COSC3000 Visualisation Proposal

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It's no secret that SpaceX has changed the landscape for rocket launches and payload deployment globally, with no end in sight in their technological innovation. With this changing landscape, it begs the question for just how much SpaceX has impacted the global launch scene, with this visualisation project aiming to shed light on such changes SpaceX (and potentially other commercial space companies) have made.

What: Graph and analyse the relationship of key launch parameters (such as price per kilogram to orbit, number of launches, type of payload launched etc - continuous, discrete, and qualitative data respectively) over time, and based on launch provider (SpaceX, Rocket Lab, ULA etc). With this data evaluated, I'm confident a clear connection can be made between launch provider and impact on the commercial rocket launch industry.

Why: With so much of modern day life relying on infrastructure in orbit (telecommunications, weather forecasting etc), it is important to establish and predict how the future of satellite launching will evolve. With the likes of competing low earth orbit satellite internet constellations becoming a reality, the repeated launches of payloads at a low cost will become ever more important in a business sense. At the same time, US government plans to send humans into space will be impacted by the economics and safety record for commercial launch providers.

Available Data: Reliable data is available through Wikipedia lists, with sources clearly indicated for each data point (so verification of data is easy). Below is an example of a typical list of launches for a year of SpaceX. This data is available for other launch providers as well. Cost per launch would be taken from the average cost per year, where price per kilo to orbit would be calculated from that.

2015 [edit]

With 7 launches in 2015, Falcon 9 was the second most launched American rocket behind Atlas V.[94]

[hide] Flight No.	Date and time (UTC)	Version, Booster[N]	Launch site	Payload	Payload mass	Orbit	Customer	Launch outcome	Booster landing
14	10 January 2015, 09:47[87]	F9 v1.1 B1012[6]	Cape Canaveral, LC-40	SpaceX CRS-5[88] (Dragon C107)	2,395 kg (5,280 lb)[89]	LEO (ISS)	NASA (CRS)	Success[70]	Failure (drone ship)
	Following second-stage separation, SpaceX attempted to return the first stage for the first time to a 90 m × 50 m (300 ft × 160 ft) floating platform — called the autonomous spaceport drone ship. The test achieved many objectives and returned a large amount of data, but the grid-fin control surfaces used for the first time for more precise reentry positioning ran out of hydraulic fluid for its control system a minute before landing, resulting in a landing crash.[71]								
15	11 February 2015, 23:03[72]	F9 v1.1 B1013[6]	Cape Canaveral, LC-40	DSCOVR[66][73]	570 kg (1,260 lb)	HEO (Sun–Earth L_1 insertion)	USAF NASA NOAA	Success	Controlled (ocean)[N]
	First launch under USAF's OSP 3 launch contract.[74] First SpaceX launch to put a satellite beyond a geostationary transfer orbit, first SpaceX launch into interplanetary space, and first SpaceX launch of an American research satellite. The first stage made a test flight descent to an over-ocean landing within 10 m (33 ft) of its intended target.[75]								
16	2 March 2015, 03:50[72][76]	F9 v1.1 B1014[6]	Cape Canaveral, LC-40	ABS-3A Eutelsat 115 West B[66]	4,159 kg (9,169 lb)	GTO	ABS Eutelsat	Success	No attempt[77]
	The launch was Boeing's first conjoined launch of a lighter-weight dual-commsat stack that was specifically designed to take advantage of the lower-cost SpaceX Falcon 9 launch vehicle.[78][79] Per satellite, launch costs were less than US$30 million.[80] The ABS satellite reached its final destination ahead of schedule and started operations on 10 September 2015.[81]								
17	14 April 2015, 20:10[21]	F9 v1.1 B1015[6]	Cape Canaveral, LC-40	SpaceX CRS-6[66] (Dragon C108.1)	1,898 kg (4,184 lb)[82]	LEO (ISS)	NASA (CRS)	Success	Failure[83] (drone ship)
	After second-stage separation, a controlled-descent test was attempted with the first stage. After the booster contacted the ship, it tipped over due to excess lateral velocity caused by a stuck throttle valve that delayed downthrottle at the correct time.[84][85]								
18	27 April 2015, 23:03[86]	F9 v1.1 B1016[6]	Cape Canaveral, LC-40	TürkmenÄlem 52°E / MonacoSAT[66][87]	4,707 kg (10,377 lb)	GTO	Turkmenistan National Space Agency[88]	Success	No attempt[89]
	Original intended launch was delayed over a month after an issue with the helium pressurisation system was identified on similar parts in the assembly plant.[90] Subsequent launch successfully positioned this first Turkmen satellite at 52.0° east.								
19	28 June 2015, 14:21[21][91]	F9 v1.1 B1018[6]	Cape Canaveral, LC-40	SpaceX CRS-7[66] (Dragon C109)	1,952 kg (4,303 lb)[92]	LEO (ISS)	NASA (CRS)	Failure[93] (in flight)	Precluded[94] (drone ship)
	Launch performance was nominal until an overpressure incident in the second-stage LOX tank, leading to vehicle breakup at T+150 seconds. Dragon capsule survived the explosion but was lost upon splashdown as its software did not contain provisions for parachute deployment on launch vehicle failure.[95](more details below) The drone ship *Of Course I Still Love You* was towed out to sea to prepare for a landing test so this mission was its first operational assignment.[96]								
20	22 December 2015, 01:29[97]	F9 FT B1019.1[98]	Cape Canaveral, LC-40	Orbcomm-OG2-2 (11 satellites)[22][97]	2,034 kg (4,484 lb)	LEO	Orbcomm	Success	Success[99] (ground pad)
	Payload included eleven satellites weighing 172 kg (379 lb) each,[24] and a 142 kg (313 lb) mass simulator.[100] First launch of the upgraded v1.1 version, with a 30% power increase.[100] Orbcomm had originally agreed to be the third flight of the enhanced-thrust rocket,[101] but the change to the maiden flight position was announced in October 2015.[100] SpaceX received a permit from the FAA to land the booster on solid ground at Cape Canaveral[102] and succeeded for the first time.[99] This booster, serial number B1019, is now on permanent display outside SpaceX's headquarters in Hawthorne, California, at the intersection of Crenshaw Boulevard and Jack Northrop Avenue.[96] (more details below)								

How: Available data would manually be added to an excel spreadsheet (.csv file) where it would then be exported to Matlab to perform data analysis and visualisation. I expect to create multiple figures, separated by launch provider, payload destination, payload type, year, etc - which is all available such as in the table above.