## **DOSPIR on ArcGIS Pro**

## User's Guide



Laboratory for Advanced Construction Technology

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## 1. Original data from Iowa DOT

## a. Crash Data

## - Data obtained from

https://data.iowadot.gov/datasets/84cc3a98db944e71aed9e4a984a3ff60/explore

## - 792,337 total crashes from 2009 to 2023

Shape OBJECTED CRASH, KEY CASENUMBER LECASENUM	CRASH, DATE CRASH, MO	ONT CRASH, DAY DISTRI	BCT COUNTY_NUM CITY_N	UMER SYSTEMS	ER UTERAL	PRSTHARM LOCPS	THRM CRCOM	INNR MA	AUCSE DR	UGALC ECNIC	RC LIGHT	SRICND W	EATHER RENTO	AC RUTYP	RANED WZR	ELATED CSEV	MANALITIES	INURIES	MAINUK	MININARY	POSSINARY	UNKINJUE	PROPENS	RHICLES TO	COUPANTS RE	ORT RECORD YOU "
1 0 Point 2M 2181450 2009000005 2009462002 WTG-000195	2009-01-01	1 5	2 7	0	WEDSTON AVE & W.R.	55	1	5	2	ő	1 1	1	2	1 12	1	0 4	0	1	C	0	1	0	18000	2	4	7 554004 470
2 1 Point 2M 2181464 2009000054 2009462465 090090	2009-01-05	1 7	4 25	0 US 160	US 189/H AVE	55	1	5	20	ð	2 5	3	6	2 1	1	0 2	0	2	1	0	0		10000	4	5	7 414451 462
3 2 Point 208 2181473 2009000062 2009462902 2009000105	2009-01-03	1 7	1 64	0	SUMMIT ST	55	4	z	44	ā	2 5	3	2	2 I	1	0 3	0	1	(	1	0	0	3000	2	2	7 503764 465
4 5 Paint 214 2181474 2009000000 2009482620 09-66	2009-01-05	1 7	1 77	0	E DAEHLL DR	20	1	1	45	ā	2 5	3	6	2 1	1	0 5	0	0	(	0	0	0	8000	1	4	7 457954 460
5 4 Paint 218 2181479 2009000094 2009462640 2009000007	2009-01-01	1 5	1 77	0	MORTON AVE	35	6	97	65	ā	1 1	.1	2	90 1	1	0 5	0	0	(	0	0	0	1600	z	1	7 449520 400
6 5 Patri 216 2181485 2009000156 2009482741 09-0091	2009-01-04	1 1	1 94	0	CENTRAL AVE & S 151.	53	1	5	35	ă	1 4	3	1	2 12	1	0 5	0	0	(	0	0	0	6000	2	4	7 403241 470
7 6 Paint 214 2181486 2009000168 2009482757 09-254	2009-01-03	1 7	3 97	0	STONE ALE & WIA TE.	97	1	1	20	ð	1 1	3	5	z 4	1	0 5	0	0	(	0	0		5000	-1	1	7 224555 470
5 7 Paint 214 2181492 2009000193 2009462754 09-384	2009-01-05	1 7	3 97	0	S RATTERSON ST	33	1	6	45	ð	1 4	3	1	2 1	1	0 5	0	0	(	0	0	0	2500	-2		7 224265 470
9 8 Point 214 2181403 200000198 2009462923 09000364	2009-01-02	1 6	2 7	0	6TH ST & CLAY ST	55	1	5	7	5	1 1	1	1	1 12	1	0 5	0	0		0	0		3000	2	4	7 545318 470
10 9 Point 214 2181404 2002003215 2002462348 W09-001544	2007-01-05	1 7	2 7	0	W RECEIVER AND	33	1	2	9	8	1 1	1	1	1 4	1	0 4	0	2	0	0	2		5000	2	3	7 552799 470
11 10 Paint 204 2181507 2009003240 2009462997 09-000000	2009-01-03	1 7	1 40	0 1-35	1-35	20	1	1	20	8	2 1	3	6	2 1	1	0 3	0	2		2	0		15000	1	3	7 453042 409
12 11 Paint 214 2181503 2009003241 2009462903 09-000791	2007-01-04	1 1	1 40	0	Co Rd D25/22/TH ST	4	1	1	20	8	1 1	3	1	2 1	1	0 3	0	2	(	1	1		4000	1	3	7 499238 470
15 12 Paint 214 21815/0 200000244 2009403000 PD00000057	2009-01-05	1 7	5 51	0	NATHER	33	1	5	ta	8	1 1	1	2	1 4	1	0.5	0	0	(	0	0		1800	2	5	7 526773 454
14 15 Patri 214 2161510 202000258 2029403056 2029000015	2007-01-02	1 6	1 77	0 US 80	US 65/58 MITH ST & P.	33	1	3	24	8	1 1	1	1	1 4	1	0 4	0	2		0	2		6500	3	9	7 450344 400
15 14 Davel 74 2151511 2020002055 2020451055 (20.00451	2002.01.05	1 2	4 78	6 1.20	1.20		1		71					1 31			0						4500	2	2	7 257477 496
16 15 Date 214 2161571 200000020 20004000 0100401	2002-01-03	7	1 8	0	ATH ST & DOUGLAS BA	11				8	2 1			2 12			0	2			,			2		7 4000 40
	2002 01 02																						4000			
17 19 VEH 218 2101322 20000226 200403131 0F481	2009-01-05	1 4	1 00		R STREET & COTH AND			2	16	8		-	7	3 1		0 5	0	0		0	0		4500	-	-	7 501.007 465
	2009-01-01	-	0 0		C 31 L 31 C 3 VILLANC	30	4	1	10	a		1	-			0 3	0	U		0	0		4000	-		00+ 240+100 1
19 16 Petri 20 2181536 2009000547 2009483522 Web-001915	2009-01-05	1 3	2 7	0	MEADOWIN	33		2	10	a	1 1	4	1	1 1		0 5	0	0		0	0		6000	2	3	7 551544 470
20 19 Point 20 2181557 2009000058 2009465525 W06-6019X	2009-01-05	1 2	2 7	0	SAGER ALL & DOREEN.	- 43			20	3		3		1 12		0 5	0	0		0	0		2190			7 550544 470
21 20 Patri 214 2161546 2009000356 2009463331 01-09-601	2009-01-05	1 2	6 31	0	JOHN P RENNEDY RO	33	1	6	13	å	1 1	.1	1	1 1	1	0 5	0	0	(	0	0	0	3000	2	2	7 657257 470
22 21 Point 2M 2181547 200900367 2009463368 09-00036	2009-01-05	1 7	40	0 US 20	US 20	20	1	1	20	a	2 1	3	6	2 1	1	0 5	0	0	9	0	0		10000	1		7 431055 409
23 22 Point 214 2181548 2009000376 2009485581 0900052	2009-01-01	1 5	5 62	0 14 25	1A 23/177H ST	31	77	Π	1	ő	ππ	77	77	11 11	1	0 5	0	0	(	0	0	0	2000	1	717	7 531500 457
24 25 Point 2M 2181549 2009000387 2009483395 2009000057	2009-01-05	1 5	1 77	0	JOHN PATTERSON RD	33	1	5	7	å	1 1	3	2	2 12	1	0 5	0	0	0	0	0		2500	2	2	7 452897 400
25 24 Paint 214 2181550 2009000391 2009465399 2009000037	2009-01-04	1 1	1 77	0	SHITH ST	33	1	5	20	ő	20 1	3	1	2 1	1	0 5	0	0	(	0	0	0	1000	Z	π	7 444731 400
26 25 Point 2M 2181557 2009000418 2009465458 09-542	2009-01-05	1 5	3 97	0	MUTARY RD & CASSEL	. 33	1	5	9	ð	1 3	1	2	1 96	1	0 5	0	0	0	0	0	0	7000	2	3	7 216954 471
27 26 Paint 2M 2181568 2009003440 2009483616 0901071-A	2009-01-07	1 4	4 69	0	CORNING ST & BOUN.	53	1	5	24	ő	95 1	6	2	2 12	1	0 5	0	0	(	0	0	0	3300	2	4	7 315259 454
28 27 Petrit 214 2181569 2009000447 2009485625 2008000059	2009-01-05	1 5	1 77	0	E PARK ARE & SE ZEND.	53	1	4	71	ă	1 1	1	1	1 12	1	0 5	0	0	0	0	0	0	5000	2	4	7 451843 460
29 25 Paint 2M 2181570 2009000462 2009463652 HR16545	2009-01-05	3	6 82	0	MIDDLE RD & MARLO	35	1	92	71	ā	1 1	1	1	1 13	1	0 5	0	0	0	0	0	0	2000	2	1	7 706055 400
50 29 Point 214 2181571 2009000475 2009483672 09-005	2009-01-05	1 3	4 87	0	170TH ST	21	1	22	45	ð	95 1	2	1	2 1	2	0 5	0	0	0	0	0	0	6000	1	1	7 350710 451
31 30 Paint 214 2181572 2009000477 2009483609 2009-8033	2009-01-05	1 7	5 91	0	N HOWARD ST	33	1	5	65	ā	1 4	1	1	1 1	1	0 5	0	0	(	0	0	0	1150	2	5	7 455055 457
32 31 Point 214 2181579 2009000485 2009483724 2009000577	2009-01-05	1 7	3 97	0 1-29	1-29	95	3	1	20	ð	2 1	3	6	1 96	1	0 5	0	0	(	0	0	0	1200	1	1	7 222566 470
33 32 Point 2M 2181580 2009009483 2009465732 2009000633	2009-01-03	1 7	4 43	0 1-29	1-29	33	1	6	16	ő	2 1	3	6	1 1	1	0 4	0	1	0	0	1	0	10000	2	2	7 249044 461
34 33 Point 2M 2181581 2009000498 2009483737 2009000983	2009-01-04	1 1	Z 95	0	CO 105	20	1	1	44	ā	2 5	3	10	2 1	1	0 5	0	0	0	0	0		1000	1	2	7 463712 400
55 54 Paint 214 2181552 2009000520 2009465831 W-09-005	2009-01-08	1 5	2 3	0 IA 9	R RINDAR AL	33	1	4	71	ā	1 1	2	1	1 4	1	0 5	0	0	0	0	0	0	5000	2	3	7 623912 478
56 55 Paint 200 2181591 2009000556 2009485897 02-09-115	2009-01-05	1 7	6 31	0 US 20	US 20	55	1	6	16	ā	2 1	3	6	2 1	1	0 5	0	0	(	0	0	0	2900	2	9	7 665555 470
57 36 Paint2M 2181592 2009000558 2009485899 02-09-229	2009-01-05	1 5	6 31	0	Co Rd 121 RARK HOLL.	44	1	1	45	ā	99 1	3	z	2 1	1	0 5	0	٥	0	0	0	0	2000	1	1	7 673752 471
55 37 Paint 214 2181593 2009000363 2009463906 09002531	2009-01-05	1 7	6 52	0	GANDALE BLVD	22	1	6	20	ā	2 5	3	6	2 1	2	0 5	0	0	(	0	0		1,2000	3	6	7 618198 461
59 35 Paint 214 2181603 2009000574 2009483926 200900103	2009-01-03	1 7	1 64	0 14 14	IA 14/5 CENTER ST &	55	1	5	20	ā	2 4	3	6	2 12	1	0 5	0	0	(	0	0	0	5500	2	12	7 507243 465
40 39 Paint 214 2181604 2009000579 2009483955 09012082	2009-01-02	1 6	4 73	0 IA 2	IA 2/ICHIA 2	31	77	77	1	ā	ππ	π	π	π	1	0 5	0	0	(	0	0	0	3500	1	777	7 526531 451
41 40 Paint 218 2181605 2009000595 2009463952 2009000031	2009-01-05	1 5	1 77	0	HOLCOME ANY & 2ND.		1	4	16	ő	1 1	1	1	1 12	1	0 5	0	0	(	0	0	0	3300	2	2	7 445355 400
42 41 Patri 218 2181606 2009000004 2009482971 09-901	2009-01-05	1 5	4 70	0	LAC MARANA	31	1	1	1	ð	1 5	1	1	1 1	1	0 5	0	0	(	0	0	0	3000	1	2	7 259289 456
43 42 Paint 214 2181607 2009002021 2009486594 09005767	2009-01-16	1 6	2 7	0 IA 27	IA 27/10103 58	50	2	1	45	ð	1 1	3	1	2 95	1	0 5	0	0	(	0	0		3000	1	2	7 546631 470
44 45 Point 214 2181608 2009002946 2009486532 09005415	2009-01-15	1 5	2 7	0 US 218	US 215/52 RAMP	55	1	97	45	å	1 1	3	1	2 1	1	0 5	0	0	(	0	0	0	9000	2	2	7 547390 470
45 44 Paint 214 2181609 2009002250 2009486556 09005498	2009-01-15	1 5	2 7	0	MAIN ST	33	1	4	9	8	1 1	4	1	1 4	1	0 3	0	1	0	1	0		1100	2	3	7 545538 470
46 45 Paint 214 2181610 2009002710 2009487291 WE9-005654	2009-01-15	1 5	2 7	0	INFON AVE	97	1	1	46	8	2 4	4	2	1 12	1	0 5	0	0	(	0	0		1600	1	3	7 552963 470
47 46 Paint 2M 2161611 2009002719 2009467300 W16-00570	2009-01-56	1 6	2 7	0.0585	US ISADGAN ARE B.	33	1	5	45	8	1 1	3	1	1 12	1	0 5	0	0		0	0		4000	2	2	7 554400 470
46 47 Point 2M 2161612 2009003440 200948596	2009-01-17	1 7	6 49	0	Co Rd 155 MURSTYLLE	35	1	5	20	ð	1 5	3	2	2 1	1	0 5	0	0	(	0	0		20000	3	π	5 692617 466
40 46 Paint 214 2181613 2009031490 2009485500	2009-01-58	1 1	1 40	0		20	1	1	45	8	2 1	3	1	2 1	9	0.4	0	0	,		0		2103	1	2	5 190000 Aus
50 49 Paint 2M 2181614 2009001354 2009495175 09001180	2009-01-09	1 6	6 6	0	Co Rd V37/V37	55	1	7	71	a	1 1	4	7	1 95	1	0 5	a	0	1	0	0		1000	2	2	7 557658 467
51 50 Pairt 214 2181615 2009001335 2009485574 09000000	2009-01-07	1 4	1 8	0	Co Rd EXCHANT PM	33	1	6	42	8	1 1	1	2	1 97	1	0 4	0	1			1	-	200	2	2	7 556285 445
52 51 Patri 2M 2181616 200001545 2009487994 09-000	2009-01-10	1 7	1 94	0 US 145	US 189 A 1A SZEATEN	55	1	3	20	8	1 1	4	1	2 13	1	0 4	0	0	1	0	0		400	2	2	7 400761 400
ST CT Baiel TM 2181617 3000003002 300409000 0000000	2020-01-13		2 17	0 14 157	14 MART CT & PALL	77	1		7				1	1 11			0	0					734	,		7 40000 475
54 53 Raiel 214 2181618 2009002000 200540949 010000172	3009-01-12	1 2	6 23	0	ATH ACT IS A N SPORT	22	1	5	20	8	2 4	4	7	1 13	1	0. 0	0	0		0	0		1500	2	6	7 733235 443
and an and a second sec					the second se						-			1.0									. and it		-	AND NOT

## b. Roundabout Data

## - Data obtained from <u>SAMUEL.STURTZ@iowadot.us</u>

## - 110 roundabouts constructed from 2000 to 2023

4	MD Shape*	SymboliD Intervecti	Descriptio	Year_Open	Calopory	Residentia Sp	althruj Prelja	Retuge A	pron 1	ann 1	lags City	County	Classifica	Year	CreationDu	Creator	EditDute	Editor	NearSchool Roundabout	d_Resident	d.Spitter	d_Ped_Retu	d,Apron
Ţ.	0 Point 2M	0 Bass Pro Dr & Prairie FL.	Multi-lane in new con-	. 2009	Modern Roundabout	0	1	1	1	1.5	5 Alboone	Polk	Commercial	2029-01-01	2016-04-05	loweDOT_HegSysDps	2019-05-12	Ryan.Weim@iowadot	0 Roundabout	No	¥n.	Vin	We l
2	1 Point 2M	0 Intridale Dr & Vintage	Replacing all-way thep	2013	Modern Roundabout	a	1	1	1	2	4 Ankeny	Polk	Commercial	2013-01-01	2016-04-05	lowaDOT_HagSysDps	2019-05-12	Ryan.Weinigiowadot	0 Roundabout	No	<b>B</b> H	¥n	¥n.
3	2 Point 2M	0 SW Cherry St & SW 11	New reaching adjacen.	2011	Modern Roundabout	a	1	1	1	1	4 Arikany	Polk	Commercial	2011-01-01	2016-04-05	loweDOT_HessysDps	2019-05-12	Ryan.Webnigiowadot	1 Roundabout	No	lin .	Ve	lin .
4	3 Point 2M	0 SIN Styder Bird & SW	New residential deal.	2005	Modern Roundabout	1	1	0	1	1	4 Ankeny	Pok	Residential	2005-01-01	2016-04-03	loweDOT_HugSyiDps	2019-05-12	Ryan.Weim@iowadot	0 Roundabout	Ve	lin.	No	¥n.
5	4 Point 2M	0 NW 13th Street & NW.,	New residential devel.	2005	Modern Roundabout	1	1	0	1	1	4 Ankeny	Polk	Residential	2005-01-01	2016-04-05	lowaElOT_HaySysDps	2019-05-12	Ryan.Weim@iowadot	0 Roundabout	Ver	lin .	No	We l
6	5 Point ZM	0 SW Goodwin St & SW.,	One of three in a new.	2004	Modern Roundabout	1	1	0	1	1	4 Ankeny	Polk	Residential	2034-01-01	2016-04-05	lowaElOT_HaySysDps	2019-05-12	Ryan.Webnigiowadot	0 Roundabout	Yes	lin .	No	¥n.
7	6 Point 2M	0 SW Somerity Bird & S.	One of three in a new.	2004	Modern Roundabout	1	1	0	1	1	3 Arikeny	Pok	Residential	2004-01-01	2016-04-05	loweDOT, HugsysDps	2019-05-12	Ryan.Weim@iowadot	0 Roundabout	Ve	Tes .	No	Tes
ā	7 Point 204	0 SW Somerity Bed & S.	One of three in a new.	. 2004	Modern Roundabout	1	1	0	1	1	4 Ankeny	Pok	Residential	2004-01-01	2016-04-03	lowaDOT_HagSysDps	2019-05-12	Ryan.Weim@iswadot	0 Roundabout	Yes	¥n.	No	¥n.
9	a Point 2M	0 SW Computition D.	New Construction on.	2011	Modern Roundabout	1	1	1	.1	1	4 Ankeny	Pok	Residential	dab	2016-04-05	lowaElOT_HaySysDps	2019-05-12	Ryan.Weinigkowadot	0 Roundabout	Ye	lin .	Ve	We let
10	9 Point ZM	0 Middle Road & Strd A.	Designed to accommo.	2002	Modern Roundabout	1	1	1	1	1.5	4 Settendarf	Scott	Residential	2012-01-01	2016-04-05	lowaDOT_HugSysDps	2019-05-12	Rpan.Weim@izwadot	0 Roundabout	Yes	lin .	Viti	¥n.
11	10 Point 2M	0 independence Ave (3c	Pint high-speed, rural.	2005	Modern Roundabout	0	1	0	1	1	4 (tural)	Back Hawk	Runal	2005-01-01	2016-04-05	Investor, Hunsystops	2019-05-12	Ryan.Weim@igwadot	0 Roundabout	No	lin .	No	¥n
12	11 Point 2M	0 C57 & V62	Runal, Nigh-speed inte.	. 2012	Modern Roundabout	٥	1	0	1	1	4 nural bouth of Fairbank	Buthanan	Rural	2012-01-01	2016-04-05	Investor, Hegsystops	2019-05-12	Ryan.Weim@izawadot	0 Roundabout	No	lin .	No	¥n
13	12 Point 2M	0 Viting Road & Ceder	One-lane two-lane by.	2007	Modern Roundabout	0	1	1	0	15	3 Ceder Falls	Back Hawk	Runi	2017-01-01	2016-04-03	Invation Hansyster	2019-05-12	Rean Webn Bigwadok	0 Roundabout	140	30	¥n.	No
14	13 Point ZM	0 Brandibran Bird & Prai	In new commercial dev.	. 2029	Modern Roundabout	0	1	1	0	2	4 Ceder fails	Back Hawk	Commercial	2009-01-01	2016-04-05	IowaEOT, HansyaDos	2019-05-12	Ryan.Webn@igeradot	0 Roundabout	No	lin .	Ves	No
15	14 Point 24	0 Ridpress Ave & Chan.	Realigned north appr.	2011	Modern Roundabout	a	1	1		15	4 Cride fails	Back Havek	Commercial	2011-01-01	2016-04-05	Invation Hansviller	2019-05-12	Rean Weiss Big wadot	0 Roundabout	No	Tes .	Ver	10
16	15 Point 2M	0 60th Any Sw & Tower,	One-lane two-lane by.	2011	Modern Roundabout	0	1	1	1	2	4 Ceder Radids	Linn	Commercial	2011-01-01	2016-04-05	Invation Hansylogs	2019-05-12	Rean.Webn@lowadot	0 Roundabout	No	No.	Ve	W1
17	16 Paint 2M	0 NW 150h Sheet & Bo.	Combination dual-bin.	2002	Modern Roundabout	1	1	1	1	2	4 Chri	Dellar	Residential	2012-01-01	2016-04-05	Invation HanSeiDer	2019-05-13	Rear Webn Streadot	0 Roundabout	Ve	les.	Ver	les.
18	17 Point 2M	0 Berkuhine Parkuase & S.,	Three public sportsch.	. 2001	Other Orrular Internet		1	0	0	1	5 CH	Dellas	Traffic Circle	2001-01-01	2016-04-05	Invation HanSysDes	2019-05-15	Rean Weiss Bigeradot	0	Vin	-	No	No
10	18 Dated Thi	0 Refering Reference & F.	In new basistantial day	2005	Madam Daugdahaut						a Cha	Della	Tendertia	2015.01.01	2016.04.05	Interaction Handwidter	202.06.15	Dans Walter Witness feet	0 Enutrishuit	No.	The second secon	No.	Ten .
20	10 Dated Thi	0 University Diagram ( 18)	Her University	3115	Madam Daundaharé	0					5 Contrals	Ishman	Commercial	2015/01/01	2016-04-05	Interaction Handarders	2019-06-12	Open Walter Rissandor	0 Energiabaté	ille.	les .	No.	No.
	71 Reist Til	C Meeting Public Local	New York Indexedian	2012	Hadan Saundahad						t Candada	labaran	Commented .	2015.01.01	2014 04 05	Interaction Hand to Day	200.06.12	Anna Material Instantial	0 Reundshud	14	-		1
23	21 Dated 754	0 Distances Dr. & Linker	New York Internation	2013	Maden Daugdaback	0				1.4	S Could	Ishman	Comparial	2012/01/01	2010-04-03	Interaction Handwork	2019-06-12	Dawn Weiss Witness for	0 Roundabut	lin.	Tes .	No.	Tes .
	TI Paral TH	o had bee to be did as the	Manual designments	2012	Hadan Baradahad						7 Sundate	laborar	Taxidealid	2012 01 01	2010/01/02	Interfect HeaderDea	2010 01 12	Constitution of the second	0 Recentered	Ver	2	me Nor	-
20	12 Point and	0 The loss is formation	Note and the second	3000	Madem Recordshoot	0				1.2	1 Contrato	Johnson	Commental	2012-01-01	2010-04-05	Investor, Herster Des	2019-05-12	Repart of the providence of the	1 Republication	HI III	The second secon	No.	No.
-		o tan wear to super-	reason approximition.			d					2 COMPANY	Annovi		2012/01/01	2010/04/03	towneys, nightroon	annorm	Abreating amount	T Province Province				-
2	24 Point 2M	0 E Hh St & Quarty Road	Double-lana, north ap.	. 2005	Modern Roundabout	0				- 4	3 CONTREE	Johnson	Commercial	2005-01-01	2016-04-05	Towasion, Maysyropa	2019-05-12	Ryan.Welling towadot	0 Roundabout	140	101	MI	101
20	D PIPER	U nordej koled a Coma.	South approach is co	2001	Modern Koundabour	U					4 COMPER	Johnson	Comparcia	2007-01-01	2016-04-05	Iowacor, nejsyropt	2019-00-12	Nan.weingsowador	0 Roundabour	140	10	н	101
23	26 Point 2M	0 Contract Dr & Catve	Rebuilt 4-leg intersects	. 2014	Modern Roundabout	0		1	1	1	4 Coraly Is	Johnson	Commercial	2014-01-01	2016-04-05	TownEDT_HwySysDps	2019-05-12	Ryan.Welingitzwadot	0 Roundabout	No	lin .	WI .	WI
20	27 Point 2M	0 SW 2001 St & Rotherston.	In the Arport Outlineis.	. 2000	Modern Roundabout	0		1			4 Den Motern	Polk	Commercial	2000-01-01	2016-04-05	Towabiot_HaysyiDpi	2019-05-12	Ryan.Weinglawadot	0 Roundabout	140	W1	MI	101
29	28 Point 2M	0 lowa 3 & lowa 187	Runal, high-speed, adj.	. 2009	Modern Roundabout	0	1	0		-	4 ()uul)	Papette	Runi	2023-01-01	2016-04-05	TownEOT_HwySysDps	2019-05-17	Ryan.Wetroğistwadot	1 Roundabout	No	lin .	No	We I
30	29 Point 2M	0 10th Aw N & N 52hd 32	Replaced hap 'T' inter.	. 2029	Modern Roundabout	0	1	1		1	3 Port Dodge	Wabiter	Commercial	2029-01-01	2016-04-05	TownEDT_HugSysDps	2019-05-17	Ryan.Webs@iswadot	1 Roundabout	Mo	W1	¥n	W1
51	30 Point 2M	0 Co Rd E25 & Matthew	Behaven 3 schools; Re.	. 2015	Modern Roundabout	0	1	1	1	1	4 Gibert	201	Commercial	2013-01-01	2016-04-05	lowaDOT_HaySyiOpi	2019-05-17	Ryan.Weimiliowadot	1 Roundabout	No	lin .	Vin	Sea.
22	31 Point 204	0 Grand Aur & S Grand	Three approacher; orc.	. 2007	Modern Roundabout	0	1		1	1	3 Town City	Johnodn	Commercial	2007-01-01	2016-04-05	lowaDOT_HaySysOps	2019-05-12	Ryan.Wetnigiowadot	0 Roundabout	No	lin .	¥n	lin .
22	32 Point 2M	0 Kennedy Parking & M.	In new residential dev.	. 2006	Modern Roundabout	1	1	1	1	1	4 Iowa City	Johnson	Residential	2005-01-01	2016-04-05	loweDOT_HwySysDps	2019-05-12	Ryan.Weim@iowadot	0 Roundabout	Ve	No.	Ves	Ver
54	33 Point 2M	0 US 218 southbound m.	Diamond Interchange.	. 2012	Modern Roundabout	0	1	0	1	1	5 Janendile	Bremer	Runal	2012-01-01	2016-04-05	lowaDOT_HaySysDps	2019-05-12	Ryan.Weingiswadot	0 Roundabout	No	lit.	No	¥n.
55	34 Point 2M	0 US 218 northbound ra	Diamond interchange.	2012	Modern Roundebout	٥	1	0	1	1	3 Janendile	Bremer	Runi	2012-01-01	2016-04-05	lowsEOT_HwySyxDpx	2019-05-12	Ryan.Webnigiowadot	0 Roundabout	No	lin .	No	lin .
36	35 Point 2M	0 NW 62nd Ave & Plone	1 of 4 on 12nd Ave cor.	. 2012	Modern Roundabout	0	1	1	1	2	3 Johnstion	Polk	Commercial	2012-01-01	2016-04-05	Investor_HegSysDps	2019-05-12	Ryan.Weim@iowadot	0 Roundabout	No	lin .	Yes	B1
57	35 Point 2M	0 NW 62nd Ave & South	2 of 4 on 62nd Ave cor.	. 2012	Modern Roundabout	a	1	1	1	2	4 Johnstion	Polk	Commercial	2012-01-01	2016-04-05	lowaDOT_HaySyiDpi	2019-05-12	Ryan.Weim@igwadot	0 Roundabout	No	lin .	Ves	lin .
22	37 Point 2M	0 NW 62nd Ave & DuPo	3 of 4 on 62nd Ave cor.	. 2012	Modern Roundabout	0	1	1	1	2	3 Johnstion	Polk	Commercial	2012-01-01	2016-04-05	lowaDOT_HaySysDps	2019-05-12	Ryan.Webnilliowadot	0 Roundabout	No	lin .	Yes	No.
39	33 Point 2M	0 NW 62nd Ave & Plone	A of 4 on 62nd Ave eat.	. 2012	Modern Roundebout	đ	1	1	1	2	3 Johnstion	Pok	Commercial	2012-01-01	2016-04-05	loweDOT_HwySysDps	2019-05-12	Ryan.Weim@iowadot	0 Roundabout	No	<b>V</b> ri	Ver	lin .
40	39 Point 20	0 Tower Terrace & Albur	New intersection on A.	. 2015	Modern Roundabout	a	1	1	1	1.5	4 Maton	Linn	Commercial	2013-01-01	2016-04-03	lowaDOT_HaySysDps	2019-05-12	Ryan.Weim@iswadot	0 Roundabout	No	¥n.	Ym	Yes
41	40 Point 2M	0 358h St. & Tower Terrace	Two-lane and one-lan.	. 2011	Modern Roundabout	1	1	1	1	1.5	4 Marion	Linn	Residential	2011-01-01	2016-04-05	lowaElOT_HaySysDps	2019-05-12	Ryan.Weine@iowadot	0 Roundabout	Ym	\in	Ver	lin .
42	41 Point 2M	0 3rd 52 & Mason Oty HL.	Record gund intersec.	. 2013	Modern Roundabout	0	1	1	1	1	3 Maton City	Camo Gordo	Commercial	2013-01-01	2016-04-05	lowaElOT_HaySysDps	2019-05-12	Rpan.Weim@iowadot	0 Roundebout	No	lin .	Vin	¥n
43	42 Point 2M	0 US 50 & lowe 1	Replaced 4-way stop	2013	Modern Roundabout	0	1	0	1	1.5	4 Mount Venion	Linn	Commercial	2013-01-01	2016-04-05	loweDOT_HeysysDps	2019-05-12	Ryan.Weim@izwadot	0 Roundabout	No	lin -	No	Ver.
44	45 Point 2M	0 US 30 & 10th Ave S	Three-approaches repl	. 2013	Modern Roundabout	٥	1	1	1	1	3 Mount Vennen	Linn	Commercial	2013-01-01	2016-04-05	loweDOT_HeySysDps	2019-05-12	Ryan.Weim@izwadot	0 Roundabout	No	lin .	Yes	¥n.
45	44 Point 2M	0 Orchard Ave & Polla R.,	Includes pedestrian u	2003	Modern Roundabout	٥	3	1	1	1	4 Oskaloosa	Mahaska	Commercial	2005-01-01	2016-04-03	IowaElOT_HaySysDps	2019-05-12	Ryan.Webn@lowadot	0 Roundabout	No	lin .	Ves	Ver
46	45 Point 2M	0 5 let US 34 & US 63	Three approaches; Incl.	. 2006	Modern Roundabout	0	1	0	1	1	3 Ottumana	Wapello	Commercial	2005-01-01	2016-04-05	lowaElOT_HagSysOps	2019-05-12	Ryan.Webn@iowadot	0 Roundabout	No	lin .	No	¥n.
47	46 Point 2M	0 Peputa St & NCC entr	Single-lane, new entra-	. 2012	Modern Roundabout	0	1	1	1	1	4 Pesita	Dubuque	Commercial	2012-01-01	2016-04-05	loweDOT_HeySyrOpe	2019-05-12	Ryan.Weimilliswadot	0 Roundabout	No	¥n	Yes	'in
45	47 Point 2M	0 MW 142nd St & DougL.	Double-lang routh sp.	. 2017	Modern Roundabout	1	1	1	1	2	4 Urbandale	Polk	Residential	2017-09-01	2016-04-05	IowaDOT_HagSyLOps	2019-05-12	Ryan.Weim@izwadot	0 Roundabout	Yes	ία.	Yes	Yes .
49	45 Point 2M	0 Tet Ave NW & Dit St NW	Replaced T Intersects	. 2005	Modern Roundabout	0	1	1	0	Ţ	4 Warnty	Gromer	Commercial	2005-01-01	2016-04-05	Invalio1_HaySysDps	2019-05-12	Ryan.Weise@iowadot	0 Roundabout	No	Sec.	Yes	180
50	49 Point 2M	0 WWels Pargo Tail &	In new Wells Pargo de.	. 2005	Other Orcular Intersec	. 0	1	0	1	1	3 West Des Moines	Dallas	Traffic Circle	2005-01-01	2016-04-05	loweDOT_HegSysDps	2019-05-12	Ryan.Weim@isewadot	0	No	Sec.	No	lin .
51	50 Point 2M	0 W Wels Pargo Trail &	in new Wells Pargo de.	. 2005	Other Circular Intersec	. 0	1	0	1	1	3 West Des Moimes	Dellas	Traffic Circle	2005-01-01	2016-04-05	IowaElOT_HaySysOps	2019-05-12	Ryan.Weimigizwadot	0	No	Sec.	No	Wei
52	51 Point 2M	0 West Access & W Well.	In new Wells Pargo de.	. 2005	Other Circular Intersec	. 0	1	0	1	1	4 West Des Moines	Datas	Traffic Circle	2005-01-01	2016-04-05	Invation_HaySyiDps	2019-05-12	Ryan.Weimigiowadot	0	No	lin .	No	¥u.
53	52 Point 2M	0 Bue Sten Or, Vilage	Neu residential/comm.	2007	Modern Roundabout	1	1	1	1	1	4 West Des Moines	Polk	Residential	2007-01-01	2016-04-05	lowaDOT_HaySysDps	2019-05-12	Ryan.Weimgliowadot	0 Roundabout	Yes	30	Yes	lin .
54	53 Point 2M	0 Entwood Bvd & 76th	Replacing all-way stop	2017	Modern Roundabout	0	1	1	1	1	4 Cedar Rapids	Linn	Residential	2017-01-01	2016-04-05	lowaElOT_HagSysDps	2019-05-12	Ryan.Weim@izwadot	0 Roundabout	No	ία.	Ye	lin .

### 2. Data Preprocessing in ArcGIS Pro

In this phase, we will employ ArcGIS Pro to conduct preliminary processing on two datasets, setting the stage for subsequent in-depth analysis and visualization. This involves refining and consolidating the data to ensure it is optimally structured for our intended uses.

### 2-1. Performing Spatial Join on Layer Files

By performing a spatial join between the 'Crash\_Data' and 'Roundabouts' layers, we can create a merged layer file that displays crash data occurring within a 250-foot radius of each roundabout

- From the ArcGIS Pro Navigation bar, select 'View' > 'Geoprocessing' > 'Spatial Join'.

● ● 回 ち・ペ・ ○	User's Guide D Command Search (A	11t + Q)		JB - University of Iowa 🔔 🤵 ? — 🗇 🗙
Project Map Insert Analysis View Edit Imagery Share Help Gobal Local Convert Link Views Catalog Catalog Contents Geoperating Python To Views Units Link Views Vi	Father Layer Labeling Data Linear Referencing Standard Audion Indexs Is Wandper Audion Indexs Thumbhal Accessibility Animution D	Enable Location - 5	Oraving Illumination Mode V Scene	Mode Distance Vew Olgoing Vew Olgoing
Geoprocessing ⓒ Spatia	l Join	~ <del>1</del> ×		
Parameters Environments Target Features		?		
Crash_Data		× 🖃		
Join Features				
Roundabouts		× 📄		
The input has a filter. Records to be processed	: 110	2		
Output Feature Class				
Crash_Data_Roundabouts				
Join Operation				
Join one to many		~		
Keep All Target Features				
Match Option				
Within a distance		~		
Search Radius				
250	US Survey Feet	~		
> Fields	-			

- Parameters:

- a. Target Features: Crash\_Data
- b. Joined Features: Roundabouts
- c. Output Feature Class: Crash\_Data\_Roundabouts
  - This will be the name for the new layerfile.
- d. Join Operation: Join one to many
- e. Uncheck 'Keep All Target Features'

## f. Match Option: Within a Distance

g. Search Radius: 250 US Survey Feet

> Click the 'Run' button to perform the spatial join of the two layers.

## a. Spatial-Joined Data (Crash\_Data\_Roundabouts)

- 110 total roundabouts constructed from 2000 to 2023
- 2,671 total crashes from 2009 to 2023

OBJECTID	1º Shape * Joi	n_Count 17	ARGET_FID JO	DIN, RD OBJECTID CRASH, KEY	CASENUMBER LECASENUM	CRASH_DATE CRA	SH, MONT C	RASH, DAY	DISTRICT C	OUNTY_NUM CITY	NUMBE SYSTEMS	TR LITERAL	FRSTHARM LO	CFSTHRM CI	COMNNR M	IAICSE DRU	GALC ECN	TCRC LK	HT CSRFC	ND WEAT	HER RONT	CRC RD	TYP IN	WED WZREL	ATED C	IEV FATAL	mes inju	UES MAJIN	UURY
1 1	Point 2M	1	152	74 2181717 2009002494	2009487044 09-0290	2009-01-18	1	1	1	94	0	1ST AVE S CONNECTO	33	1	3	24	3	1	4	5	2	2	18	1	0	ŝ	Ó	0	0
2 2	Point ZM	1	327	95 2181892 2009005281	2003490838 01-09-4857	2509-02-02	2	2	6	31	0	UNIVERSITY AVE & CR.,	33	1	5	7	8	1	4	1	1	1	12	1	0	5	0	0	0
3 3	Point ZM	1	454	105 2182019 2000007314	2003493235 09-000124	2009-02-14	2	7	1	77	0	NE RISING SUN DR	33	1	5	30	8	2	1	3	1	1	1	1	0	4	0	1	0
4 4	Point ZM	1	705	97 2182270 2000014843	2003502015 05007401	2509-04-14	4	3	6	57	0	10TH AVE & CENTRAL	33	1	3	70	8	1	1	1	1	1	1	1	0	4	0	1	0
5 5	Point 2M	1	800	72 2182365 2000012363	2003499124 01-09-12360	250948-23	3	2	6	31	0	GRANDWEW AVE N	33	1	5	7	8	1	1	2	5	1	12	1	0	5	0	0	0
6 6	Point ZM	5	1555	71 2183120 200003783	2003512137 01054533	2009-06-15	6	2	2	7	0	N FRONTAGE RD & H	33	1	5	7	8	1	5	5	1	1	13	1	0	5	0	0	0
7 7	Point ZM	1	1601	68 2183256 2003028520	2003517465 00015718	2503-07-24	7	6	6	57	0	W 8TH AVE & UNDALE	54	1	1	20	8	1	4	2	5	2	12	1	0	5	0	0	0
8 8	Point 2M	1	1920	31 2183485 2003029436	2003518527 00011813	2009-08-02	8	1	6	52	0	S GRAND AVE & UNIVE.	. 33	1	6	70	8	1	1	1	1	1	1	1	0	5	Ŭ	Ó	đ
9 9	Point 2M		2264	108 2183829 2000087141	2003527310	2009-09-10	9	5	6	57	0	JOHNSON AVE NW	33	6	3	9	8	77	1	1	99	77	4	1	0	5	0	0	0
10 10	Point ZM	5	2865	22 2184430 2000046503	2003537877 01061936	2009-11-18	11	4	6	52	0	1ST AVE	33	1	6	8	8	1	1	2	5	1	97	1	0	5	0	0	0
11 11	Point 2M	1	3263	99 2184828 2000053766	2003545726 00137465	2009-12-29	12	3	2	1	0 14 984	IA GRAUNIVERSITY AVE.	. 33	1	4	2	8	1	4	1	1	1	12	1	0	4	0	1	0
12 12	Point ZM	1	3535	92 2185100 2010000042	2010545913 201000036	2010-01-01	1	6	6	57	0	JACOUN DR SW & JAC	33	1	5	7	8	1	5	1	2	1	12	1	0	5	0	0	0
18 18	Point 2M		3580	95 2185145 2010001566	2010548928 01-10-1529	2010-01-12	1	3	6	31	0	UNIVERSITY AVE & CR.,	38	1	.5	3	8	1	1	2	2	1	12	1	0	5	0	0	0
14 14	Point ZM	5	3589	65 2185454 2010006978	2010555958	2010-01-25	1	2	6	52	0	Co Rd W66/DUBUQUE	33	1	3	45	8	2	5	4	7	2	1	1	0	4	0	1	0
15 15	Paint ZM	1	4433	60 2185998 2010015605	2010565894 10007223	2010-02-11	2	5	6	52	0	OAKDALE BLVD & 157	33	1	5	7	8	1	4	1	1	1	12	1	0	5	0	0	0
16 16	Point ZM	1	4446	55 2186011 2010015572	2010565585 10007192	2010-04-09	4	6	6	57	0	THAT	33	1	6	30	8	1	1	1	1	1	1	1	0	5	0	Ó	0
17 17	Point 2M	1	4800	76 2186374 201000010	2010571179 01-10-20992	2010-05-07	5	6	6	31	0	UNIVERSITY AVE	33	1	6	16	8	2	1	2	5	4	14	1	0	5	0	0	0
18 18	Point ZM	1	4583	99 2186448 2010023067	2010574879 10054686	2010-05-27	5	5	2	7	0 14.934	IA 954 UNIVERSITY AVE.	. 33	1	4	9	8	1	1	1	1	1	12	1	0	5	0	0	0
19 19	Point 2M	1	5287	58 2186552 2010029070	2010581530 10014902	2010-07-16	7	6	6	57	0	35TH ST	33	1	5	7	8	1	1	1	1	1	12	1	0	5	0	0	0
20 20	Point ZM	1	5485	14 2187050 2010082716	2010585996 10082701	2010-08-07	8	7	2	7	0	W RIDGEWAY AVE	15	1	1	70	8	1	1	1	1	1	13	1	0	1	1	1	0
21 21	Point 2M	1	5560	47 2187125 2010083736	2010587072 10-2279	2010-08-23	8	2	1	77	0	142ND ST	33	1	6	71	8	1	1	1	1	1	97	1	0	5	0	0	0
22 22	Paint ZM	1	5837	42 2187402 2010040592	2010594717 20101050	2010-10-09	10	7	6	57	0 US 30	US 30 & IA 1/5 15T AVE	33	1	ś	1	8	1	1	1	1	1	12	1	0	3	0	1	0
23 23	Point ZM		5968	94 2187533 2010041877	2010596131 10112380	2010-10-23	10	7	2	7	0 14 984	A GRAUNIVERSITY AVE	33	1	3	24	8	1	1	1	1	1	1	1	0	6	0	0	0
24 24	Point ZM	1	5974	76 2187539 2010040431	2010594537 01-10-40652	2010-10-08	10	6	6	31	0	UNIVERSITY AVE	33	1	6	10	8	1	1	1	1	1	4	1	0	5	0	0	0
25 25	Paint ZM		6166	76 2187731 2010046212	2010500354 01-10-55180	2010-11-15	11	2	6	31	0	ASBLEV RD	33	1	6	10	8	1	1	1	4	.1	4		0	4	0		0
26 26	Paint 7M		6300	31 2187667 2010045160	2010602583 2010-052017	200.11.01	11	2		-	0	CRAND AVE	22	1	3	24		1	-	-		1	47	1	0		0	0	0
07 07	David 714		4024	59 2218410 200202817	20042240 0003431	2001/11/20		2		0	0	HOLDAY OD & 17TH AVE	22			45	,			2	,	3			0	4	0		0
28 28	David 714		4024	52 1019211 100000018	MOUTEN WORKSH	000001-00		2			0	THES	22		2	20	2								0		0		0
20 20	Dained 714		2004	54 2019491 200200000	20042014 000161	2005,01.11			4		0	718455780	22		4	3	2			4	3		12		0	4	0	0	0
20 20	Paint 7M		9130	33 2220596 20000R2105	200522260 200054851	2001.00.18	0		2		0 US 218	US 218 & RADRICK DD	22		4	7	2	-	-	1		1	12	1	0	2	0	2	2
સ સ	David 7M		9143	75 2220640 2000/85/82	20052404_01_01_01_02056	2001.00.13	9			21	0	INVERSIVANE	22		2		2	1	2						0	4	0	6	0
2 2	David 7M		9195	72 2220671 200282420	200522555 01.05.45778	2005,05,28	0			21	0	COLCENT & DEHINT	22	5	4	7	2						15		0	4	0	3	0
22 22	David 714		10125	76 0001661 000062101	2003544998 01-01-50744	3101.42.07	10		4	2	0	INVERSIVALE				- 20	2		4	1	2		14		0	4	0	0	0
24 24	Dated 713		11162	20 1101620 100082462	200000000 0000000	3568.42.33	2	2			0	HIMBOR CT	22	-	2	16			1	1		-	+1		0		0		0
24 24	David 714		11052	06 3332236 3010006587	2010520520 1/055200	2562,05.08	4	-	1	2	- 150 AL	A GRANNASDOD DIS	22		2	20	2	-					12	-	0	1	0	0	0
26 26	David 764		11072	0k 3332420 3740007277	30052002 300000107	2010/07/04	2		1	73	0	852/50 2/5	22		2	16	2			2	4		1		0	4	0		0
20 20	David 211		12/2	46 1102676 1010002221	201027282 2010881127	201007-04		2	4		0 115 24	IC 24	22		2	42	2			4	40		+2		0	2	0	1	0
20 20	Parts 200		+1400	45 2223076 2010000002	2010200217 201000294702	201040-10	0	3	1	1	0 05 54	IN ADMARKAGED IN A	33		3	11					1		12		0	3	0	4	0
20 20	Park 20		12402	22 2223261 2010003061	2010302403 10032400	2010409400	-	4	4	1	0 10 204	UNDUS DR			*	24	•		-			-	14		0	1	0		0
30 30	PUPE DR		10405	00 2224013 2010/40013	2010203741 10024040	2010-1245	14	•	0	5/	0	UNDALE DR	30		3	10	0		3	1		- 2			0	3	0	0	0
40 40	Puri 20	1	34151	105 2255410 2007009494	20049458	200942-05	2		0	3/	0	WILEI BOD NW & JOR.	. 55	1	3	1	0	0	1	1	1		12	1	0	3	0	0	0
41 41	Parts 200		1400/	42 2255705 2003011446	2003406083 20031007	200941+14		1	0	5/	0 05 50	US DO	22	-	3	20	0		-	1	-		12		0	3	0		0
12 12	David 211		15010	VR 3366126 300000566	200510812 200106010	3101.02 02	-	-	4	1	0 05210	WI PLAND NO & DO	32		4	6	2	4				1	12		0	4	0	0	A
40 40	Parts Die		12020	C6 0100446 000000000	WAREPASE ALOSSA	2009405405	13	2	4	2/	0	HOLDWAD	35		4	10	0		1	1	1	1	+2		0	4	0		a
44 44	PUTE DA	1	1/0/1	30 2255410 20076555//	MOLECULAR ADDRESS	2009-12-50	14	4	0	24	0		35		3	10	0	4	-	30		4	14	-	4	1	0	0	4
40 40	PUPE DA		1/145	40 2250462 2007053856	MARCELIN AL NE SPOR	2000-11-15	1		4	70	0 00 65	US DO	40		1	46	0	-	1	2	4				0	2	0	0	0
40 40	PUEK DA		10/05	(0 2257624 2010015083	2010203203 01-10-14525	2010-04-05	1	4	0	51	0	OWNERS THE & ASE.	55		e 2	2	0		-	4	3	-	47		0	3	0		9
47 47	PWPE DM	1	10034	ev 225795 2010022525	2010574716 10025117	2010405422	0	4	0	2	0	CONTRACT BOARD OF TST	55	1	3	3	0	1	-		4	1	11		0	4	0		1
45 45	PUPE 2M	1	1944/	00 2280/88 2010(8484)	201058/765 10015262	2010-05-27	ő	0	0	3/	0	WEIMAR	55	1	3	1	ő	1	1	1	1	1	15	1	0	3	0	0	0

## 2-2. Removing Unnecessary Columns in Crash\_Data\_Roundabouts

"In the 'Crash\_Data\_Roundabouts' dataset, we'll focus on retaining only the essential columns for our analysis. These include: 'OBJECTID', 'Shape', 'XCOORD', 'YCOORD', 'JOIN\_FID', 'CRASH\_DATE', 'CSEV', 'FATALITIES', 'PROPDMG', 'Year\_Open', 'Category', 'City', and 'County'. The 'Shape', 'XCOORD', and 'YCOORD' columns provide spatial information (coordinates). 'Year\_Open' indicates the construction year of the roundabouts, 'JOIN\_FID' is the unique identifier for each roundabout, 'CSEV' represents crash severity, and 'PROPDMG' details the property damage."

To manually remove unnecessary columns, right-click on 'Crash\_Data\_Roundabouts' in the Contents pane, select 'Attribute Table', then right-click on the columns you wish to remove and choose 'Delete.

Contents v 4 ×	1	Sort Ascending	U	RY	MININJURY	POSSINJURY	UNKINJURY
Search P ~	J	Sort Descending		0	0	0	0
È= ◯ ☑ / ¤ ⊘ ≫	1	Custom Sort Ctrl+Shift+S		0	0	0	0
			-	0	0	0	1
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A Layers		Ereeze/Unfreeze Field		0	0	0	0
Crash_Da 🛱 Copy	E	Calculate Field		0	0	0	0
• Remove		- Calculate Geometry		0	0	0	0
Secondada Se		Statistics		0	0	0	0
Crash_Dz Attribute Table Ctrl+T		Summaria		0	0	0	0
Open Table (Ctrl+T) 9 Ctrl+Shift+D	Bi∑:	Summanze	-	0	0	0	0
Open the attribute table for this		Fi <u>e</u> lds		0	0	1	0
	×	De <u>l</u> ete		0	0	0	0

### a. Streamlined 'Crash\_Data\_Roundabouts'

	OBJECTID_1 *	Shape *	JOIN_FID	CRASH_DATE	CSEV	FATALITIES	PROPDMG	XCOORD	YCOORD	Year_Open	Category	City	County	Classifica
1	1	Point ZM	74	1/18/2009	5	0	3000	402829	4706531	2016	Modern Roundabout	Fort Dodge	Webster	Commercial
2	2	Point ZM	95	2/2/2009	5	0	1200	689968	4707698	2020	Modern Roundabout	Dubuque	Dubuque	Commercial
з	3	Point ZM	105	2/14/2009	4	0	4000	461011	4604945	2018	Modern Roundabout	Pleasant Hill	Polk	Commercial
4	4	Point ZM	97	4/14/2009	4	0	1800	615937	4654753		Planned Roundabout	Marion	Linn	Mini Roundabout
5	5	Point ZM	72	3/23/2009	5	0	2500	689989	4707556	2016	Modern Roundabout	Dubuque	Dubuque	Commercial
6	6	Point ZM	71	6/15/2009	5	0	1800	546552	4706933	2016	Modern Roundabout	Cedar Falls	Black Hawk	Commercial
7	7	Point ZM	68	7/24/2009	5	0	2000	614235	4654548	2019	Planned Roundabout	Marion	Linn	Residential
8	8	Point ZM	31	8/2/2009	5	0	1750	621097	4612888	2007	Modern Roundabout	Iowa City	Johnson	Commercial
9	9	Point ZM	103	9/10/2009	5	0	2745	605616	4647395	2019	Modern Roundabout	Cedar Rapids	Linn	Commercial
10	10	Point ZM	22	11/18/2009	5	0	1600	619274	4616659	2002	Modern Roundabout	Coralville	Johnson	Residential
11	11	Point ZM	99	12/29/2009	4	0	10000	548373	4706208	2017	Modern Roundabout	Cedar Falls	Black Hawk	Commercial
12	12	Point ZM	92	1/1/2010	5	0	2500	605080	4647106	2019	Modern Roundabout	Cedar Rapids	Linn	Commercial
13	13	Point ZM	95	1/12/2010	5	0	3100	689968	4707698	2020	Modern Roundabout	Dubuque	Dubuque	Commercial
14	14	Point ZM	65	1/25/2010	4	0	11500	619719	4619943	2022	Planned Roundabout	Coralville	Johnson	Residential
15	15	Point ZM	60	2/11/2010	5	0	3100	619590	4617624	2020	Planned Roundabout	Coralville	Johnson	Residential
16	16	Point ZM	56	4/9/2010	5	0	3000	617291	4654440	2016	Modern Roundabout	Marion	Linn	Commercial
17	17	Point ZM	76	5/7/2010	5	0	1600	689302	4707827	2020	Planned Roundabout	Dubuque	Dubuque	Commercial
18	18	Point ZM	99	5/27/2010	5	0	2500	548373	4706208	2017	Modern Roundabout	Cedar Falls	Black Hawk	Commercial
19	19	Point ZM	58	7/16/2010	5	0	5000	617966	4656349	2016	Modern Roundabout	Marion	Linn	Residential
20	20	Point ZM	14	8/7/2010	1	1	0	544838	4702053	2011	Modern Roundabout	Cedar Falls	Black Hawk	Commercial
21	21	Point ZM	47	8/23/2010	5	0	5500	432611	4608886	2017	Modern Roundabout	Urbandale	Polk	Residential
22	22	Point ZM	42	10/9/2010	3	0	3000	630774	4641663	2013	Modern Roundabout	Mount Vernon	Linn	Commercial
23	23	Point ZM	94	10/23/2010	5	0	3000	547100	4706888		Modern Roundabout	Cedar Falls	Black Hawk	Residential
24	24	Point ZM	76	10/8/2010	5	0	2500	689284	4707830	2020	Planned Roundabout	Dubuque	Dubuque	Commercial
25	25	Point ZM	76	11/15/2010	4	0	3000	689272	4707878	2020	Planned Roundabout	Dubuque	Dubuque	Commercial
26	26	Point ZM	31	11/1/2010	5	0	3300	621105	4612885	2007	Modern Roundabout	Iowa City	Johnson	Commercial
27	27	Point ZM	59	1/20/2009	5	0	4200	617924	4616873	2015	Modern Roundabout	Coralville	Johnson	Residential
28	28	Point ZM	54	1/20/2009	5	0	11000	615702	4654421	2016	Modern Roundabout	Marion	Linn	Commercial
29	29	Point ZM	54	1/11/2009	5	0	10000	615655	4654420	2016	Modern Roundabout	Marion	Linn	Commercial

### 3. Advanced Data Preprocessing with Python in ArcGIS Pro

Python in ArcGIS Pro offers powerful scripting capabilities for spatial analysis and automating geoprocessing tasks. Jupyter Notebooks, integrated within ArcGIS Pro, provide an interactive environment where you can write and execute Python code, visualize data, and document the process in a single, easy-to-use interface.

To open a new Notebook in ArcGIS Pro, go to the Navigation bar, click on 'Insert', and then select 'New Notebook'.



# **3-1.** Loading 'Crash\_Data\_Roundabouts' Layer into a Pandas DataFrame in Jupyter Notebook

The code snippet below will access the "Crash\_Data\_Roundabouts" layer from an ArcGIS Pro project and converts it into a pandas DataFrame. It will retrieve all data and field names from the layer, allowing for efficient data manipulation and analysis within a Jupyter Notebook environment.

<pre>import au import px # Access project = arcmap = # Access layer = [ # Use Sea data = [r # Get the field_nam # Create original_ # Display original_</pre>	rcpy andas the cu projec the "C lyr fo rchCur fiela es = [ a pano data = Dataf data.h	as pd wrent AroBIS Pro project wrp.AroBISProject("OLPFENT") tilistMaps("Lavers")[0] breah_Data_Roundabouts' laver por lyr in aromao.listLavers() if lyr isor to extract data from the laver from in arcoy.da.SearchCursor(laver, in names field.name for field in arcoy.ListFi las DataFrame(data, columns=field_na rame 'original_data' ead()	.name , "*")] ields(laye mes)	"Crash_Data_Ro r)]	oundabo	uts"][0]								
OBJEC	TID_1	Shape	JOIN_FID	CRASH_DATE	CSEV	FATALITIES	PROPDMG	XCOORD	YCOORD	Year_Open	Category	City	County	Classifica
0	1	(-94.18270383781186, 42.505045555208255)	74	2009-01-18	5	0	3000	402829	4706531	2016	Modern Roundabout	Fort Dodge	Webster	Commercial
1	2	(-90.68811838405617, 42.498333890496724)	95	2009-02-02	5	0	1200	689968	4707698	2020	Modern Roundabout	Dubuque	Dubuque	Commercial
2	3	(-93.46782795179848, 41.59525399037943)	105	2009-02-14	4	0	4000	461011	4604945	2018	Modern Roundabout	Pleasant Hill	Polk	Commercial
3	4	(-91.5993114487643, 42.03627658719478)	97	2009-04-14	4	0	1800	615937	4654753		Planned Roundabout	Marion	Linn	Mini Roundabout
														inini reconnectore

## 3-2. Converted CRASH\_DATE to YEAR (From YYYY-MM-DD to YYYY)

original\_data['CPASH\_DATE'] = pd.to\_datetime(original\_data['CPASH\_DATE']).dt.year # Display the DataFrame to verify the new 'YEAR' column original\_data

### 3-3. Reversing Severity Scale in 'CSEV'

The original 'Severity' column ranges from 1 to 5, with 5 indicates crashes involving unknown injuries and 1 indicates the most severe incidents, potentially involving fatalities. For enhanced clarity in our visualization, we will reverse this order in the 'CSEV' column. After this adjustment, a severity rating of 1 will indicate unknown injuries, while a rating of 5 will represent the most severe cases with potential fatalities.

```
# Remap 'CSEV' column values
original_data['CSEV'] = 6 - original_data['CSEV']
# Display the DataFrame to verify the changes
original_data
```

### 3-4. Adding 'Standard' Column

To analyze the impact of roundabouts on crash occurrences, we will introduce a new column, 'standard', with three categories: 'Before', 'After', and 'Same'. This categorization is based on comparing 'CRASH\_DATE' with 'Year\_Open'. If the 'CRASH\_DATE' occurs before 'Year\_Open', the category is set to 'Before'. If it occurs after, it's classified as 'After'. When both dates are the same, the category is marked as 'Same'.

<pre># Repla origina # Remov origina # Funct def cat eli els # Apply origina # Displ origina</pre>	e non-n I_data[' e rows w I_data = ion to a egorize( return f row['(A return f row['(C return the fun I_data[' ay the D I_data.h	umeric values in 'Year_Open' with Na Year_Open'] = odicto_numeric(original here' Year_Open' is 0 original_data[original_data['Year_O leformine the standard category (row): SH_DATE'] < row['Year_Open']: 'Before' 'SHATE'] > row['Year_Open']: 'After' 'Same' clion to create the 'standard' colum standard'] = original_data.apply(cat lafarame to verify the changes ead()	W, then o _data['Ve pen'] != n egorize,	onvert to inte ar_Open'], ern 0] axis=1)	ors='c	∞erce').fil	lna(0).ast)	rpe(int)							
OBJ	ECTID_1	Shape	JOIN_FID	CRASH_DATE	CSEV	FATALITIES	PROPDMG	XCOORD	YCOORD	Year_Open	Category	City	County	Classifica	standard
0	1	(-94.18270383781186, 42.505045555208255)	74	2009	1	0	3000	402829	4706531	2016	Modern Roundabout	Fort Dodge	Webster	Commercial	Before
1	2	(-90.68811838405617, 42.498333890496724)	95	2009	1	0	1200	689968	4707698	2020	Modern Roundabout	Dubuque	Dubuque	Commercial	Before
2	3	(-93.46782795179848, 41.59525399037943)	105	2009	2	0	4000	461011	4604945	2018	Modern Roundabout	Pleasant Hill	Polk	Commercial	Before
4	5	(-90.68791011905671, 42.4970509437461)	72	2009	1	0	2500	689989	4707556	2016	Modern Roundabout	Dubuque	Dubuque	Commercial	Before
5	6	(-92.43332062784464, 42.51336786973144)	71	2009	1	0	1800	546552	4706933	2016	Modern Roundabout	Cedar Falls	Black Hawk	Commercial	Before

### 3-5 Excluding Roundabouts with Insufficient Crash Data History

To ensure a comprehensive comparison, we will remove roundabouts constructed between 2000 and 2011, as well as those constructed in 2021, 2022, and 2023. This is because our crash data spans from 2009 to 2023, and we aim to have at least three years of crash data (2009, 2010, 2011) for each roundabout for a robust analysis.

# M df_t # G sort # G firs last # C year #Un df_t df_t	ake a copy of total = orig et sorted // ted_unique_y st_ten_years t_two_years t_two_years ombine the y rs_to_remove rs_to_remove rop rows whe total = df_t total.head()	of 'original_d inal_data.cop st of unique ears = sorted first two and = sorted_uniq ears to be re- st = first_ten_ st [x for x in some 'Year_Open otal[~df_tota	ata' y() 'Year_ (df_tc /ast que_yea moved years sorted 'is i  ['Yea	<i>Open' val</i> , tal['Year tars[:10] urs[-2:] + last_tw _unique_ye <i>n years_t</i> i ur_Open'].	ues _Open'].unique _ <i>Open' values</i> o_years o_years ears if x not o_remove isin(years_to,	e()) in ye _remove	ars_to_remov 2)]	ve]					
	OBJECTID_1		Shape	JOIN_FID	CRASH_DATE	CSEV	FATALITIES	PROPDMG	XCOORD	YCOORD	Year_Open	Category	City
0	1	(-94.182703837 42.50504555520	81186, 08255)	74	2009	1	0	3000	402829	4706531	2016	Modern Roundabout	Fort Dodge

Ŭ.	42.505045555208255)	14	2005	1.1		5000	402025	4100331	2010	Roundabout	Dodge	
2	3 (-93.46782795179848, 41.59525399037943)	105	2009	2	0	4000	461011	4604945	2018	Modern Roundabout	Pleasant Hill	
4	5 (-90.68791011905671, 42.4970509437461)	72	2009	1	0	2500	689989	4707556	2016	Modern Roundabout	Dubuque	Dub
5	6 (-92.43332062784464, 42.51336786973144)	71	2009	1	0	1800	546552	4706933	2016	Modern Roundabout	Cedar Falls	E
6	7 (-91.61990822948115, 42.03467983550604)	68	2009	1	0	2000	614235	4654548	2019	Planned Roundabout	Marion	

### 3-6. Analyzing Crash Data Relative to Roundabout Construction Years

To analyze the impact of roundabout construction on road safety, we group crash data by each roundabout's identifier ('JOIN\_FID') and the crash dates. We pivot this data to align each roundabout's crash history with its construction year. Then, we calculate the average number of crashes before and after each roundabout was built. The resulting DataFrame, 'crash\_count', clearly shows how crash frequencies change relative to the construction dates of roundabouts. For further analysis, key columns like 'FID', 'Year\_Open', 'Avg\_Before', and 'Avg\_After' are saved in a new DataFrame named "Crash".



Co

	FID	Year_Open	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total	Avg_Before	Avg_After
0	1	2013.0	0.0	0.0	0.0	1.0	4.0	2.0	3.0	1.0	4.0	5.0	4.0	2.0	9.0	12.0	10.0	57.0	0.250000	5.200000
1	26	2014.0	0.0	0.0	0.0	1.0	1.0	2.0	1.0	1.0	0.0	1.0	0.0	0.0	3.0	0.0	2.0	12.0	0.400000	0.888900
2	30	2013.0	0.0	1.0	0.0	0.0	3.0	0.0	3.0	0.0	2.0	1.0	1.0	2.0	1.0	0.0	0.0	14.0	0.250000	1.000000
3	33	2012.0	9.0	3.0	3.0	2.0	1.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	5.000000	0.363600
4	35	2012.0	1.0	0.0	0.0	0.0	3.0	1.0	0.0	1.0	0.0	2.0	1.0	2.0	0.0	4.0	0.0	15.0	0.333300	1.272700
5	36	2012.0	1.0	0.0	2.0	1.0	0.0	4.0	1.0	1.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	12.0	1.000000	0.727300
6	38	2012.0	0.0	1.0	2.0	1.0	4.0	3.0	2.0	0.0	0.0	4.0	3.0	0.0	1.0	2.0	1.0	24.0	1.000000	1.818200
7	42	2013.0	3.0	7.0	6.0	7.0	9.0	13.0	18.0	17.0	22.0	19.0	19.0	9.0	15.0	6.0	2.0	172.0	5.750000	14.000000
8	43	2013.0	3.0	2.0	3.0	1.0	2.0	1.0	3.0	1.0	4.0	3.0	4.0	0.0	0.0	0.0	0.0	27.0	2.250000	1.600000
9	47	2017.0	1.0	5.0	0.0	3.0	5.0	4.0	6.0	3.0	4.0	2.0	7.0	10.0	5.0	13.0	14.0	82.0	3.375000	8.500000
10	53	2017.0	2.0	0.0	0.0	0.0	3.0	1.0	4.0	2.0	4.0	1.0	3.0	1.0	3.0	2.0	2.0	28.0	1.500000	2.000000
11	54	2016.0	12.0	3.0	5.0	3.0	2.0	6.0	8.0	7.0	7.0	9.0	12.0	11.0	5.0	10.0	9.0	109.0	5.571400	9.000000
12	56	2016.0	0.0	2.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	2.0	3.0	4.0	5.0	23.0	0.857100	2.285700
13	57	2014.0	3.0	1.0	2.0	2.0	3.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0	1.0	0.0	20.0	2.200000	1.000000
14	58	2016.0	0.0	5.0	5.0	3.0	5.0	7.0	4.0	8.0	5.0	5.0	3.0	5.0	5.0	2.0	6.0	68.0	4.142900	4.428600
15	59	2015.0	8.0	2.0	3.0	1.0	1.0	3.0	0.0	5.0	4.0	3.0	1.0	4.0	4.0	7.0	2.0	48.0	3.000000	3.750000
16	68	2019.0	2.0	3.0	2.0	0.0	2.0	2.0	5.0	3.0	1.0	1.0	2.0	2.0	1.0	3.0	1.0	30.0	2.100000	1.750000
17	69	2016.0	0.0	0.0	1.0	1.0	2.0	0.0	0.0	1.0	0.0	3.0	3.0	2.0	4.0	2.0	3.0	22.0	0.571400	2.428600
18	70	2016.0	0.0	0.0	0.0	1.0	2.0	2.0	0.0	0.0	11.0	22.0	8.0	12.0	14.0	16.0	18.0	106.0	0.714300	14.428600
19	71	2016.0	4.0	6.0	4.0	4.0	2.0	7.0	4.0	6.0	1.0	3.0	2.0	3.0	5.0	2.0	2.0	55.0	4.428600	2.571400
20	72	2016.0	6.0	4.0	3.0	2.0	6.0	6.0	4.0	4.0	8.0	7.0	5.0	4.0	2.0	4.0	5.0	70.0	4.428600	5.000000
21	73	2015.0	0.0	1.0	1.0	2.0	0.0	1.0	1.0	0.0	1.0	2.0	1.0	0.0	2.0	0.0	0.0	12.0	0.833300	0.750000
22	74	2016.0	2.0	2.0	2.0	2.0	4.0	3.0	3.0	3.0	3.0	2.0	5.0	2.0	6.0	2.0	3.0	44.0	2.571400	3.285700
23	81	2017.0	1.0	0.0	0.0	2.0	1.0	4.0	3.0	0.0	6.0	3.0	0.0	9.0	6.0	7.0	7.0	49.0	1.375000	5.333300
24	82	2017.0	0.0	0.0	1.0	2.0	1.0	0.0	1.0	1.0	2.0	1.0	0.0	0.0	2.0	1.0	0.0	12.0	0.750000	0.666700
25	83	2016.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	5.0	1.0	0.0	3.0	0.0	2.0	13.0	0.000000	1.857100
26	87	2019.0	2.0	3.0	3.0	3.0	2.0	2.0	8.0	1.0	1.0	0.0	1.0	1.0	2.0	1.0	0.0	30.0	2.500000	1.000000
27	88	2018.0	0.0	3.0	3.0	3.0	5.0	5.0	3.0	7.0	1.0	0.0	2.0	3.0	6.0	2.0	3.0	46.0	3.333300	3.200000
28	89	2019.0	2.0	0.0	1.0	2.0	3.0	2.0	2.0	1.0	2.0	1.0	1.0	2.0	1.0	2.0	2.0	24.0	1.600000	1.750000
29	90	2012.0	0.0	1.0	0.0	0.0	1.0	1.0	2.0	6.0	2.0	2.0	3.0	3.0	6.0	7.0	2.0	36.0	0.333300	3.181800
30	91	2019.0	1.0	0.0	2.0	4.0	1.0	3.0	1.0	3.0	3.0	2.0	1.0	2.0	2.0	2.0	0.0	27.0	2.000000	1.500000
31	92	2019.0	0.0	7.0	8.0	3.0	3.0	6.0	2.0	8.0	3.0	4.0	4.0	1.0	1.0	2.0	1.0	53.0	4.400000	1.250000
32	93	2017.0	1.0	2.0	3.0	3.0	2.0	2.0	1.0	2.0	3.0	3.0	2.0	1.0	2.0	2.0	2.0	31.0	2.000000	2.000000
33	99	2017.0	8.0	10.0	5.0	5.0	7.0	6.0	7.0	5.0	8.0	6.0	2.0	3.0	7.0	6.0	6.0	91.0	6.625000	5.000000
34	103	2019.0	9.0	5.0	7.0	6.0	4.0	6.0	3.0	6.0	2.0	4.0	1.0	3.0	7.0	2.0	2.0	67.0	5.200000	3.500000
35	104	2019.0	0.0	1.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	3.0	1.0	0.0	3.0	1.0	13.0	0.500000	1.250000
36	Average	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	2.309553	3.320508

## 3-7. Creating Roundabout Crash Data Bar Charts with Matplotlib

To plot a bar chart for each roundabout's crash data, we will utilize Matplotlib, a powerful plotting library in Python. The code will prompt the user to specify a directory where the charts should be saved. It will then create a new folder in that directory to store the individual bar charts.

For each roundabout, identified by 'FID', we will generate a bar chart showing the number of crashes per year. These charts will be color-coded: years before the roundabout's

construction will be marked in green, the construction year in red, and years after construction in blue. This color scheme will help in visually distinguishing the data points relative to the roundabout's construction year.

After creating each chart, we will add a legend to clarify the color coding and then save the chart as a PNG file in the designated folder. The code will loop through all the roundabouts in the 'crash\_count' DataFrame, ensuring each one has a corresponding bar chart, which will be stored in the newly created folder. This systematic approach allows for an efficient and organized way to analyze and visualize the crash data in relation to the construction years of roundabouts.





### 3-8 Uploading Roundabout Crash Data Charts to AWS S3 Bucket

To display bar charts on an interactive online map, we need to save the PNG files to a server and include their URLs in the "Crash" DataFrame we created earlier. We will use Amazon Web Services (AWS) S3 bucket for hosting these files. Alternatively, if you have a different server or cloud service, you can upload the charts there and use those URLs instead. Here is how to proceed with this task:

i. Set Up AWS Account and S3 Bucket:

First, you need to have an AWS account. If you don't have one, you can create it at AWS Management Console.

Once logged in, navigate to the S3 service and create a new bucket. While creating it, you can set the bucket's privacy settings. Make sure to comply with AWS's best practices for security and privacy.

ii. Upload Files to the S3 Bucket:

Once your bucket is set up, you can upload your files. Navigate to the 'Roundabout\_Crash\_Data\_Charts' folder we created and proceed to upload your files there.

iii. Set Access Control List (ACL) for Public Access:

To make an individual file publicly accessible, you need to change its ACL (Access Control List).

In the S3 console, select the file, then choose the 'Permissions' tab. Under the 'Access control list (ACL)' section, you can set the file to be publicly readable.

Be cautious with public access as it allows anyone on the internet to view or download the file.

Roundabout\_Crash\_Data\_Charts/

0	bjects Properties						
O	bjects (34) Info ojects are the fundamental entities stored in Amazon S3. You	u can use Amazon S3 inventory 🔀 to get a list of	all objects in yo	ur bucket. For others to access your o	bjects, you'll need to explicitly	grant them permissions. <u>Lear</u>	m more. 🔀
	C Copy S3 URI Copy URL	Download Open Z	Delete	Actions A Create fo	older M Upload		
0	C Find objects by prefix			Download as Share with a presigned URL			
	Name 🔺	Type 🗢	Last mc	Calculate total size	Size	⊽	Storage class
	1.png	png	Decemb 06:00)	Copy Move		28.5 KB	Standard
	🗅 103.png	png	Decemb 06:00)	Initiate restore Query with S3 Select		27.6 KB	Standard
	104.png	png	Decemb 06:00)	Edit actions Rename object		29.7 KB	Standard
	🗅 30.png	png	Decemb 06:00)	Edit storage class		29.9 KB	Standard
	🗅 33.png	png	Decemb 06:00)	Edit server-side encryption Edit metadata		27.5 KB	Standard
	🗅 35.png	png	Decemb 06:00)	Edit tags Make public using ACL	_	30.6 KB	Standard
	36.png	png	Decemb 06:00)	er 26, 2023, 10:45:52 (UTC-		30.6 KB	Standard
	38.png	png	Decemb 06:00)	er 26, 2023, 10:45:53 (UTC-		31.0 KB	Standard
	42.png	png	Decemb 06:00)	er 26, 2023, 10:45:53 (UTC-		28.3 KB	Standard
	43.png	png	Decemb 06:00)	er 26, 2023, 10:45:54 (UTC-		30.3 KB	Standard
	47.png	png	Decemb 06:00)	er 26, 2023, 10:45:54 (UTC-		28.6 KB	Standard

iv. Retrieve the File URL:

Once the file is uploaded and the ACL is set, each file in the S3 bucket has a unique URL.

You can find this URL in the S3 console by selecting the file. The 'Object URL' is typically in the format: https://[bucket-

name].s3.[region].amazonaws.com/[filename].

	Object overview	
Dume         SLIB           SNB44209CB40B452495888650715bet0018582460.0018504         SISUB           SNB44209CB40B452495888650715bet0018582460.0018504         SISUB           SNB44209CB40B452495888650715bet0018582460.0018504         SISUB           Mini Resource Name (ARB)         Amazon Resource Name (ARB)           US Eart (Drint of u-essi-2         amazon Sisterior Name (ARB)           Likit modelid         amazon Sisterior Name (ARB)           December 28, 2023, 10-4550 (UTC.06:00)         Entry Lip (Expl           Sing         7 06/ca22425015065011110216/97M           255 58         Object URL           Type         Object URL           Type         Ministry / Monodabout, Crash, Data, Chart (J ang           Kry         In thips / Monodabout, Crash, Chart, J ang           Kry         In thips / Monodabout, Crash, Chart, J ang	Owner SS984Aegion VS Seat (Delive) sis-seat-2 Last modified December 20, 2023, 10-45-50 (UTC-06-00) Sizer 283-50 Type prog Key Čenovladoust, Orabi, (Data, Charts/1 prog	53 URI S3 Uritis S43/(dospie//Roundabourt_Crash_Data_Charts/1 png Amazon/Rounce Name (ARI) S47 amaws.S1=dospie/Neumabourt_Crash_Charts(11 png Extraty tag (Etag) 705(cose242425015c05c1a011192196991 Object URL 11105//Monouns1.us-seast-2.amazonaws.com/Neumdabourt_Crash_Charts(1 png

## 3-8 Add URL to the DataFrame

To integrate the URLs of our saved bar charts into the 'Crash' DataFrame, we add a new column titled 'URL'. This is achieved by concatenating a base URL with the 'FID' of each roundabout, followed by the '.png' file extension, creating a complete URL for each corresponding bar chart. The base URL points to the location where the charts are stored on the AWS S3 bucket, ensuring each 'URL' column entry is a direct link to the respective bar chart image. We also adjust the DataFrame display settings to ensure the full URLs are visible without truncation.

# As base # Aa Cras # Se pd.s # Di Cras	<pre>(Ascuning 'Crash' is your existing DataFrame ase_url = "https://dospir.s3.us=east-2.mazonaw.com/Roundabout_Crash_Data_Charts/" Add a new column 'URL' to the DataFrame Trash['URL'] = Crash['Fl0'].apply(lambda x: ff\base_url){x}.ong") # Set option to display full content in a DataFrame column d.set_option('display.max.colwidth', None) # Display the DataFrame to verify the new 'URL' column Trash</pre>												
	FID	Year_Open	Avg_Before	Avg_After	URL								
0	1	2013.0	0.2500	5.2000	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/1.png								
1	26	2014.0	0.4000	0.8889	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/26.png								
2	3 <b>0</b>	2013.0	0.2500	1.0000	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/30.png								
3	33	2012.0	5.0000	0.3636	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/33.png								
4	35	2012.0	0.3333	1.2727	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/35.png								

### 3-9 Calculating and Integrating Average Crash Severity and Property Damage

To calculate the average crash severity ('CSEV') and property damage ('PROPDMG') before and after roundabout construction, we will use a custom Python function. This function ensures accurate averaging, even in cases where all data points are zero. It calculates the average 'CSEV' and 'PROPDMG' for each roundabout, separated into 'Before' and 'After' construction

categories. We then group our data by each roundabout's unique identifier ('JOIN\_FID') and apply this function. Finally, to focus on relevant roundabouts, we filter these averages to include only those found in our 'Crash' DataFrame, ensuring our analysis is specific and targeted.

```
# Function to celculate average, keeping zero values if they are the only ones present
def calculate_average(df, colum):
    if df(column].eq(0).all(): # /f all values are zero
        return 0
    else:
        return df[df[column] != 0][column].mean() # Calculate average excluding zeros
# droup by 'WORLFID' and calculate averages using the custom function
    avg.df = df.total.groubSV('JOINLFID').acply(lambda x: pd.Series({
        'CSEV_Before': calculate_average(x|x'standard'] == 'Before'], 'CSEV'),
        'CSEV_After': calculate_average(x|x'standard'] == 'After'], 'CSEV'),
        'CSEV_After': calculate_average(x|x'standard'] == 'After'], 'FROPDMG'),
        'PROPDMG.Before': calculate_average(x|x'standard'] == 'After'], 'FROPDMG'),
        'PROPDMG.After': calculate_average(x|x'standard'] == 'After'], 'FROPDMG')
})), reset_index()
# Filter out row where VORLFID'.unique()
    avg.df = avg.df[avg.df['JOIN_FID'].isin(unique_fid_list)]
        # Diselay the resulting DataFrame
        avg.df.head()
```

JOIN FID	CSEV Before	CSEV After	PROPDMG Refore	PROPDMG After

0	1	3.0	1.250000	13500.0	3939.423077
3	26	1.5	1.000000	3000.0	7306.250000
4	30	1.0	1.200000	7500.0	3878.000000
5	33	1.8	1.000000	9280.0	9325.000000
7	35	1.0	1.142857	2500.0	4310.714286

Next, we will create a new DataFrame, 'Average', as a copy of the previously created 'Crash' DataFrame. Into 'Average', we will integrate the calculated average crash severity and property damage data. This integration is done by merging 'Average' with our calculated averages dataframe ('avg\_df'), ensuring that each roundabout's unique identifier ('FID') in 'Crash' aligns with 'JOIN\_FID' in 'avg\_df'. After the merge, we'll drop any redundant columns and refine the data, including rounding specific columns to the desired decimal places and converting identifier columns to integers.

```
      # Greate a copy of the 'Cresh' DataFrame

      Average = Crash.copy()

      # Kenue that 'JONE_FID' in 'Average'

      # Ensure that 'JONE_FID' column if not needed

      Average = Average.merge(avg_df, left_on='FID', right_on='JOIN_FID', how='left')

      # Drop the extra 'JONE_FID' column if not needed

      Average = Column if not needed

      # Verage('VolUN_FID' column if not needed

      Average('volUN_FID' column if not needed

      # Average('volUN_FID' column if not needed

      # Average('volUN_FID' column if not needed

      Average('volUN_FID' column if not needed

      # Average('volUN_FID' column if not needed

      Average('Nog_After') = crash_count('Avg_After').cound(4)

      # Average('Nog_After') = crash_count('Avg_After').cound(4)

      # Verage('Nog_After') = crash_count('Avg_After').cound(4)

      # Average('Vera_Open') = Average('Vera_Open') = Average('Nog_After', 'Avg_Before', 'Crash_After', 'CSEV_After', 'Avg_After')

      # Round the other specified columns to three deeimal place

      columns_to_round) = Average(columns_to_round).round(3)

      # Display the updated DataFrame

      Average.head()

      URL CSEV_Before CSEV_After PROPDMG_Before PROPDMG_After
```

0	1	2013	0.250	5.200	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/1.png	3.0	1.250	13500.0	3939.423	0.250	5.200
1	26	2014	0.400	0.889	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/26.png	1.5	1.000	3000.0	7306.250	0.400	0.889
2	30	2013	0.250	1.000	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/30.png	1.0	1.200	7500.0	3878.000	0.250	1.000
3	33	2012	5.000	0.364	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/33.png	1.8	1.000	9280.0	9325.000	5.000	0.364
4	35	2012	0.333	1.273	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/35.png	1.0	1.143	2500.0	4310.714	0.333	1.273

# To export this DataFrame 'Average' to an excel file, you can use 'to\_excel' method provided by pandas.

# Export the DataFrame 'Average' to an Excel file excel\_filename = 'data/Average\_Data.xlsx' Average.to\_excel(excel\_filename, index=False) print(f''texcel\_filename' has been saved.")

	Α	В	С	D	E	F	G	н	1
1	FID	Year_Open	Crash_B	Crash_A	URL	CSEV_B	CSEV_A	PROPDMG_B	PROPDMG_A
2	1	2013	0.25	5.2	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/1.png	3	1.25	13500	3939.423
3	26	2014	0.4	0.889	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/26.png	1.5	1	3000	7306.25
4	30	2013	0.25	1	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/30.png	1	1.2	7500	3878
5	33	2012	5	0.364	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/33.png	1.8	1	9280	9325
6	35	2012	0.333	1.273	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/35.png	1	1.143	2500	4310.714
7	36	2012	1	0.727	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/36.png	1	1	2500	3490
8	38	2012	1	1.818	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/38.png	2	1.1	2233.333	4452.5
9	42	2013	5.75	14	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/42.png	1.261	1.279	6715.217	5717.307
10	43	2013	2.25	1.7	https://dospir.s3.us-east-2.amazonaws.com/Roundabout_Crash_Data_Charts/43.png	1.556	1.412	8222.222	6887.824

### 4. Enhancing ArcGIS Pro Maps with Interactive Charts and Data Pop-ups

To enhance the interactivity of our ArcGIS Pro map, we will integrate the charts and dataframe that we have meticulously prepared. This task is accomplished using two pivotal functionalities within ArcGIS Pro. Initially, we'll employ the "Calculate Field" tool, a more stable alternative to exporting dataframes through a Jupyter Notebook—a method which, while possible, tends to be susceptible to crashes and lacks reliability. By leveraging "Calculate Field," we can seamlessly modify and incorporate our data into the active map layer.

Following this integration, we will enrich the map's user experience by configuring popups with the "Configure Pop-ups" feature. This will not only display the geographic information but will also imbue the map with dynamic visual elements and provide data-driven insights via the interactive charts and pop-ups, making the map both informative and engaging.

## 4-1. Establishing a Persistent "Rndbt\_ID" Identifier Column

In the "Roundabouts" layer, the "FID" column uniquely identifies each row. However, these identifiers are subject to change during certain operations, such as when rows are deleted, or the dataset is otherwise altered. To preserve the original "FID" values and maintain a consistent reference to each roundabout, we will create a new column named "Rndbt\_ID". This new field will duplicate the current "FID" values, ensuring that the original identifiers remain unaltered regardless of subsequent modifications to the layer.

Here's how we accomplish this:

1. Begin by right-clicking on the 'Roundabouts' layer in ArcGIS Pro and selecting "Attribute Table" to open it.

2. Once the attribute table is open, right-click on any column header and choose "Calculate Field."



3. Configure the tool by selecting "Rndbt\_ID" as the field to calculate, and simply set the expression to !FID!, which instructs ArcGIS Pro to copy the "FID" field values directly into "Rndbt\_ID".

4. Choose "Long Integer" as the field type to support whole number identifiers.

This tool modifies the Input Table			
Input Table			1.
Roundabouts			*
Perd Name (Existing or New)			
Expression Type			1.
Python 3			3
Expression			
Fields	Y	Helpers	т
FID RndELID KeepRow Shape SymbolD Intersect Descriptio		at_integer_ratio() (.apitalize() center() conjugate() .count() decode() .denominator()	Û
Insert Values		* / * - =	
Rndbt_ID =			
IFIDI			
Code Block			
Enforce Domains			S ✓ a ⇒
			Enable Undo D Apply OK

5. Execute the calculation. The "Rndbt\_ID" column will now mirror the "FID" column, creating a stable and unchanging identifier for each roundabout feature.

	III Roundabouts ×													
Fiel	d: 🕎	Add	Calculate	Selectio	Selection: 🖫 Select By Attributes 🥰 Zoom To 🚏 Switch 🗐 Clear 💭 Delete 🗐 Copy									
	FID	Rndbt_ID	t_ID KeepRow Shape* SymbolID Intersecti Descriptio		Year_Open									
1	0	0	0	Point ZM	0	Bass Pro Dr & Prairie Fi	Multi-lane in new com	2009						
2	1	1	1	Point ZM	0	Irvindale Dr & Vintage	Replacing all-way stop	2013						
3	2	2	0	Point ZM	0	SW Cherry St & SW 11	New roadway adjacen	2011						
4	3	3	0	Point ZM	0	SW Snyder Blvd & SW	New residential devel	2006						
5	4	4	0	Point ZM	0	NW 13th Street & NW	New residential devel	2005						

### 4-2. Removing Unnecessary Rows Using the "Calculate Field" Tool

To streamline our "Roundabouts" layer by removing unnecessary rows, we will once again utilize the "Calculate Field" tool. This time, the tool will be used to flag roundabouts that we wish to retain, facilitating manual deletion of unwanted rows. The list of Roundabout IDs to be kept corresponds with the values in the FID column that we previously exported to an Excel file (DataFrame 'Average').

Here's the step-by-step process for our "Roundabouts" layer:

1. Open the "Calculate Field" tool in ArcGIS Pro.

2. Add a new field named "KeepRow" to the layer. This field will act as a flag, indicating whether a row should be kept (1) or not (0).

3. Inside the tool's Code Block, define your list of FIDs as follows:

>>> Roundabout\_list = [1, 26, 30, 33, 35, 36, 38, 42, 43, 47, 53, 54, 56, 57, 58, 59, 68, 69, 70, 71, 72, 73, 74, 81, 82, 83, 87, 88, 89, 90, 91, 92, 93, 99, 103, 104]

4. Set the expression in the tool to:

>>> 1 if !Rndbt\_ID! in Roundabout\_list else 0

5. Execute the "Calculate Field" tool.

alculate Field				?
B This tool modifies the Input Table				
Input Table Roundabouts				- 1
Field Name (Existing or New) KeepRow				
Expression Type Python 3				
Expression				
Fields	T	Helpers		1
FID Rndbt_ID Shape SymbolID Intersect Descriptio Year_Open	Î	.as_integer_ratio() .capitalize() .center() .count() .decode() .denominator()		ĺ
Insert Values		* / + - =		
KeepRow =				
1 if !Rndbt_ID! in Roundabout_list else 0				
Code Block				
Roundabout_list = [1, 26, 30, 33, 35, 36, 38,	. 42, 43, 47, 53, 54, 56, 57, 58,	50, 68, 60, 70, 71, 72, 73, 74, 81, 8	2, 83, 87, 88, 89, 90, 9	u, 92, 93, 99, 10-
10				
			4	/
Enforce Domains				
			Enable Undo 🍞	Apply OK

To finalize the removal of unwanted rows, proceed as follows:

6. Sort the "KeepRow" column in ascending order within the attribute table. This will group all rows with a '0' together.

7. Select these rows and use the 'Delete Rows' command to remove them from the layer.

1	FID	KeepRow *	Shape *	Intersecti	SymboliD	Descriptio	Year_Open
1	1	1	Point ZM	Irvindale Dr & Vintage	0	Replacing all-way stop	2013
2	26	1	Point ZM	Commerce Dr & Comm	0	Rebuilt 4-leg intersecti	2014
3	30	1	Point ZM	Co Rd E23 & Matthew	0	Between 3 schools; Re	2013
4	33	<u></u> t	Point ZM	US 218 southbound ra	0	Diamond interchange	2012
5	35	1	Point ZM	NW 62nd Ave & Pione	0	1 of 4 on 62nd Ave cor	2012

By following these steps, we ensure that our "Roundabouts" layer is streamlined to include only the essential records. This refinement is guided by the predetermined list of FID values, which was meticulously compiled during our earlier data preprocessing phase using Python.

### 4-3. Importing Excel Data and Performing Table Joins in ArcGIS Pro

In this section, we focus on importing the 'Average\_Data' Excel file into ArcGIS Pro and executing a table join with the 'Roundabouts' layer.

1. Importing the 'Average\_Data' Excel File:

- Begin by opening ArcGIS Pro and accessing the 'Map' tab.

- Use the 'Add Data' option and select 'Add Data from File' to import the 'Average\_Data.xlsx' file.

- Locate and select your Excel file, integrating it as a new table in your project.
- 2. Executing a Table Join:
  - Right-click on the 'Roundabouts' layer in the Contents pane.
  - Navigate to 'Joins and Relates' and choose 'Add Join'.
  - In the 'Add Join' dialog, select the 'Rndbt\_ID' field from the 'Roundabouts' layer.
  - Then, select the imported 'Average\_Data' table and its 'FID' field.

- The join operation will append the fields from 'Average\_Data' to the 'Roundabouts' layer, based on the matching criteria between 'Rndbt\_ID' and 'FID'.

Add Join	?	×
Pending edits.		
Input Table Roundabouts	~	
Input Join Field     Roundabouts_20211020.Rndbt_ID	Ŷ	ġ
A Join Table Sheet1\$	~	
FID	Ŷ	ġ.
<ul> <li>Keep All Target Features</li> <li>Index Joined Fields</li> </ul>		
Validate Join		
	OK	

After performing the "Add Join" operation, your attribute table should display additional columns from the 'Average\_Data' table alongside the existing 'Roundabouts' layer fields, as illustrated below:

	FID	Rndbt_ID	Shape *	Descriptio	Year_Open	Category	City	County	Crash_A	Crash_B	CSEV_A	CSEV_B	PROPDMG_A	PROPDMG_B	URL
1	0	1	Point ZM	Replacing all-way stop	2013	Modern Roundabout	Ankeny	Polk	5.2	0.25	1.25	3	3939.423	13500	https://dospir.s3.us-east
2	1	26	Point ZM	Rebuilt 4-leg intersecti	2014	Modern Roundabout	Coralville	Johnson	0.889	0.4	1	1.5	7306.25	3000	https://dospir.s3.us-east
3	2	30	Point ZM	Between 3 schools; Re	2013	Modern Roundabout	Gilbert	Story	1	0.25	1.2	1	3878	7500	https://dospir.s3.us-east
4	3	33	Point ZM	Diamond interchange	2012	Modern Roundabout	Janesville	Bremer	0.364	5	1	1.8	9325	9280	https://dospir.s3.us-east
5	4	35	Point ZM	1 of 4 on 62nd Ave cor	2012	Modern Roundabout	Johnstson	Polk	1.273	0.333	1.143	1	4310.714	2500	https://dospir.s3.us-east

## 4-4. Customizing Pop-Up Displays for the "Roundabouts" Layer

The next step in our DOSPIR is to enhance the interactivity of the "Roundabouts" layer by configuring custom pop-ups. These pop-ups will activate when a point on the map is clicked, displaying a tailored window of information that caters to the specific needs and interests of the users. By setting up pop-ups, we can provide immediate access to detailed data, such as annual crash statistics, directly within the map's interface, improving the user experience and offering insightful context at a glance. The configuration of these pop-ups will be designed to meet user requirements, ensuring that the most relevant and useful information is presented efficiently.

Configure	e Pop-ups - Ro	undabouts_20	211020		? ~ ₽ ×
A			du	<u>i</u>	
Text	Fields	Image	Chart	Carousel	Arcade
	₩ · ×		-		
Title:			{Rndbt_ID}		
			Fields(5)		
			Fields(1)		
	Number of Crash		Crash Severity	Prop	perty Damage
[]]]			Fields(6)		
Disable	Expressions	Formats			Reset

- Access the Configure Pop-ups Window:

Right-click on the layer for which you want to configure pop-ups and select "Configure Pop-ups".

- Customize the Pop-up Content:

The pop-up configuration window will appear, displaying various elements that you can add or adjust.

The title of the pop-up can be set to show a unique identifier or name from the feature, such as "Rndbt\_ID" in this case.

- Adding Fields and Charts:

To display specific data, click on the "Fields" option to choose which attributes from the layer you want to show in the pop-up.

To add a visual element, click on the "Chart" option to create a chart that graphically represents the attribute data, making the pop-up more informative and engaging.



To display the Annual Crash Data for each roundabout, we will create a field within the pop-up that exclusively shows the "URL". This URL links to the corresponding bar charts hosted on AWS S3, which we have prepared earlier.

Title	Annual Crash Data	
Caption	Please click the URL to view the Annual Crash Data for this Roundabout.	
Only	use visible fields and Arcade expressions	
🗌 Dis	ay Field Alias {Field Name}	
~	URL {URL}	

Once satisfied with the configuration, you can save your settings, and these pop-ups will be enabled for the layer.



### 5. Publishing the Updated Layer Online

The next step in our GIS project is to publish the newly updated "DOSPIR" layer as a Web Map to our ArcGIS online account. This process will involve:

- Naming the map package "DOSPIR."
- Saving it within a designated folder in the ArcGIS online account.
- Clicking 'Analyze' to inspect the package for any potential issues.

Share As Web Map	? ~ □ ×
Layers	
Map Configuration	
Item Details	
Name	
DOSPIR	
Summary	
Updated 2024-01-11	
Tags	
Select a Configuration ()	
Use sumbel times compatible with all clients	
ose syndor types compatible with an clients	
Location	
DOSPIR	• 👄
Share with	
V Everyone	
University of Iowa	
Groups 🐱	
Finish Sharing	
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During the analysis phase, it's common to encounter warnings or errors related to layer properties or ArcGIS Pro configurations. These can be addressed by reviewing the error messages and making the necessary adjustments directly within the tool. Once all issues have been resolved and the package is free of errors, we're ready to share "DOSPIR" online, thereby providing access to a wider audience and extending the reach of our GIS data beyond the confines of ArcGIS Pro.

To view the "DOSPIR" Web Map, begin by opening a web browser and heading to the ArcGIS Online portal at https://www.arcgis.com. Log in with your ArcGIS Online account credentials. Once logged in, proceed to the "My Content" section where you can find all your saved items. In the designated folder where you uploaded the "DOSPIR" Web Map, you will be able to see and manage your file. This is where you can perform various actions such as viewing the map, editing its properties, or sharing it with others.

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#### 6. Leveraging the DOSPIR Web Map for Various Applications

The DOSPIR Web Map on ArcGIS Online can serve multiple purposes depending on the objectives set for the database. For instance, to provide users with an intuitive and engaging way to explore the data, one could create an "Instant App" featuring an Interactive Legend. This type of app streamlines the process of sharing GIS information by offering a ready-to-use application with customizable options. Here's a brief overview of creating an Instant App:



- Select the DOSPIR Web Map: Navigate to the DOSPIR Web Map in your ArcGIS Online content and select it.
- Choose to Create an App: From the item details page, look for the option to create an app and select "Instant Apps" from the available choices.
- Configure the App: Select a template that suits your presentation needs, such as one with an Interactive Legend if you wish to allow users to toggle map layers on and off.
- Customize App Settings: Tailor the app's settings to enhance the user experience. This includes configuring the legend, map extent, search options, and more, depending on the chosen template.
- Preview and Publish: Before making the app public, preview it to ensure it meets your requirements. Once satisfied, publish the app so it becomes accessible to your intended audience.



Creating an Instant App in this manner allows for the effective dissemination of the DOSPIR database, catering to interactive and informative user experiences.

https://uiowa.maps.arcgis.com/apps/instant/interactivelegend/index.html?appid=e8fd8f3be8e64153813b3 edae9d88675

### 6-1. Embedding the DOSPIR Instant App into Your Webpage

Upon successfully publishing the DOSPIR Instant App, ArcGIS Online provides you with an HTML iframe code snippet. This embed code is the key to incorporating the DOSPIR interactive map within your own website, granting users the convenience of exploring the map directly on the page. To integrate the DOSPIR Web Map, simply place the iframe code into the appropriate section of your website's HTML. This integration ensures that visitors can fully engage with the DOSPIR map's features and data without the need to navigate away from your webpage.

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