663	0.66	0.988	0.99	0.986	0.989	0.989	0.99	0.989	0.99	0.661	0.525