

Investigating and Comparing Discussion Topics in Multilingual Underground Forums

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B. Common Topics

Table A.1 shows information about the cluster pairs that have highly related topics. Each row pictures a Russian cluster (left side) and a corresponding highly related English cluster (right side). A cluster can have more than one highly related cluster from the other data set.

Table A.1: Discovered common topics (cluster pairs with high similarity). P=Paragraphs, T=Threads, A=Authors.
 Note^b: Some threads (< 1%) have a missing author.

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
880	737	546	{buy_mail_base}	293	241	177	{buy_mailpass_mail}
1428	968	730	{need_telegram_bot}	426	327	261	{telegram_telegram_bot}
272	270	260	{looking_seller_sellers_buyer}	147	147	122	{pm_pm_buyers}
370	347	291	{buy_database_databases}	515	409	254	{selling_database_data}
70	64	40	{iframe_form_payment}	33	32	19	{cc_form_payment_payments}
3398	2594	1751	{buy_base_bases}	223	175	153	{buy_base_bases}
630	418	349	{redirect_redirects}	168	120	102	{redirect_redirects_link}
5122	2709	1709	{domains_domains_domain}	576	359	294	{domains_domains_domain}
880	737	546	{buy_mail_base}	137	119	100	{buy_emails_email_business}
6765	3435	2340	{need_crypt_encryption_file}	1558	878	700	{crypt_crypter_encryption}
305	289	260	{price_price_account}	222	199	173	{pay_price_account_balance}
1068	780	508	{buy_database_site_sites}	147	123	101	{dating_base_site_email}
2500	1907	1278	{need_language_translation}	185	168	153	{speak_russian_language_people}
829	740	583	{buy_traffic_countries}	436	316	260	{buy_traffic_quality}
454	379	332	{need_mail_hack}	89	73	62	{need_email_emails}
51	48	48	{buy_base_email_sale}	137	119	100	{buy_emails_email_business}
306	212	190	{need_file_pdf}	829	516	382	{exploit_exploit_office_word}
172	134	103	{buy_loader_play}	105	73	59	{play_loader}
267	206	173	{sms_spam}	300	230	173	{sms_spam}
182	151	134	{sms_sms_interception}	82	62	59	{sms_sms_interception}
287	215	192	{need_calls_number}	253	161	144	{need_calls_service_voice}
61	55	49	{grabber_grabber_form}	26	24	23	{formgrabber_requests_internet}
1521	1033	748	{buy_browser_chrome}	468	289	232	{firefox_browser_internet_explorer}
997	740	577	{buy_paypal_account}	374	268	221	{paypal_paypal_account}
233	211	183	{buy_vbv_cvv}	81	68	58	{buy_cvv_shop}
271	267	228	{work_guarantor_forum}	515	487	333	{work_guarantor_forum}
1997	1949	1499	{write_contacts_pm}	165	159	138	{contact_contacts}
532	483	429	{looking_coder_team}	382	311	255	{looking_coder_developer}
727	382	305	{looking_miner_mining}	221	113	95	{looking_miner_mining}
836	760	665	{test_test_tests}	228	203	182	{test_test_tests}
54	43	41	{selling_license_smoke_bot}	75	59	51	{sell_license_smoke_loader}
1004	498	391	{need_tor_network}	153	98	89	{tor_tor_network}
2809	1409	1017	{need_proxy_proxies}	488	315	265	{proxy_proxies}
1555	1101	832	{buy_ads_adwords}	760	492	344	{looking_ads_adwords}
3205	2122	1400	{buy_exploit_vulnerability}	830	567	425	{exploit_exploit_exploits}
71	66	60	{address_email_phone_format}	1812	1218	731	{need_scans_email_phone}
35	35	31	{address_number_phone_birth}	1812	1218	731	{need_scans_email_phone}
90	74	70	{buy_email_mail}	87	65	58	{checker_emails_email}
267	206	173	{sms_spam}	567	381	303	{sms_sms_bulk}
400	329	289	{sms_sms_number}	567	381	303	{sms_sms_bulk}
1521	1033	748	{buy_browser_chrome}	26	24	23	{formgrabber_requests_internet}
103	92	74	{access_access_domain_admin}	279	237	149	{access_access_admin_domain}
2983	1680	1206	{buy_cards_card}	661	461	380	{need_cards_card_credit}
122	117	106	{buy_yusa_sale}	293	241	177	{buy_mailpass_mail}
167	159	149	{buy_mix_world}	436	316	260	{buy_traffic_quality}
196	196	175	{price_guarantor}	515	487	333	{work_guarantor_forum}
27	27	19	{form_form_site}	100	96	52	{shop_orders_day}
287	260	225	{buy_downloads_countries}	436	316	260	{buy_traffic_quality}
254	210	169	{buy_accounts_amazon}	269	191	143	{looking_accounts_amazon_aws}
297	184	124	{card_card_video}	89	56	47	{geforce_geforce_card_mb}

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
54	48	28	{redirect_payment}	55	48	16	{redirect_paypal_payments_payment}
1665	1124	785	{works_windows_system}	156	145	118	{works_windows_x64}
498	429	395	{return_money_moneyback_refund}	135	114	102	{refund_refund_money}
231	230	211	{send_pm_contact}	280	278	221	{pm_jabber}
1323	1248	999	{apologize_topic_section}	37	36	36	{sorry_thread_section_place}
1822	1526	1146	{write_jabber_pm}	165	159	138	{contact_contacts}
83	74	63	{buy_mustache_pm}	147	113	91	{buy_loads_price}
83	74	63	{buy_mustache_pm}	1599	1151	736	{logs_logs_log}
67	50	41	{looking_networks_network}	46	32	31	{looking_pentester_pentesters}
157	157	6	{rights_pcs_ip_user}	59	59	6	{access_pc_ip_scanner}
361	249	218	{keylogger_keylogger_keyboard}	224	135	117	{keylogger_keylogger_family}
143	105	86	{buy_forms_tax}	206	148	115	{buy_forms_tax}
518	320	278	{need_machine_vmware}	117	90	84	{vmware_workstation_guest}
1321	960	791	{looking_botnet_botnets}	447	324	268	{looking_botnet_botnets}
38	27	23	{selling_access_office_version}	170	135	94	{office_office_office365}
163	132	127	{need_invite_invites}	88	57	50	{need_invite_genesis}
167	151	129	{support_proxy_socks5}	521	341	285	{socks_socks_socks5}
232	183	139	{buy_gifts_gift}	133	86	75	{card_card_gift}
33	30	28	{looking_traffic_adwords}	760	492	344	{looking_ads_adwords}
859	452	350	{dns_dns_server}	119	95	85	{server_dns_domain}
270	222	198	{buy_vps_server}	260	209	180	{need_vps_bulletproof}
164	162	141	{strait_date_year}	144	78	70	{date_6th_time}
701	554	486	{sale_server_servers}	65	57	50	{rent_rent_month}
829	740	583	{buy_traffic_countries}	147	113	91	{buy_loads_price}
52	50	36	{buy_mile_hash}	293	241	177	{buy_mailpass_mail}
880	737	546	{buy_mail_base}	275	194	148	{leads_leads_email}
880	737	546	{buy_mail_base}	114	75	56	{looking_mailpass_mail}
880	737	546	{buy_mail_base}	223	175	153	{buy_base_bases}
880	737	546	{buy_mail_base}	1599	1151	736	{logs_logs_log}
51	48	48	{buy_base_email_sale}	293	241	177	{buy_mailpass_mail}
63	56	53	{works_office_versions}	98	59	46	{office_office_bit}
423	292	240	{looking_macro_office}	829	516	382	{exploit_exploit_office_word}
578	472	408	{need_newsletter_email}	64	57	52	{need_emails_inbox_day}
136	120	107	{looking_coder_android}	32	29	26	{looking_developer_android_coder}
136	120	107	{looking_coder_android}	382	311	255	{looking_coder_developer}
292	229	202	{buy_number_phone_numbers}	44	36	27	{need_database_phone_number}
371	287	234	{need_python_coder}	269	121	110	{looking_python_programming}
557	523	464	{support_support_service}	63	56	54	{support_support_customer}
937	848	736	{offer_service_services}	53	52	48	{pm_service_services}
216	159	139	{uac_uac_bypass}	105	85	77	{bypass_uac}
2260	1816	1294	{need_panel_admin}	279	237	149	{access_access_admin_domain}
65	48	44	{sell_keys_windows}	32	22	20	{windows_key_product}
155	149	131	{time_days_order}	59	53	50	{delivery_hours_time}
31	29	25	{buy_database_mail}	137	119	100	{buy_emails_email_business}
91	79	68	{buy_dumps_dump}	223	175	153	{buy_base_bases}
2108	1845	1427	{countries_countries_country}	242	215	195	{countries_countries_country}
165	162	147	{write_forum_pm}	165	159	138	{contact_contacts}
77	76	70	{payment_transactions_guarantor_forum}	515	487	333	{work_guarantor_forum}
133	132	121	{work_guarantor_pm}	515	487	333	{work_guarantor_forum}
502	434	391	{discounts_discount}	133	110	104	{discount_discount_discounts_orders}
229	203	189	{buy_installs_installes}	160	123	102	{buy_installs_countries}
30	30	30	{know_topic_flame}	37	36	36	{sorry_thread_section_place}

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
138	110	92	{buy_accounts_seller}	269	191	143	{looking_accounts_amazon_aws}
51	46	45	{buy_chase_mail}	211	161	122	{logs_logs_bank}
774	646	513	{buy_banks_bank}	211	161	122	{logs_logs_bank}
198	141	97	{processor_processor_ghz}	226	111	90	{cpu_cores_processor_ghz}
933	631	516	{accept_money_qiwi_yandex}	30	23	23	{money_wallet_qiwi_yandex}
54	48	28	{redirect_payment}	33	32	19	{cc_form_payment_payments}
44	44	43	{accept_webmoney_payment}	418	375	325	{accept_btc_payment}
595	456	408	{selling_license_licenses}	172	126	112	{license_license_updates}
231	230	211	{send_pm_contact}	233	233	162	{contact_telegram_pm}
35	34	33	{ask_people_answers_hint}	270	257	211	{help_help_advance}
1822	1526	1146	{write_jabber_pm}	280	278	221	{pm_jabber}
40	39	37	{looking_partners_partner}	915	783	594	{looking_money_term_partner}
1857	1632	1265	{looking_software_program}	69	64	63	{software_software_program}
83	74	63	{buy_mustache_pm}	223	175	153	{buy_base_bases}
2101	1540	1091	{buy_ftp_server}	274	200	170	{ftp_ftp_server}
102	102	40	{end_problem_guarantor_auction}	515	487	333	{work_guarantor_forum}
76	75	54	{end_hours_bet}	25	25	19	{end_hours_bet}
51	48	35	{blitz_blitz_bet_hours}	25	25	19	{end_hours_bet}
138	111	100	{looking_terminal_pos_terminals}	80	64	54	{pos_access_sale}
2500	1907	1278	{need_language_translation}	76	65	59	{language_language_languages}
1729	957	701	{buy_money_poker_casino}	130	101	84	{looking_database_casino_poker}
62	59	53	{price_lines_line}	110	95	70	{lines_lines_line}
464	306	247	{flash_flash_player}	156	89	72	{player_exploit_flash}
136	116	111	{crack_crack_program}	33	25	25	{looking_software_internet}
92	88	73	{write_gills_pm_gill}	165	159	138	{contact_contacts}
146	127	118	{buy_access_network_networks}	189	161	122	{selling_access_admin_network}
192	152	91	{buy_access_citrix}	114	106	55	{citrix_access}
742	551	435	{buy_vnc_bot}	447	324	268	{looking_botnet_botnets}
742	551	435	{buy_vnc_bot}	184	111	96	{looking_hvnc_software}
317	226	184	{buy_hvnc_bot}	64	49	40	{android_rat}
317	226	184	{buy_hvnc_bot}	447	324	268	{looking_botnet_botnets}
62	61	59	{offer_slag_pm}	147	147	122	{pm_pm_buyers}
228	201	188	{subscription_subscription_subscriptions}	65	57	50	{rent_rent_month}
69	58	51	{buy_cpanel_access}	169	126	96	{buy_cpannels_cpanel}
69	58	51	{buy_cpanel_access}	293	241	177	{buy_mailpass_mail}
83	70	67	{looking_botnet_android}	148	111	87	{looking_bot_android}
623	507	396	{looking_bot_android}	64	49	40	{android_rat}
623	507	396	{looking_bot_android}	148	111	87	{looking_bot_android}
623	507	396	{looking_bot_android}	447	324	268	{looking_botnet_botnets}
87	73	67	{list_bots_ip}	119	95	85	{server_dns_domain}
3443	2158	1569	{looking_bot_bots}	733	431	341	{looking_bot_bots}
2722	2092	1388	{buy_soap_soaps}	293	241	177	{buy_mailpass_mail}
365	315	279	{looking_stream_streams}	65	57	50	{rent_rent_month}
306	248	207	{buy_traffic_iframe}	436	316	260	{buy_traffic_quality}
308	262	222	{need_access_computer_control}	104	90	83	{rdp_rdp_server_access}
35	24	21	{need_fax_faxes}	567	381	303	{sms_sms_bulk}
51	51	48	{send_link_pm_links}	165	159	138	{contact_contacts}
53	48	40	{sell_root_server}	189	161	122	{selling_access_admin_network}
403	362	325	{buy_dedics_sale}	223	175	153	{buy_base_bases}
477	390	268	{buy_response_job}	218	171	135	{dump_dumps}
477	390	268	{buy_response_job}	436	316	260	{buy_traffic_quality}
477	390	268	{buy_response_job}	275	194	148	{leads_leads_email}
477	390	268	{buy_response_job}	223	175	153	{buy_base_bases}

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
538	332	236	{buy_channels_youtube}	107	67	55	{buy_channels_youtube}
3398	2594	1751	{buy_base_bases}	275	194	148	{leads_leads_email}
160	128	106	{alexa_rank_traffic}	134	88	72	{rank_rank_country}
264	224	184	{buy_traffic_android}	160	123	102	{buy_installs_countries}
264	224	184	{buy_traffic_android}	29	27	25	{android_traffic}
207	197	180	{throw_people_time}	181	162	138	{know_method_methods}
2809	1409	1017	{need_proxy_proxies}	521	341	285	{socks_socks_socks5}
310	167	137	{selling_tunnels_ssh_tunnel}	208	135	113	{ssh_ssh_tunnel}
270	190	137	{yandex_site}	168	120	102	{redirect_redirects_link}
149	123	87	{buy_logs_facebook}	275	194	148	{leads_leads_email}
149	123	87	{buy_logs_facebook}	1599	1151	736	{logs_logs_log}
113	97	85	{buy_accounts_facebook_business}	275	194	148	{leads_leads_email}
66	62	52	{visitors_visitors_day}	45	41	36	{visitors_visits_day}
43	36	32	{need_email_flood}	36	25	19	{flooder_service_email_flood}
27	23	20	{need_hotmail_mail}	89	73	62	{need_email_emails}
51	50	44	{ability_files_file_mail}	70	57	50	{mailer_script_attachment_email}
880	737	546	{buy_mail_base}	218	171	135	{dump_dumps}
880	737	546	{buy_mail_base}	436	316	260	{buy_traffic_quality}
880	737	546	{buy_mail_base}	170	135	94	{office_office_office365}
51	48	48	{buy_base_email_sale}	147	123	101	{dating_base_site_email}
51	48	48	{buy_base_email_sale}	96	63	53	{bins_bins_bin}
63	56	53	{works_office_versions}	156	145	118	{works_windows_x64}
1659	1297	1029	{looking_spam_spammer}	997	715	520	{need_spammer_spam}
211	169	160	{looking_exe_pdf}	829	516	382	{exploit_exploit_office_word}
104	97	94	{need_letters_inbox_day}	64	57	52	{need_emails_inbox_day}
286	162	98	{need_phone_nokia}	153	126	99	{iphone_windows_gb}
46	42	36	{need_sms_bot}	82	62	59	{sms_sms_interception}
121	77	71	{viber_viber_numbers}	69	46	43	{whatsapp_whatsapp_way_message}
476	392	304	{buy_android_pm}	160	123	102	{buy_installs_countries}
476	392	304	{buy_android_pm}	436	316	260	{buy_traffic_quality}
292	229	202	{buy_number_phone_numbers}	219	163	126	{need_numbers_phone}
349	272	230	{need_sms_numbers}	567	381	303	{sms_sms_bulk}
200	171	162	{need_site_web}	157	132	116	{looking_website_web_developer}
64	51	46	{looking_loader_loaders}	229	181	172	{loader_loader_file}
1521	1033	748	{buy_browser_chrome}	83	68	63	{firefox_passwords_password_browsers}
227	200	155	{buy_shells_traffic_day}	436	316	260	{buy_traffic_quality}
787	653	492	{buy_shells_shell}	436	316	260	{buy_traffic_quality}
787	653	492	{buy_shells_shell}	203	158	126	{buy_shells_shell}
241	200	176	{screenshots_screenshots_screen}	31	27	26	{screenshot_screenshot_screen-shots_desktop}
124	124	118	{pass_test_guarantor}	515	487	333	{work_guarantor_forum}
467	407	293	{selling_access_admin_panel}	189	161	122	{selling_access_admin_network}
887	540	413	{need_cookies_cookie}	166	132	118	{need_cookies_cookie}
186	151	126	{passwords_passwords_browsers}	83	68	63	{firefox_passwords_password_browsers}
89	82	63	{find_password_admin_administrator}	279	237	149	{access_access_admin_domain}
482	369	309	{need_brute_force}	230	184	144	{need_force_checker}
44	32	31	{bypass_smartscreen_windows_filter}	36	29	23	{bypass_smartscreen}
357	270	227	{need_scan_scanner}	189	146	127	{scanner_scanner_scanning}
131	85	79	{allows_signature_signatures}	317	165	141	{ssl_certificate_signing}
370	347	291	{buy_database_databases}	218	171	135	{dump_dumps}
370	347	291	{buy_database_databases}	293	241	177	{buy_mailpass_mail}
91	79	68	{buy_dumps_dump}	515	409	254	{selling_database_data}
91	79	68	{buy_dumps_dump}	293	241	177	{buy_mailpass_mail}
91	79	68	{buy_dumps_dump}	1599	1151	736	{logs_logs_log}

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
45	36	29	{looking_language_programmer_developer}	29	19	13	{need_coder_project}
34	29	23	{need_stock_banks_bank}	36	26	14	{need_bank_account}
152	129	107	{need_rights_root_server}	111	79	57	{escalation_command_privilege}
122	117	106	{buy_yusa_sale}	137	119	100	{buy_emails_email_business}
122	117	106	{buy_yusa_sale}	223	175	153	{buy_base_bases}
167	159	149	{buy_mix_world}	147	113	91	{buy_loads_price}
165	162	147	{write_forum_pm}	87	87	81	{contact_pm_information}
648	498	396	{installation_installation_installer}	72	67	64	{installs_installer_installation}
271	267	228	{work_guarantor_forum}	505	457	310	{work_escrow_payment}
271	267	228	{work_guarantor_forum}	24	24	19	{work_guarantor_forum}
313	310	285	{work_prepayment_guarantor}	515	487	333	{work_guarantor_forum}
92	90	83	{transaction_transactions_guarantor}	515	487	333	{work_guarantor_forum}
270	266	237	{sell_sale_hand_hands}	44	44	37	{sell_hand_hands}
272	270	260	{looking_seller_sellers_buyer}	147	113	91	{buy_loads_price}
329	244	176	{create_file_configuration}	55	32	31	{intecom_checklistxlsx_configuration_file}
51	44	29	{redirect_orders_day}	48	46	29	{redirect_redirect_orders_shop}
654	517	270	{orders_orders_day}	100	96	52	{shop_orders_day}
229	203	189	{buy_installs_installes}	436	316	260	{buy_traffic_quality}
98	90	85	{buy_mix_world}	126	97	92	{buy_installs_install}
98	90	85	{buy_mix_world}	436	316	260	{buy_traffic_quality}
287	260	225	{buy_downloads_countries}	147	113	91	{buy_loads_price}
287	260	225	{buy_downloads_countries}	1599	1151	736	{logs_logs_log}
134	126	122	{buy_installations_installs_exchange}	126	97	92	{buy_installs_install}
254	210	169	{buy_accounts_amazon}	211	161	122	{logs_logs_bank}
543	492	415	{buy_accounts_account}	147	147	122	{pm_pm_buyers}
543	492	415	{buy_accounts_account}	253	208	178	{buying_accounts_account}
51	46	45	{buy_chase_mail}	170	135	94	{office_office_office365}
51	46	45	{buy_chase_mail}	293	241	177	{buy_mailpass_mail}
162	161	141	{need_advice_tips}	270	257	211	{help_help_advance}
1008	723	588	{loader_loader_panel}	229	181	172	{loader_loader_file}
93	85	76	{startup_entry_registry_program}	79	62	56	{startup_persistence}
123	114	98	{form_payment_site}	33	32	19	{cc_form_payment_payments}
363	319	290	{withdraw_money_withdrawal_account}	43	29	26	{withdraw_withdrawal_funds}
31	31	22	{form_form_payment_site}	33	32	19	{cc_form_payment_payments}
42	41	38	{accept_wmz_payment}	418	375	325	{accept_btc_payment}
498	429	395	{return_money_moneyback_refund}	596	394	303	{paid_money_days_guy}
349	316	287	{scammers_time_scam}	505	457	310	{work_escrow_payment}
176	162	155	{wrote_pm_time}	73	62	57	{stopped_messages_days}
152	147	137	{contact_questions_pm}	87	87	81	{contact_pm_information}
1770	1452	1133	{said_money_person_time}	596	394	303	{paid_money_days_guy}
231	230	211	{send_pm_contact}	76	76	69	{contact_pm}
231	230	211	{send_pm_contact}	111	107	85	{contact_pm}
196	155	132	{agreed_defendant_work}	596	394	303	{paid_money_days_guy}
76	76	70	{looking_information_info}	270	257	211	{help_help_advance}
72	69	63	{help_assistance_advance}	270	257	211	{help_help_advance}
81	73	69	{looking_programmer_c_coder}	382	311	255	{looking_coder_developer}
1822	1526	1146	{write_jabber_pm}	233	233	162	{contact_telegram_pm}
48	48	10	{guarantor_people_expense}	515	487	333	{work_guarantor_forum}
536	450	377	{need_ligament_ligaments}	148	111	87	{looking_bot_android}
61	50	33	{buy_luxsocks_account}	45	30	26	{buy_luxsocks_sale}
83	74	63	{buy_mustache_pm}	436	316	260	{buy_traffic_quality}
83	74	63	{buy_mustache_pm}	515	409	254	{selling_database_data}
83	74	63	{buy_mustache_pm}	275	194	148	{leads_leads_email}

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
83	74	63	{buy_mustache_pm}	293	241	177	{buy_mailpass_mail}
83	74	63	{buy_mustache_pm}	38	30	26	{buy_logs_botnet}
83	74	63	{buy_mustache_pm}	253	208	178	{buying_accounts_account}
424	293	242	{need_captcha_site_service}	53	46	44	{captcha_captcha_login_page}
2101	1540	1091	{buy_ftp_server}	189	161	122	{selling_access_admin_network}
179	136	117	{looking_strike_cobalt}	175	114	90	{strike_strike_cobalt}
49	49	43	{end_drop_time_auction}	32	32	20	{availability_pm_auction_hours}
51	48	35	{blitz_blitz_bet_hours}	90	90	53	{end_bid_auction}
200	196	132	{end_auction_hours}	59	52	34	{end_hours_bid}
200	196	132	{end_auction_hours}	90	90	53	{end_bid_auction}
44	44	27	{end_hours_auction}	55	55	28	{end_hours_bid}
160	140	124	{looking_stealer_azorult}	447	324	268	{looking_botnet_botnets}
1068	780	508	{buy_database_site_sites}	218	171	135	{dump_dumps}
1068	780	508	{buy_database_site_sites}	275	194	148	{leads_leads_email}
1068	780	508	{buy_database_site_sites}	137	119	100	{buy_emails_email_business}
1068	780	508	{buy_database_site_sites}	293	241	177	{buy_mailpass_mail}
55	50	46	{buy_sheets_sheet}	223	175	153	{buy_base_bases}
62	59	53	{price_lines_line}	222	199	173	{pay_price_account_balance}
1477	1036	807	{need_drops_drop}	374	268	221	{paypal_paypal_account}
52	30	29	{written_burp_suite}	40	33	30	{suite_columns_burp}
684	503	409	{buy_grandfathers_grandfather}	223	175	153	{buy_base_bases}
1009	852	696	{rent_bunch_month}	65	57	50	{rent_rent_month}
586	550	481	{unsubscribe_unsubscribe_pm_topic}	181	162	138	{know_method_methods}
146	127	118	{buy_access_network_networks}	114	106	55	{citrix_access}
146	127	118	{buy_access_network_networks}	170	135	94	{office_office_office365}
146	127	118	{buy_access_network_networks}	293	241	177	{buy_mailpass_mail}
162	116	101	{buy_teamviewer_team}	51	44	42	{teamviewer_viewer_team}
162	116	101	{buy_teamviewer_team}	121	96	87	{vnc_vnc_session}
1768	1139	767	{buy_rdp_access}	208	135	113	{ssh_ssh_tunnel}
1768	1139	767	{buy_rdp_access}	104	90	83	{rdp_rdp_server_access}
742	551	435	{buy_vnc_bot}	80	64	54	{pos_access_sale}
317	226	184	{buy_hvnc_bot}	184	111	96	{looking_hvnc_software}
294	250	218	{looking_pentesters_team}	46	32	31	{looking_pentester_pentesters}
172	148	132	{need_site_sites}	422	302	232	{need_page_phishing}
136	90	80	{need_ip_cloudflare}	45	32	31	{bypass_cloudflare_ip}
149	124	107	{buy_logs_cookies}	31	28	25	{logs_logs_botnet}
149	124	107	{buy_logs_cookies}	170	135	94	{office_office_office365}
149	124	107	{buy_logs_cookies}	211	161	122	{logs_logs_bank}
62	61	59	{offer_slag_pm}	223	175	153	{buy_base_bases}
87	72	59	{selling_logs_zeus}	38	30	26	{buy_logs_botnet}
28	25	22	{sell_license_andromeda_time}	75	59	51	{sell_license_smoke_loader}
69	58	51	{buy_cpanel_access}	269	191	143	{looking_accounts_amazon_aws}
69	58	51	{buy_cpanel_access}	189	161	122	{selling_access_admin_network}
888	507	384	{need_ddos_attacks}	131	94	86	{ddos_attack_service}
83	70	67	{looking_botnet_android}	447	324	268	{looking_botnet_botnets}
623	507	396	{looking_bot_android}	149	106	87	{looking_botnet_android}
140	120	108	{looking_bot_bank}	136	104	83	{looking_bot_banking}
1321	960	791	{looking_botnet_botnets}	148	111	87	{looking_bot_android}
83	65	57	{looking_report_credit}	155	59	48	{report_report_credit_score}
2722	2092	1388	{buy_soap_soaps}	170	135	94	{office_office_office365}
306	248	207	{buy_traffic_iframe}	1599	1151	736	{logs_logs_log}
308	262	222	{need_access_computer_control}	121	96	87	{vnc_vnc_session}
204	114	97	{ransomware_ransomware_malware}	276	164	137	{ransomware_ransomware_ransom}

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
26	23	19	{set_password_cookies_login}	170	135	94	{office_office_office365}
221	139	100	{looking_powershell_script}	93	66	59	{powershell_command}
35	24	21	{need_fax_faxes}	300	230	173	{sms_spam}
51	51	48	{send_link_pm_links}	233	233	162	{contact_telegram_pm}
51	51	48	{send_link_pm_links}	280	278	221	{pm_jabber}
38	37	36	{build_50_price}	24	23	21	{cost_build_builder}
38	37	36	{build_50_price}	222	199	173	{pay_price_account_balance}
403	362	325	{buy_dedics_sale}	293	241	177	{buy_mailpass_mail}
403	362	325	{buy_dedics_sale}	1599	1151	736	{logs_logs_log}
158	130	113	{need_apk_pm}	72	52	45	{crypt_apk_crypter}
477	390	268	{buy_response_job}	160	123	102	{buy_installs_countries}
477	390	268	{buy_response_job}	66	56	49	{buy_rdp_quality}
477	390	268	{buy_response_job}	203	158	126	{buy_shells_shell}
477	390	268	{buy_response_job}	137	119	100	{buy_emails_email_business}
477	390	268	{buy_response_job}	40	27	17	{buy_info_profiles}
477	390	268	{buy_response_job}	147	113	91	{buy_loads_price}
477	390	268	{buy_response_job}	1599	1151	736	{logs_logs_log}
1126	845	704	{program_program_affiliate}	915	783	594	{looking_money_term_partner}
3398	2594	1751	{buy_base_bases}	293	241	177	{buy_mailpass_mail}
272	221	206	{buy_links_link}	1599	1151	736	{logs_logs_log}
264	224	184	{buy_traffic_android}	436	316	260	{buy_traffic_quality}
25	23	20	{takes_minutes_installation_server}	53	44	41	{uptime_server_hours_time}
131	119	109	{buy_sox_server}	521	341	285	{socks_socks_socks5}
1004	498	391	{need_tor_network}	42	29	24	{looking_traffic_onion_onions}
114	39	36	{fastflux_fastflux_networks}	119	95	85	{server_dns_domain}
114	39	36	{fastflux_fastflux_networks}	66	33	28	{fastflux_fastflux_panel}
612	355	277	{buy_ssh_server}	208	135	113	{ssh_ssh_tunnel}
2417	940	706	{vpn_vpn_server}	153	98	89	{tor_tor_network}
178	174	153	{looking_suppliers_supplier}	38	37	36	{looking_vendor_suppliers_supplier}
232	183	139	{buy_gifts_gift}	96	63	53	{bins_bins_bin}
96	69	47	{buy_itunes_gift}	133	86	75	{card_card_gift}
421	357	302	{buy_socks_socks5}	66	56	49	{buy_rdp_quality}
421	357	302	{buy_socks_socks5}	521	341	285	{socks_socks_socks5}
421	357	302	{buy_socks_socks5}	223	175	153	{buy_base_bases}
130	121	116	{bypass_bypass_bypasses}	69	64	63	{software_software_program}
90	88	71	{selling_access_sale}	189	161	122	{selling_access_admin_network}
149	123	87	{buy_logs_facebook}	436	316	260	{buy_traffic_quality}
149	123	87	{buy_logs_facebook}	137	119	100	{buy_emails_email_business}
61	30	24	{allows_telnet_client}	103	84	77	{smtp_smtp_server}
145	74	55	{interception_traffic_network}	140	107	88	{network_packets_nmap}
320	229	188	{need_sniffer_sniff}	62	44	43	{sniffer_sniffer_cc}
58	55	53	{depends_price_traffic}	215	209	182	{price_price_quality}
270	222	198	{buy_vps_server}	576	359	294	{domains_domains_domain}
75	71	70	{need_hosting_bulletproof}	260	209	180	{need_vps_bulletproof}
154	131	121	{servers_servers_countries}	242	215	195	{countries_countries_country}
829	740	583	{buy_traffic_countries}	126	97	92	{buy_installs_install}
829	740	583	{buy_traffic_countries}	160	123	102	{buy_installs_countries}
829	740	583	{buy_traffic_countries}	66	56	49	{buy_rdp_quality}
829	740	583	{buy_traffic_countries}	203	158	126	{buy_shells_shell}
829	740	583	{buy_traffic_countries}	275	194	148	{leads_leads_email}
829	740	583	{buy_traffic_countries}	1599	1151	736	{logs_logs_log}
227	182	142	{looking_ssn_number}	1812	1218	731	{need_scans_email_phone}
28	26	25	{sell_base_ssn}	293	241	177	{buy_mailpass_mail}

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
28	26	25	{sell_base_ssn}	1812	1218	731	{need_scans_email_phone}
77	62	53	{buy_accounts_developer_play}	34	25	21	{accounts_account_developer_apple}
52	50	36	{buy_mile_hash}	137	119	100	{buy_emails_email_business}
40	38	15	{date_date_release}	144	78	70	{date_6th_time}
42	37	33	{offer_services_classmates_networks}	89	73	62	{need_email_emails}
36	34	33	{depends_price_mail}	64	57	52	{need_emails_inbox_day}
100	80	73	{need_spam_spammer}	27	22	19	{looking_users_discord_server}
100	80	73	{need_spam_spammer}	426	327	261	{telegram_telegram_bot}
49	46	44	{agree_product_terms_rules}	105	88	83	{agree_right_service_rules}
32	31	30	{need_script_mail}	40	29	24	{need_shell_sendmail_mail}
27	23	20	{need_hotmail_mail}	25	22	20	{need_inbox_gmail}
87	78	76	{help_password_mail}	27	27	21	{access_access_email}
149	141	132	{need_access_mail}	27	27	21	{access_access_email}
156	137	123	{pass_database_mail_mailpass}	114	75	56	{looking_mailpass_mail}
156	137	123	{pass_database_mail_mailpass}	77	68	63	{need_list_email_mail}
156	137	123	{pass_database_mail_mailpass}	293	241	177	{buy_mailpass_mail}
107	96	90	{substitution_email_sender}	64	57	52	{need_emails_inbox_day}
880	737	546	{buy_mail_base}	147	123	101	{dating_base_site_email}
880	737	546	{buy_mail_base}	269	191	143	{looking_accounts_amazon_aws}
880	737	546	{buy_mail_base}	66	56	49	{buy_rdp_quality}
880	737	546	{buy_mail_base}	219	163	126	{need_numbers_phone}
880	737	546	{buy_mail_base}	83	79	43	{mailpass_usa_mail}
880	737	546	{buy_mail_base}	147	113	91	{buy_loads_price}
880	737	546	{buy_mail_base}	71	64	49	{buy_fullz_sale}
51	48	48	{buy_base_email_sale}	71	64	49	{buy_fullz_sale}
1659	1297	1029	{looking_spam_spammer}	138	100	71	{looking_office_spammer}
1659	1297	1029	{looking_spam_spammer}	64	57	52	{need_emails_inbox_day}
180	172	154	{buy_base_spam_bases}	293	241	177	{buy_mailpass_mail}
99	83	76	{looking_addresses_email_mail}	87	65	58	{checker_emails_email}
950	673	510	{buy_smtp_server}	87	65	58	{checker_emails_email}
950	673	510	{buy_smtp_server}	64	57	52	{need_emails_inbox_day}
950	673	510	{buy_smtp_server}	247	192	150	{looking_smtp_inbox}
105	78	52	{buy_logs_gmail}	293	241	177	{buy_mailpass_mail}
105	78	52	{buy_logs_gmail}	1599	1151	736	{logs_logs_log}
161	154	145	{reserve_right_explanation_service}	105	88	83	{agree_right_service_rules}
198	153	120	{buy_skrill_neteller}	374	268	221	{paypal_paypal_account}
210	186	163	{buy_links_logs}	1599	1151	736	{logs_logs_log}
121	77	71	{viber_viber_numbers}	426	327	261	{telegram_telegram_bot}
336	249	197	{need_apk_play}	69	56	55	{need_apk_play}
476	392	304	{buy_android_pm}	29	27	25	{android_traffic}
476	392	304	{buy_android_pm}	1599	1151	736	{logs_logs_log}
54	53	51	{looking_logs_people}	915	783	594	{looking_money_term_partner}
52	52	50	{price_price_log}	215	209	182	{price_price_quality}
182	151	134	{sms_sms_interception}	567	381	303	{sms_sms_bulk}
400	329	289	{sms_sms_number}	300	230	173	{sms_spam}
120	112	102	{sold_copies_copy}	24	23	21	{cost_build_builder}
61	55	49	{grabber_grabber_form}	468	289	232	{firefox_browser_internet_explorer}
214	188	168	{looking_services_web_development}	32	29	26	{looking_developer_android_coder}
214	188	168	{looking_services_web_development}	382	311	255	{looking_coder_developer}
214	188	168	{looking_services_web_development}	157	132	116	{looking_website_web_developer}
27	24	23	{buy_lock_browser_browsers}	184	111	96	{looking_hvnc_software}
260	226	194	{looking_code_javascript}	31	24	21	{need_coder_javascript}
227	200	155	{buy_shells_traffic_day}	203	158	126	{buy_shells_shell}

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
227	200	155	{buy_shells_traffic_day}	147	113	91	{buy_loads_price}
787	653	492	{buy_shells_shell}	275	194	148	{leads_leads_email}
787	653	492	{buy_shells_shell}	189	161	122	{selling_access_admin_network}
787	653	492	{buy_shells_shell}	293	241	177	{buy_mailpass_mail}
787	653	492	{buy_shells_shell}	147	113	91	{buy_loads_price}
787	653	492	{buy_shells_shell}	223	175	153	{buy_base_bases}
787	653	492	{buy_shells_shell}	1599	1151	736	{logs_logs_log}
290	170	114	{need_sound_mp3}	229	148	91	{audio_formats_video}
937	848	736	{offer_service_services}	447	324	268	{looking_botnet_botnets}
937	848	736	{offer_service_services}	171	153	129	{looking_hacker_hackers}
937	848	736	{offer_service_services}	68	63	61	{tools_tools_tool}
379	346	186	{company_services_industry}	258	232	138	{company_access_industry}
997	740	577	{buy_paypal_account}	253	208	178	{buying_accounts_account}
73	68	58	{users_users_database}	515	409	254	{selling_database_data}
449	366	316	{looking_locker_lockers}	148	111	87	{looking_bot_android}
1575	1054	776	{need_password_passwords}	632	456	379	{need_password_login}
106	68	59	{buy_certificate_code_signing}	317	165	141	{ssl_certificate_signing}
151	142	137	{terms_time_days_hours}	59	53	50	{delivery_hours_time}
31	29	25	{buy_database_mail}	293	241	177	{buy_mailpass_mail}
31	29	25	{buy_database_mail}	223	175	153	{buy_base_bases}
370	347	291	{buy_database_databases}	147	123	101	{dating_base_site_email}
370	347	291	{buy_database_databases}	189	161	122	{selling_access_admin_network}
370	347	291	{buy_database_databases}	223	175	153	{buy_base_bases}
370	347	291	{buy_database_databases}	44	44	37	{sell_hand_hands}
91	79	68	{buy_dumps_dump}	218	171	135	{dump_dumps}
91	79	68	{buy_dumps_dump}	269	191	143	{looking_accounts_amazon_aws}
91	79	68	{buy_dumps_dump}	147	147	122	{pm_pm_buyers}
45	36	29	{looking_language_programmer_developer}	382	311	255	{looking_coder_developer}
327	190	130	{injection_injection_sql}	290	159	116	{injection_injection_sql}
156	118	98	{set_rights_file}	27	18	17	{chrootmysqldevnull_permissions_file_tmd}
99	84	74	{buy_bins_base}	96	63	53	{bins_bins_bin}
233	211	183	{buy_vbv_cvv}	218	171	135	{dump_dumps}
233	211	183	{buy_vbv_cvv}	137	119	100	{buy_emails_email_business}
233	211	183	{buy_vbv_cvv}	293	241	177	{buy_mailpass_mail}
122	117	106	{buy_yusa_sale}	218	171	135	{dump_dumps}
122	117	106	{buy_yusa_sale}	275	194	148	{leads_leads_email}
122	117	106	{buy_yusa_sale}	1599	1151	736	{logs_logs_log}
62	61	56	{buy_loading_cis}	436	316	260	{buy_traffic_quality}
167	159	149	{buy_mix_world}	275	194	148	{leads_leads_email}
167	159	149	{buy_mix_world}	154	124	108	{mix_loads_world}
2108	1845	1427	{countries_countries_country}	154	124	108	{mix_loads_world}
1428	968	730	{need_telegram_bot}	27	22	19	{looking_users_discord_server}
1428	968	730	{need_telegram_bot}	69	46	43	{whatsapp_whatsapp_way_message}
140	107	95	{need_binance_account}	51	38	33	{binance_ats_crypto}
90	88	84	{share_pm_people}	69	68	59	{contact_pm_telegram_thanks}
33	15	15	{ram_mbits_month}	194	68	65	{ram_ram_traffic}
165	162	147	{write_forum_pm}	176	171	144	{pm_price}
165	162	147	{write_forum_pm}	76	76	69	{contact_pm}
165	162	147	{write_forum_pm}	233	233	162	{contact_telegram_pm}
165	162	147	{write_forum_pm}	280	278	221	{pm_jabber}

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
42	42	40	{work_guarantor_exploit}	515	487	333	{work_guarantor_forum}
196	196	175	{price_guarantor}	24	24	19	{work_guarantor_forum}
192	191	179	{work_service_guarantor_expense}	24	24	19	{work_guarantor_forum}
192	191	179	{work_service_guarantor_expense}	515	487	333	{work_guarantor_forum}
133	132	121	{work_guarantor_pm}	24	24	19	{work_guarantor_forum}
48	48	48	{discounts_discounts_wholesalers}	133	110	104	{discount_discount_discounts_orders}
272	270	260	{looking_seller_sellers_buyer}	269	191	143	{looking_accounts_amazon_aws}
272	270	260	{looking_seller_sellers_buyer}	275	194	148	{leads_leads_email}
272	270	260	{looking_seller_sellers_buyer}	247	192	150	{looking_smtp_inbox}
272	270	260	{looking_seller_sellers_buyer}	80	74	67	{price_code_source}
272	270	260	{looking_seller_sellers_buyer}	253	208	178	{buying_accounts_account}
272	270	260	{looking_seller_sellers_buyer}	82	72	63	{buy_banks_bank}
139	136	127	{price_price_piece}	126	97	92	{buy_installs_install}
606	595	524	{price_price_prices}	215	209	182	{price_price_quality}
654	517	270	{orders_orders_day}	24	24	12	{orders_orders_site}
85	76	57	{orders_orders_day_card}	100	96	52	{shop_orders_day}
85	76	57	{orders_orders_day_card}	24	24	12	{orders_orders_site}
273	239	203	{download_file}	76	65	58	{download_file}
229	203	189	{buy_installs_installes}	275	194	148	{leads_leads_email}
98	90	85	{buy_mix_world}	160	123	102	{buy_installs_countries}
287	260	225	{buy_downloads_countries}	203	158	126	{buy_shells_shell}
287	260	225	{buy_downloads_countries}	275	194	148	{leads_leads_email}
43	41	37	{looking_person_installations_partner}	915	783	594	{looking_money_term_partner}
134	126	122	{buy_installations_installs_exchange}	436	316	260	{buy_traffic_quality}
134	126	122	{buy_installations_installs_exchange}	147	147	122	{pm_pm_buyers}
111	106	97	{pay_installs_price}	126	97	92	{buy_installs_install}
111	106	97	{pay_installs_price}	160	123	102	{buy_installs_countries}
111	106	97	{pay_installs_price}	222	199	173	{pay_price_account_balance}
111	106	97	{pay_installs_price}	215	209	182	{price_price_quality}
396	364	308	{buy_accounts_logs}	253	208	178	{buying_accounts_account}
68	68	65	{buy_acc_pm}	147	147	122	{pm_pm_buyers}
254	210	169	{buy_accounts_amazon}	170	135	94	{office_office_office365}
254	210	169	{buy_accounts_amazon}	87	57	43	{smtp_smtp_aws}
337	331	285	{buy_akki_aki}	269	191	143	{looking_accounts_amazon_aws}
51	46	45	{buy_chase_mail}	269	191	143	{looking_accounts_amazon_aws}
51	46	45	{buy_chase_mail}	253	208	178	{buying_accounts_account}
39	19	19	{gbits_anlym_mb_ram}	194	68	65	{ram_ram_traffic}
39	19	19	{gbits_anlym_mb_ram}	226	111	90	{cpu_cores_processor_ghz}
2115	1951	1312	{write_toad_pm}	176	171	144	{pm_price}
2115	1951	1312	{write_toad_pm}	165	159	138	{contact_contacts}
241	238	216	{write_suggestions_pm}	57	54	52	{appreciated_advice_suggestions}
51	50	41	{accept_payment_liberty}	418	375	325	{accept_btc_payment}
123	114	98	{form_payment_site}	418	375	325	{accept_btc_payment}
123	114	98	{form_payment_site}	55	48	16	{redirect_paypal_payments_payment}
70	64	40	{iframe_form_payment}	55	48	16	{redirect_paypal_payments_payment}
119	110	103	{system_payments_payment_systems}	418	375	325	{accept_btc_payment}
1665	1124	785	{works_windows_system}	98	59	46	{office_office_bit}
43	36	33	{compressed_file_compression}	170	135	100	{bytes_kb_size_file}
123	103	90	{unpack_archive_zip}	202	65	52	{need_file_zip}
150	145	136	{write_experience_people}	57	54	52	{appreciated_advice_suggestions}
152	147	137	{contact_questions_pm}	76	76	69	{contact_pm}
231	230	211	{send_pm_contact}	40	40	36	{pm_pm_person}
231	230	211	{send_pm_contact}	165	159	138	{contact_contacts}

Russian dataset				English dataset			
Number of			Cluster label	Number of			Cluster label
P	T	A ^b		P	T	A ^b	
231	230	211	{send_pm_contact}	87	87	81	{contact_pm_information}
134	131	119	{salary_salary_month}	65	57	50	{rent_rent_month}
1997	1949	1499	{write_contacts_pm}	87	87	81	{contact_pm_information}
1997	1949	1499	{write_contacts_pm}	76	76	69	{contact_pm}
1997	1949	1499	{write_contacts_pm}	233	233	162	{contact_telegram_pm}
1997	1949	1499	{write_contacts_pm}	280	278	221	{pm_jabber}
81	73	69	{looking_programmer_c_coder}	70	52	41	{need_coder_php}
532	483	429	{looking_coder_team}	32	29	26	{looking_developer_android_coder}
532	483	429	{looking_coder_team}	29	19	13	{need_coder_project}
79	64	58	{looking_code_programmer_programming}	382	311	255	{looking_coder_developer}
199	166	151	{training_courses_course}	228	203	182	{test_test_tests}
69	69	62	{looking_person_cooperation}	915	783	594	{looking_money_term_partner}
1822	1526	1146	{write_jabber_pm}	87	87	81	{contact_pm_information}
1822	1526	1146	{write_jabber_pm}	76	76	69	{contact_pm}
1822	1526	1146	{write_jabber_pm}	117	108	98	{support_account_jabber_server}
480	193	132	{detained_information_years_code}	120	53	46	{said_attacks_government_security}
TOTAL				TOTAL			
259506	202196	156594		144578	110263	83784	